

Right to Know Hazardous Substance Fact Sheets

# Emergency Responder Quick Reference

This handbook contains comprehensive safety and health information for over 400 hazardous substances to assist emergency responders in the event of a chemical emergency.

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Public Health Services  
Division of Epidemiology, Environmental and Occupational Health  
Consumer, Environmental and Occupational Health Service  
Right to Know Program  
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[www.nj.gov/health/rtk](http://www.nj.gov/health/rtk)

Common Name: **ACEPHATE**

Synonyms: N-(Methoxy(methylthio)phosphinoyl)acetamide; Orthene™; Lancer®

CAS No: 30560-19-1

Molecular Formula: C<sub>4</sub>H<sub>10</sub>NO<sub>3</sub>PS

RTK Substance No: 3140

Description: Colorless to white crystal or powder with an odor of rotten cabbage. It may be dissolved in a liquid "carrier."

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>3 - Health</b></p> <p><b>1 - Fire</b></p> <p><b>1 - Reactivity</b></p> <p><b>DOT#:</b> UN 2783</p> <p><b>ERG Guide #:</b> 152</p> <p><b>Hazard Class:</b> 6.1 (Poison)</p>	<p><b>Acephate</b> does not burn, however it is often dissolved in a liquid carrier which may be flammable or combustible.</p> <p>Use dry chemical, CO<sub>2</sub>, water spray or foam as extinguishing agents.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Phosphorus Oxides</i>, <i>Sulfur Oxides</i> and <i>Nitrogen Oxides</i>.</p> <p>Use water spray to keep fire-exposed containers cool.</p>	<p><b>Acephate</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); ALKALINE MATERIALS or STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); and HYPOCHLORITES.</p>

### SPILL/LEAKS

**Isolation Distance:**

Solid Spill: 25 meters (50 feet)

Liquid Spill: 50 meters (175 feet)

Fire: 800 meters (1/2 mile)

Moisten solid spilled material, or use a HEPA-filter vacuum for clean-up, and deposit in sealed containers.

Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers. DO NOT wash into sewer.

**Acephate** is hazardous to the environment and specific attention should be given to birds and honeybees.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Rotten cabbage
<b>Flash Point:</b>	199°F (93°C)
<b>Vapor Pressure:</b>	<1 mm Hg at 77°F (25°C)
<b>Specific Gravity:</b>	1.35 (Water = 1)
<b>Water Solubility:</b>	Soluble
<b>Melting Point:</b>	149° to 194°F (65° to 90°C)
<b>Decomposes:</b>	311°F (155°C)
<b>Molecular Weight:</b>	183.2
<b>pH:</b>	3.5-4.5 (1% in water)

### EXPOSURE LIMITS

No occupational exposure limits have been established for **Acephate**.

**Acephate** is skin absorbable.

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Nitrile, Neoprene and SilverShield®/4H®
<b>Coveralls:</b>	DuPont Tyvek® for <i>solid Acephate</i>
<b>Respirator:</b>	<b>Outdoors:</b> Full facepiece APR with Organic vapor cartridge and pesticide pre-filters <b>Indoors or Liquid:</b> Supplied air or SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns
<b>Inhalation:</b>	Headache, dizziness, blurred vision, sweating, nausea and vomiting, muscle twitching, loss of coordination, convulsions, coma and death
<b>Chronic:</b>	Carcinogen (liver) in animals

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention immediately.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention immediately.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** to a medical facility.

**Common Name: ACETALDEHYDE**

Synonyms: Ethanal; Ethyl Aldehyde; Acetic Aldehyde

CAS No: 75-07-0

Molecular Formula: C<sub>2</sub>H<sub>4</sub>O

RTK Substance No: 0001

Description: Clear, colorless liquid, or a gas above 69°F (21°C), with a sharp, fruity odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>3 - Health</b></p> <p><b>4 - Fire</b></p> <p><b>2 - Reactivity</b></p> <p><b>DOT#:</b> UN 1089</p> <p><b>ERG Guide #:</b> 129</p> <p><b>Hazard Class:</b> 3 (Flammable)</p>	<p><b>Acetaldehyde</b> can spontaneously decompose or polymerize to form explosive <i>Peroxides</i> when heated, distilled, evaporated or contaminated.</p> <p><b>FLAMMABLE AND REACTIVE LIQUID</b></p> <p>Use dry chemical, CO<sub>2</sub>, water spray or alcohol-resistant foam as extinguishing agents.</p> <p>Water and foam may not be effective in fighting fires.</p> <p><b>POISONOUS GASES ARE PRODUCED IN FIRE.</b></p> <p><b>CONTAINERS MAY EXPLODE IN FIRE.</b></p> <p>Use water spray to keep fire-exposed containers cool and to reduce vapors.</p> <p>Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source or flashback.</p> <p><b>Acetaldehyde</b> may form an ignitable vapor/air mixture in closed tanks or containers.</p>	<p><b>Acetaldehyde</b> is <b>REACTIVE</b> and can form explosive <i>Peroxides</i> on prolonged contact with <b>AIR</b>.</p> <p><b>Acetaldehyde</b> reacts with <b>STRONG ACIDS</b> (such as <b>HYDROCHLORIC, SULFURIC and NITRIC</b>); <b>STRONG BASES</b> (such as <b>SODIUM HYDROXIDE and POTASSIUM HYDROXIDE</b>); <b>AMMONIA</b>; <b>ALCOHOLS</b>; <b>ISOCYANATES</b>; <b>OXIDIZING AGENTS</b> (such as <b>PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE</b>); <b>KETONES</b>; <b>AMINES</b>; and <b>TRACE AMOUNTS of METALS</b> resulting in violent or explosive polymerization (uncontrolled reactions).</p>

### SPILL/LEAKS

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquid with fly ash, cement powder or commercial sorbent and place into sealed containers for disposal.

Use only non-sparking tools and equipment, especially when opening and closing containers of **Acetaldehyde**.

Metal containers involving the transfer of **Acetaldehyde** should be grounded and bonded.

Neutralize water spills with *Sodium Bisulfite*.

Keep **Acetaldehyde** out of confined spaces, such as sewers, because of the possibility of an explosion.

DO NOT wash into sewer.

**Acetaldehyde** is harmful to aquatic life in very low concentrations.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	0.067 to 0.21 ppm
<b>Flash Point:</b>	-36°F (-38°C)
<b>LEL:</b>	4%
<b>UEL:</b>	60%
<b>Auto Ignition Temp:</b>	347°F (175°C)
<b>Vapor Density:</b>	1.52 (air = 1)
<b>Vapor Pressure:</b>	740 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	0.8 (water = 1)
<b>Water Solubility:</b>	Floats and Mixes
<b>Boiling Point:</b>	69°F (21°C)
<b>Freezing Point:</b>	-190°F (-123°C)
<b>Ionization Potential:</b>	10.22 eV
<b>Molecular Weight:</b>	44.06

### EXPOSURE LIMITS

**OSHA:** 200 ppm, 8-hr TWA

**NIOSH:** Lowest Feasible Concentration

**ACGIH:** 25 ppm, Ceiling

**IDLH:** 2,000 ppm

The Protective Action Criteria values are:

PAC-1 = 45 ppm    PAC-2 = 270 ppm    PAC-3 = 840 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl, Viton/Butyl and Barrier® (>8-hr breakthrough)
<b>Coveralls:</b>	Tychem® BR, Responder® and TK (8-hr breakthrough)
<b>Respirator:</b>	>25 ppm - SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation and severe burns
<b>Skin:</b>	Irritation, rash and burning feeling on contact
<b>Inhalation:</b>	Nose, throat and lung irritation, with coughing, and severe shortness of breath (pulmonary edema)
	Headache, dizziness, lightheadedness, and passing out
<b>Chronic:</b>	Cancer (nose and larynx) in animals

### FIRST AID AND DECONTAMINATION

**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

**Medical** observation is recommended as symptoms may be delayed.

Common Name: **ACETAMIDE**

Synonyms: Acetic Acid Amide; Acetimidic Acid

CAS No: 60-35-5

Molecular Formula: C<sub>5</sub>H<sub>5</sub>NO

RTK Substance No: 2890

Description: Colorless, crystalline (sand-like) material

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>2 - Health</b></p> <p><b>1 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p><b>DOT#:</b> UN 3077</p> <p><b>ERG Guide #:</b> 171</p> <p><b>Hazard Class:</b> 9 (Miscellaneous)</p>	<p>Use dry chemical, CO<sub>2</sub>, water spray or foam as extinguishing agent.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i>.</p> <p>Use water spray to keep fire-exposed containers cool.</p>	<p><b>Acetamide</b> reacts with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); and REDUCING AGENTS.</p>

### SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Collect powdered material in the most convenient and safe manner and deposit in sealed containers.

Potential for bioconcentration in aquatic organisms is low.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	140 to 160 mg/m <sup>3</sup>
<b>Flash Point:</b>	Combustible
<b>Specific Gravity:</b>	1.16 (water = 1)
<b>Vapor Pressure:</b>	10 mm Hg at 221°F (105°C)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	430°F (222°C)
<b>Melting Point:</b>	176°F (81°C)
<b>Ionization Potential:</b>	9.65 eV
<b>Molecular Weight:</b>	59.1

### EXPOSURE LIMITS

No occupational exposure limits have been established for **Acetamide**.

The Protective Action Criteria values are:

PAC-1 = 21 mg/m<sup>3</sup>; PAC-2 = 230 mg/m<sup>3</sup>;

PAC-3 = 1,400 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Rubber
<b>Coveralls:</b>	DuPont Tyvek®, Tychem® Polycoat, QC, CPF 1, SL, CPF 2 or equivalent
<b>Boots:</b>	No information
<b>Respirator:</b>	Supplied air

### HEALTH EFFECTS

<b>Eyes:</b>	No information
<b>Skin:</b>	No information
<b>Inhalation:</b>	Nose and throat irritation
<b>Chronic:</b>	Carcinogen - (Liver) in animals

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Remove** contaminated clothing and wash contaminated skin with water.

**Transfer** to a medical facility.



Common Name: **ACETIC ACID**

Synonyms: Glacial Acetic Acid; Ethanoic Acid; Ethylic Acid

CAS No: 64-19-7

Molecular Formula: CH<sub>3</sub>COOH or C<sub>2</sub>H<sub>4</sub>O<sub>2</sub>

RTK Substance No: 0004

Description: Colorless liquid with vinegar odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>2 - Fire</b> <b>0 - Reactivity</b> <b>DOT#:</b> UN 2789 <b>ERG Guide #:</b> 132 <b>Hazard Class:</b> 8 (Corrosive)	Use dry chemical, CO <sub>2</sub> , water spray, alcohol-resistant foam or other foaming agent. POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE. Use water spray to cool containers and disperse vapors. Vapor is heavier than air and may explode if ignited in an enclosed space.	Reacts violently with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE). <b>Acetic Acid</b> attacks many METALS forming flammable and explosive <i>Hydrogen gas</i> . Incompatible with CHROMIC ACID; SODIUM PEROXIDE; NITRIC ACID; ACETONE; and AMMONIUM NITRATE.

### SPILL/LEAKS

**Isolation Distance:** 50 to 100 meters  
(160 to 330 feet)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.

Use water spray to disperse vapors.

Soda Ash (Sodium Carbonate) can be used to neutralize spills.

This substance is harmful to aquatic organisms.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	0.48 to 1.0 ppm
<b>Flash Point:</b>	103°F (39°C)
<b>LEL:</b>	4%
<b>UEL:</b>	19.99%
<b>Vapor Density:</b>	2.1 (air = 1)
<b>Vapor Pressure:</b>	15 mm Hg at 77°F (25°C)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	244°F (118°C)
<b>Ionization Potential:</b>	10.66 eV

### EXPOSURE LIMITS

<b>OSHA:</b>	10 ppm 8-hr TWA
<b>NIOSH:</b>	10 ppm 10-hr TWA, 15 ppm STEL
<b>ACGIH:</b>	10 ppm 10-hr TWA, 15 ppm STEL
<b>IDLH:</b>	50 ppm
<b>ERPG-1:</b>	5 ppm
<b>ERPG-2:</b>	35 ppm
<b>ERPG-3:</b>	250 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Neoprene, Butyl Rubber
<b>Coverall:</b>	DuPont Tychem® CPF4, Responder®, TK, Reflector®; CHEMFAB Challenger® 4000.
<b>Boot:</b>	Neoprene or Butyl
<b>Respirator:</b>	>10 ppm - air purifying respirator with organic vapor cartridges, >100 ppm - supplied air

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation, burns, possible eye damage
<b>Skin:</b>	Irritation, burns
<b>Acute:</b>	Nose, throat and lung irritation, pulmonary edema, coughing, shortness of breath
<b>Chronic:</b>	Bronchitis, thickening and cracking of the skin

### FIRST AID AND DECONTAMINATION

<b>Remove</b>	the person from exposure.
<b>Flush</b>	eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Immediate medical attention is necessary.
<b>Remove</b>	contaminated clothing and wash contaminated skin with soap and water.
<b>Begin</b>	artificial respiration if breathing has stopped and CPR if necessary.
<b>Medical</b>	observation is recommended for 24 to 48 hours as symptoms may be delayed.

**Common Name: ACETONE**

Synonyms: Dimethyl Ketone; 2-Propanone

CAS No: 67-64-1

Molecular Formula: C<sub>3</sub>H<sub>6</sub>O

RTK Substance No: 0006

Description: Clear, colorless liquid with a sweet odor

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<p><b>1 - Health</b></p> <p><b>3 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p><b>DOT#:</b> UN 1090</p> <p><b>ERG Guide #:</b> 127</p> <p><b>Hazard Class:</b> 3</p> <p>(Flammable)</p>	<p><b>FLAMMABLE LIQUID.</b></p> <p>Use dry chemical, CO<sub>2</sub>, water spray or alcohol-resistant foam as extinguishing agents.</p> <p>Water may not be effective in fighting fires.</p> <p><b>POISONOUS GASES ARE PRODUCED IN FIRE.</b></p> <p><b>CONTAINERS MAY EXPLODE IN FIRE.</b></p> <p>Use water spray to keep fire-exposed containers cool.</p> <p>Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source and flashback.</p> <p><b>Acetone</b> may form an ignitable vapor/air mixture in closed tanks or containers.</p>	<p><b>Acetone</b> may explode when mixed with NITROSYL PERCHLORATE; and CHLOROFORM or BROMOFORM in the presence of a BASE.</p> <p><b>Acetone</b> reacts with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); ACETIC ACID; and NITRIC ACID to form explosive <i>peroxides</i>.</p> <p><b>Acetone</b> attacks PLASTICS.</p>

**SPILL/LEAKS**

**Isolation Distance:**

Spill: 50 meters (150 feet)  
Fire: 800 meters (1/2 mile)

Absorb liquids in dry sand, earth, or a similar material and place into sealed containers for disposal. Use only non-sparking tools and equipment.

Metal containers involving the transfer of **Acetone** should be grounded and bonded.

Keep **Acetone** out of confined spaces, such as sewers, because of the possibility of an explosion. **DO NOT** wash into sewer as **Acetone** is dangerous to aquatic life in high concentrations.

**EXPOSURE LIMITS**

**OSHA:** 1,000 ppm, 8-hr TWA  
**NIOSH:** 250 ppm, 10-hr TWA  
**ACGIH:** 500 ppm, 8-hr TWA; 750 ppm, STEL  
**IDLH:** 2,500 ppm

The Protective Action Criteria values are:  
PAC-1 = 200 ppm    PAC-2 = 3,200 ppm  
PAC-3 = 5,700 ppm

**HEALTH EFFECTS**

**Eyes:** Irritation  
**Skin:** Irritation  
**Inhalation:** Nose and throat irritation with coughing and wheezing  
Headache, nausea and vomiting, dizziness, lightheadedness and even passing out

**PHYSICAL PROPERTIES**

**Odor Threshold:** 13 to 62 ppm  
**Flash Point:** -4 °F (-20 °C)  
**LEL:** 2.5%  
**UEL:** 12.8%  
**Auto Ignition Temp:** 869 °F (465 °C)  
**Vapor Density:** 2 (air = 1)  
**Vapor Pressure:** 180 mm Hg at 68 °F (20 °C)  
**Specific Gravity:** 0.8 (water = 1)  
**Water Solubility:** Soluble  
**Boiling Point:** 133 °F (56 °C)  
**Freezing Point:** -140 °F (95.6 °C)  
**Ionization Potential:** 9.69 eV  
**Molecular Weight:** 58.1

**PROTECTIVE EQUIPMENT**

**Gloves:** Butyl, Silver Shield®/4H® and Barrier® (>8-hr breakthrough)  
**Coveralls:** Tychem® BR, CSM and TK; Trelchem® HPS and VPS (>8-hr breakthrough)  
**Respirator:** >250 ppm - full facepiece APR with *Organic vapor cartridges*  
>2,500 ppm - SCBA

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.  
**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** promptly to a medical facility.

Common Name: **ACETONITRILE**

Synonyms: Methyl Cyanide; Cyanomethane

CAS No: 75-05-8

Molecular Formula: C<sub>2</sub>H<sub>3</sub>N

RTK Substance No: 0008

Description: Colorless liquid with an *Ether*-like odor

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<p><b>2 - Health</b></p> <p><b>3 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p><b>DOT#:</b> UN 1648</p> <p><b>ERG Guide #:</b> 127</p> <p><b>Hazard Class:</b> 3 (Flammable)</p>	<p><b>FLAMMABLE LIQUID</b></p> <p>Use dry chemical, CO<sub>2</sub>, alcohol-resistant foam as extinguishing agents, as water may not be effective in fighting fires.</p> <p><b>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Hydrogen Cyanide</i>.</b></p> <p><b>CONTAINERS MAY EXPLODE IN FIRE.</b></p> <p>Use water spray to keep fire-exposed containers cool.</p> <p>Vapors may travel to a source of ignition and flash back.</p>	<p><b>Acetonitrile</b> reacts violently with <b>OXIDIZING AGENTS</b> (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).</p> <p><b>Acetonitrile</b> is not compatible with <b>STRONG ACIDS</b> (such as HYDROCHLORIC, SULFURIC and NITRIC); <b>STRONG BASES</b> (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); <b>REDUCING AGENTS</b> (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES); <b>ALKALI METALS</b> (such as POTASSIUM); <b>NITRATING AGENTS</b>; <b>IRON SALTS</b> of PERCHLORATE; <b>NITROGEN-FLUORINE COMPOUNDS</b>; <b>CHLOROSULFONIC ACID</b>; <b>INDIUM</b>; <b>PERFLUOROUREA</b>; and <b>SULFUR</b> and <b>NITROGEN TRIOXIDES</b>.</p> <p>May react with <b>WATER, MOISTURE</b> and <b>STEAM</b> to form toxic and flammable vapors.</p>

**SPILL/LEAKS**

**Isolation Distance:**

Small Spills: 50 meters (150 feet)

Large Spills: 300 meters (1,000 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.

Keep **Acetonitrile** out of confined spaces, such as sewers, because of the possibility of an explosion.

May be toxic to aquatic life at high levels.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	98 ppm
<b>Flash Point:</b>	42°F (6°C)
<b>LEL:</b>	3%
<b>UEL:</b>	16%
<b>Auto Ignition Temp:</b>	975°F (524°C)
<b>Vapor Density:</b>	1.42 (air = 1)
<b>Vapor Pressure:</b>	73 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	0.78 (water = 1)
<b>Water Solubility:</b>	Miscible
<b>Boiling Point:</b>	179°F (82°C)
<b>Ionization Potential:</b>	12.2 eV
<b>Molecular Weight:</b>	41.1

**EXPOSURE LIMITS**

**OSHA:** 40 ppm, 8-hr TWA

**NIOSH:** 20 ppm, 10-hr TWA

**ACGIH:** 20 ppm, 8-hr TWA

**IDLH:** 500 ppm

The 60-minute Protective Action Criteria values are:

PAC-1 = 13 ppm    PAC-2 = 50 ppm

PAC-3 = 150 ppm

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Butyl, Silver Shield®/4H® and Viton/Butyl (>8-hr breakthrough)
<b>Coveralls:</b>	DuPont CPF 4, BR, LV, Responder®, CSM and TK; Kappler® Zytron® 500; and Saint-Gobain ONESuit® TEC (>8-hr breakthrough)
<b>Respirator:</b>	>13 ppm - Supplied air

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose, throat and lung irritation Flushing of the face, chest tightness, headache, nausea and vomiting, weakness and shortness of breath

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses, if worn, while rinsing.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** to a medical facility.

**Use** *Amyl Nitrite* capsules if symptoms develop.

Common Name: **ACETOPHENONE**

Synonyms: Acetyl Benzene; Phenyl Methyl Ketone

CAS No: 98-86-2

Molecular Formula: C<sub>8</sub>H<sub>8</sub>O

RTK Substance No: 2961

Description: Colorless to yellow-tinted liquid with a sweet, strong odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>2 - Fire</b> <b>0 - Reactivity</b> <b>DOT#:</b> UN 1993 <b>ERG Guide #:</b> 128 <b>Hazard Class:</b> 3 (Flammable)	<b>COMBUSTIBLE LIQUID</b> Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. <b>POISONOUS GASES ARE PRODUCED IN FIRE.</b> Use water spray to keep fire-exposed containers cool.	<b>Acetophenone</b> may react with <b>STRONG ACIDS</b> (such as HYDROCHLORIC, SULFURIC and NITRIC); <b>REDUCING AGENTS</b> (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES); and <b>STRONG BASES</b> (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE) to produce heat and flammable and explosive <i>Hydrogen gas</i> . <b>Acetophenone</b> is not compatible with <b>OXIDIZING AGENTS</b> (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); <b>CYANIDES</b> ; <b>ALDEHYDES</b> ; and <b>ANHYDRIDES</b> .

### SPILL/LEAKS

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers for disposal.

Use only non-sparking tools and equipment, especially when opening and closing containers of **Acetophenone**.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	0.36 to 0.6 ppm
<b>Flash Point:</b>	170°F (77°C) to 180°F (82°C)
<b>LEL:</b>	1.1%
<b>UEL:</b>	6.7 %
<b>Auto Ignition Temp:</b>	1,058°F (570°C)
<b>Vapor Density:</b>	4.1 (air = 1)
<b>Vapor Pressure:</b>	1 mm Hg at 60°F (16°C)
<b>Specific Gravity:</b>	1 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	396°F (202°C)
<b>Freezing Point:</b>	68°F (20°C)
<b>Ionization Potential:</b>	9.28 eV
<b>Molecular Weight:</b>	120.15

### EXPOSURE LIMITS

**ACGIH:** 10 ppm, 8-hr TWA

The Protective Action Criteria values are:

PAC-1 = 6 ppm

PAC-2 = 10 ppm

PAC-3 = 71 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl, Neoprene, Silver Shield®/4H® and Viton (>8-hr breakthrough)
<b>Coveralls:</b>	Tychem® CPF 4 and Responder® (>8-hr breakthrough for <i>Ketones, aromatic</i> )
<b>Respirator:</b>	>10 ppm - full facepiece APR with <i>Organic Vapor</i> filters >70 ppm - SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns
<b>Inhalation:</b>	Nose and throat irritation with coughing and wheezing Headache, dizziness, nausea and loss of coordination

### FIRST AID AND DECONTAMINATION

<b>Remove</b> the person from exposure.
<b>Flush</b> eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.
<b>Quickly</b> remove contaminated clothing and wash contaminated skin with large amounts of soap and water.
<b>Begin</b> artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b> promptly to a medical facility.

Chemical Name: **2-ACETYLAMINOFLUORENE**

Synonyms: AAF; 2-Fluorenylacetamide

CAS No: 53-96-3

Molecular Formula: C<sub>15</sub>H<sub>13</sub>NO

RTK Substance No: 0010

Description: Tan powder or crystalline solid

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b>  DOT#: N/A ERG Guide #: N/A Hazard Class: N/A	- <b>2-Acetylaminofluorene</b> is considered a combustible solid, but does not readily ignite. - Use dry chemical, CO <sub>2</sub> , water spray or alcohol-resistant foam. - POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> . - Use water spray to keep fire-exposed containers cool.	- <b>2-Acetylaminofluorene</b> is not compatible with CYANIDES; STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); ACID ANHYDRIDES; OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); and STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE).

**SPILLS/LEAKS**

**Isolation Distance:** 25 meter (75 feet)

- Dampen solid spills with water before collection.
- Collect spilled material using a wet method or a vacuum with a HEPA filter.

**PHYSICAL PROPERTIES**

**Flash Point:** 531 °F (277 °C)  
**Boiling Point:** 577 °F (303 °C)  
**LEL:** No Information  
**UEL:** No Information  
**Vapor Density:** No Information  
**Vapor Pressure:** 0.0000287 mm Hg at 25 °F (estimated)  
**Water Solubility:** Insoluble  
**Melting Point:** 381 °F (194 °C)  
**Ionization Potential:** No Information

**EXPOSURE LIMITS**

**OSHA:** Refer to 29 CFR 1910.1014  
**NIOSH:** Recommends that exposure to occupational carcinogens be limited to the lowest feasible concentration.  
**ACGIH:** N/A  
**IDLH LEVEL:** N/A  
**PAC LEVELS:** PAC-1 = 1.2 mg/m<sup>3</sup>; PAC-2 = 14 mg/m<sup>3</sup>; PAC-3 = 480 mg/m<sup>3</sup>

**PROTECTIVE EQUIPMENT**

**Gloves:** Chemical-resistant gloves (e.g. Nitrile)  
**Coverall:** Protective clothing to prevent skin contact  
**Boot:** Protective boots to prevent skin contact  
**Respirator:** Supplied Air

**HEALTH EFFECTS**

**Eyes:** Irritation  
**Inhalation:** Nose, throat and lung irritation.  
**Skin:** May cause skin irritation.  
**Chronic:** Carcinogen (bladder, kidney and liver) in animals.

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses, if worn, while rinsing.  
**Remove** contaminated clothing. Wash contaminated skin with soap and water.  
**Begin** respirator support if breathing becomes difficult.

Common Name: **ACETYL IODIDE**

Synonyms: Ethanoyl Iodide

CAS No: 507-02-8

Molecular Formula: C<sub>2</sub>H<sub>3</sub>IO

RTK Substance No: 0017

Description: Colorless, fuming liquid which turns brown on contact with air or moisture

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>1 - Fire</b> <b>1 - Reactivity</b>  <b>DOT#:</b> UN 1898 <b>ERG Guide #:</b> 156 <b>Hazard Class:</b> 8 (Corrosive)	<b>Acetyl iodide</b> may burn, but does not readily ignite. Use dry chemical or CO <sub>2</sub> as extinguishing agents. DO NOT USE WATER directly on material itself. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Iodine vapor</i> and other <i>Iodides</i> . CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool and to knock-down vapors.	<b>Acetyl iodide</b> will react with WATER or MOISTURE to release toxic and corrosive <i>Hydrogen Iodide</i> .  <b>Acetyl iodide</b> reacts vigorously with STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE) to give off heat and may react explosively if mixed with DIISOPROPYL ETHER and other ETHERS in the presence of small amounts of METAL SALTS.  <b>Acetyl iodide</b> is corrosive to METALS.

### SPILL/LEAKS

**Isolation Distance:** 25 to 50 meters  
(75 to 150 feet)

Neutralize spilled material with crushed limestone, soda ash or lime.

### PHYSICAL PROPERTIES

**Odor Threshold:** Pungent odor  
**Flash Point:** No information  
**LEL:** No information  
**UEL:** **No information**  
**Vapor Density:** **No information**  
**Vapor Pressure:** No information  
**Water Solubility:** Decomposes  
**Boiling Point:** 221°F (105°C)

### EXPOSURE LIMITS

**OSHA:** N/A  
**NIOSH:** N/A  
**ACGIH:** N/A  
**IDLH LEVEL:** N/A

### PROTECTIVE EQUIPMENT

**Gloves:** Silver Shield®/4H® for Acetic Acid  
**Coveralls:** DuPont Tychem® Responder®, CSM, and TK for *corrosive heavy liquid chemicals*  
**Boots:** No information  
**Respirator:** Supplied Air

### HEALTH EFFECTS

**Eyes:** Irritation and burns  
**Skin:** Irritation and burns  
**Acute:** Lung irritation with coughing and shortness of breath (pulmonary edema)  
**Chronic:** Bronchitis with coughing, phlegm and/or shortness of breath

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention immediately.  
**Quickly** remove contaminated clothing. Wash contaminated skin with large amounts of soap and water. Seek medical attention immediately.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** to a medical facility.  
**Medical** observation is recommended as symptoms may be delayed.



Common Name: **ACETYL CHLORIDE**

Synonyms: Acetic Chloride; Ethanoyl Chloride

CAS No: 75-36-5

Molecular Formula: C<sub>2</sub>H<sub>3</sub>ClO

RTK Substance No: 0013

Description: Colorless to pale yellow, fuming liquid with a pungent odor

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<p><b>3 - Health</b></p> <p><b>3 - Fire</b></p> <p><b>2-<del>W</del> - Reactivity</b></p> <p><b>DOT#:</b> UN 1717</p> <p><b>ERG Guide #:</b> 155</p> <p><b>Hazard Class:</b> 3 (Flammable)</p>	<p><b>Acetyl Chloride</b> is a FLAMMABLE AND REACTIVE LIQUID.</p> <p>Use dry chemical or CO<sub>2</sub> as extinguishing agents.</p> <p>DO NOT USE WATER OR FOAM.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Hydrogen Chloride</i> and <i>Phosgene</i>.</p> <p>CONTAINERS MAY EXPLODE IN FIRE.</p> <p>Use water spray to keep fire-exposed containers cool. Do not get water inside containers.</p> <p>Vapors may travel to a source of ignition and flash back.</p> <p>Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.</p>	<p><b>Acetyl Chloride</b> reacts violently with WATER to release heat and toxic and corrosive <i>Hydrogen Chloride</i> and <i>Acetic Acid</i>.</p> <p><b>Acetyl Chloride</b> reacts violently with ALCOHOLS; STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); AMINES; POWDERED METALS; PHOSPHORUS TRICHLORIDE; and DIMETHYL SULFOXIDE.</p>

**SPILL/LEAKS**

**Isolation Distance:**

Small Spill in Water: 30 meters (100 feet)

Large Spill in Water: 120 meters (400 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.  
DO NOT USE WATER.

Keep **Acetyl Chloride** out of confined spaces, such as sewers, because of the possibility of an explosion.

DO NOT wash into sewer.

Hazardous to the environment, especially to water.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	Pungent
<b>Flash Point:</b>	40°F (4°C)
<b>LEL:</b>	5%
<b>UEL:</b>	19%
<b>Auto Ignition Temp:</b>	734°F (390°C)
<b>Vapor Density:</b>	2.7 (air = 1)
<b>Vapor Pressure:</b>	249 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.1 (water = 1)
<b>Water Solubility:</b>	Violently reactive
<b>Boiling Point:</b>	124°F (51°C)
<b>Freezing Point:</b>	-170°F (-112°C)
<b>Molecular Weight:</b>	78.5

**EXPOSURE LIMITS**

No occupational exposure limits have been established for **Acetyl Chloride**.

**PAC Levels:** PAC-1 = 0.85 ppm; PAC-2 = 9.4 ppm;  
PAC-3 = 56 ppm

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Butyl (3-hr breakthrough)
<b>Coveralls:</b>	DuPont Tychem® F and TK; Kappler® Zytron® 300 or 500; and Saint-Gobain ONESuit® TEC (>8-hr breakthrough for <i>Acid Halides</i> )
<b>Respirator:</b>	Supplied air

**HEALTH EFFECTS**

<b>Eyes:</b>	Severe irritation and burns
<b>Skin:</b>	Severe irritation, burns, dryness, redness and blisters
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing and severe shortness of breath (pulmonary edema)

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention immediately.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention immediately.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** to a medical facility.

**Medical** observation is recommended as symptoms may be delayed.



Common Name: **ACETYLENE**

Synonyms: Ethyne; Narcilene; Ethenylene; Vinylene

CAS No: 74-86-2

Molecular Formula: C<sub>2</sub>H<sub>2</sub>

RTK Substance No: 0015

Description: Colorless, odorless gas or the commercial product may have an *Ether*-like or garlic-like odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>0 - Health</b></p> <p><b>4 - Fire</b></p> <p><b>3 - Reactivity</b></p> <p><b>DOT#:</b> UN 1001</p> <p><b>ERG Guide #:</b> 116</p> <p><b>Hazard Class:</b> 2.1 (Flammable)</p>	<p><b>Acetylene</b> is a <b>FLAMMABLE GAS</b>.</p> <p>Stop flow of gas or let fire burn itself out.</p> <p><b>POISONOUS GASES ARE PRODUCED IN FIRE</b>, including flammable <i>Hydrogen gas</i>.</p> <p><b>CONTAINERS MAY EXPLODE IN FIRE.</b></p> <p>Use water spray to disperse gas, keep fire-exposed cylinders cool, and protect individuals attempting to stop leak.</p> <p>Vapors may travel to a source of ignition and flash back.</p>	<p><b>Acetylene</b> reacts violently with <b>OXIDIZING AGENTS</b> (such as <b>PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE</b>).</p> <p><b>Acetylene</b> reacts with <b>ALKALI METALS</b> (such as <b>POTASSIUM, SODIUM, MAGNESIUM and ZINC</b>) and <b>POWDERED METALS</b> and their <b>SALTS</b> (such as <b>COPPER, MERCURY and SILVER</b>) to form explosive and shock-sensitive <i>Acetylide compounds</i> and <i>Hydrogen</i>.</p> <p><b>Acetylene</b> is not compatible with <b>COBALT; CESIUM HYDRIDE; IODINE; NITRIC ACID; RUBIDIUM HYDRIDE; FERROSILICON; SODIUM HYDRIDE; BRASS; and OZONE</b>.</p> <p><b>Acetylene</b> reacts with <b>WATER</b> to form toxic <i>Ammonia</i>.</p> <p><b>Acetylene</b> is shipped under pressure dissolved in <i>Acetone</i> or <i>Dimethylformamide</i> to prevent fires and explosions.</p>

### SPILL/LEAKS

**Isolation Distance:**

Small Spill: 100 meters (330 feet)

Large Spill: 800 meters (1/2 mile)

Fire: 1,600 meters (1 mile)

Keep **Acetylene** out of confined spaces, such as sewers, because of the possibility of an explosion.

Use only non-sparking tools and equipment.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	226 ppm (with contaminants)
<b>Flash Point:</b>	Extremely flammable gas
<b>LEL:</b>	2.5%
<b>UEL:</b>	100%
<b>Auto Ignition:</b>	581°F (305°C)
<b>Vapor Density:</b>	0.9 (air = 1)
<b>Vapor Pressure:</b>	4.04 x 10 <sup>4</sup> mm Hg at 77°F (25°C)
<b>Specific Gravity:</b>	0.65 (water = 1)
<b>Water Solubility:</b>	Very slightly soluble
<b>Boiling Point:</b>	-118°F (-83°C)
<b>Freezing Point:</b>	-113°F (-80.6°C)
<b>Critical Temp:</b>	97.3°F (36.3°C)
<b>Ionization Potential:</b>	11.4 eV
<b>Molecular Weight:</b>	26

### EXPOSURE LIMITS

**NIOSH:** 2,500 ppm, Ceiling

**ACGIH:** Maintain 19.5% *Oxygen* content

The Protective Action Criteria values are:

PAC-1 = 65,000 ppm; PAC-2 = 230,000 ppm;

PAC-3 = 400,000 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	<i>Insulated</i> Neoprene, Viton and Viton/Butyl
<b>Coveralls:</b>	<i>Insulated</i> materials
<b>Respirator:</b>	< 19.5% <i>Oxygen</i> or 2,500 ppm - SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Contact with the <i>liquid</i> can cause frostbite
<b>Skin:</b>	Contact with the <i>liquid</i> can cause frostbite
<b>Inhalation:</b>	Headache, dizziness, lightheadedness, and passing out

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Immediately** flush with large amounts of warm water for at least 30 minutes, lifting upper and lower lids. Remove contact lenses, if worn, while flushing. Seek medical attention immediately.

**Immerse** affected part in warm water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** to a medical facility.

Common Name: **ACRYLAMIDE**

Synonyms: Acrylic Amide; 2-Propenamidine

CAS No: 79-06-1

 Molecular Formula: C<sub>3</sub>H<sub>5</sub>NO

RTK Substance No: 0022

Description: Colorless to white, odorless flake-like solid

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>2 - Fire</b> <b>2 - Reactivity</b> <b>DOT#:</b> UN 2074 <b>ERG Guide #:</b> 153P <b>Hazard Class:</b> 6.1 (Poison)	<b>Acrylamide</b> is a COMBUSTIBLE SOLID. Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> . CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool. <b>Acrylamide</b> decomposes and polymerizes above 184°F (85°C) releasing <i>Ammonia</i> and <i>Hydrogen gases</i> . Polymerization may be violent.	<b>Acrylamide</b> may polymerize violently when HEATED to its melting point; when exposed to ULTRAVIOLET LIGHT; or when exposed to STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE) or OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE). <b>Acrylamide</b> is not compatible with MINERAL ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); OLEUM; AMMONIA; ISOCYANATES; and COMPOUNDS containing HYDROXYL-, AMINO-, and SULFHYDRYL GROUPS.

## SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile) in all directions

Moisten spilled material first, or use a HEPA-filter vacuum for clean-up, and deposit into sealed containers.

DO NOT wash into sewer.

May bioaccumulate in aquatic life.

Severe marine pollutant.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	280°F (138°C)
<b>Auto Ignition Temp:</b>	464°F (240°C)
<b>Vapor Density:</b>	2.45 (air = 1)
<b>Vapor Pressure:</b>	0.007 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.22 (water = 1)
<b>Water Solubility:</b>	Soluble (Mixes)
<b>Boiling Point:</b>	347° to 572°F (175° to 300°C)
<b>Melting Point:</b>	184°F (85°C) (Violent polymerization)
<b>Ionization Potential:</b>	9.5 eV
<b>Molecular Weight:</b>	71.1

## EXPOSURE LIMITS

<b>OSHA:</b>	0.3 mg/m <sup>3</sup> , 8-hr TWA
<b>NIOSH:</b>	0.03 mg/m <sup>3</sup> , 10-hr TWA
<b>ACGIH:</b>	0.03 mg/m <sup>3</sup> , 8-hr TWA
<b>IDLH:</b>	60 mg/m <sup>3</sup>

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl, Nitrile, Neoprene and Viton (>8-hr breakthrough)
<b>Coveralls:</b>	DuPont Tychem® Fabrics; Kappler® Zytron® 400; and Saint-Gobain ONESuit TEC (>8-hr breakthrough for <i>Amides</i> )
<b>Respirator:</b>	>0.03 mg/m <sup>3</sup> - Supplied air

## HEALTH EFFECTS

<b>Eyes:</b>	Irritation, watering and inflammation
<b>Skin:</b>	Irritation, rash or burning feeling
<b>Inhalation:</b>	Nose and throat irritation with coughing and wheezing Confusion, disorientation, fatigue and tremors
<b>Chronic:</b>	Cancer (pancreas) in humans

## FIRST AID AND DECONTAMINATION

<b>Remove</b>	the person from exposure.
<b>Flush</b>	eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.
<b>Quickly</b>	remove contaminated clothing and wash contaminated skin with large amounts of water. Seek medical attention.
<b>Begin</b>	artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b>	to a medical facility.

Common Name: **ACRYLIC ACID**

Synonyms: Propene Acid; Ethylene Carboxylic Acid; Vinylformic Acid

CAS No: 79-10-7

Molecular Formula: C<sub>3</sub>H<sub>4</sub>O<sub>2</sub>

RTK Substance No: 0023

Description: Clear liquid with a sharp and irritating odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>2 - Fire</b> <b>2 - Reactivity</b> <b>DOT#:</b> UN 2218 <b>ERG Guide #:</b> 132P <b>Hazard Class:</b> 8 (Corrosive)	<b>Acrylic Acid</b> is a COMBUSTIBLE LIQUID. Use dry chemical, CO <sub>2</sub> , water spray or alcohol-resistant foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool. Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source. Vapors may travel to a source of ignition and flash back.	<b>Acrylic Acid</b> reacts with PURE NITROGEN; OXIDIZING AGENTS (such as PERCHLORATES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); and STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE). <b>Acrylic Acid</b> may polymerize explosively on contact with AMINES; AMMONIA; CHLOROSULFONIC ACID; PEROXIDES; and OLEUM, or when exposed to HEAT or DIRECT SUNLIGHT.

### SPILL/LEAKS

**Isolation Distance:**

Small Spill - 60 meters (200 feet)

Large Spill - 500 meters (1,600 feet)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.

Do not wash into sewer.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	0.06 ppm to 1 ppm
<b>Flash Point:</b>	124°F (51°C)
<b>LEL:</b>	2.0%
<b>UEL:</b>	<b>8.0%</b>
<b>Vapor Density:</b>	<b>2.5 (air = 1)</b>
<b>Relative Density:</b>	1.05 (water = 1)
<b>Vapor Pressure:</b>	3 mm Hg at 68°F (20°C)
<b>Water Solubility:</b>	Miscible
<b>Boiling Point:</b>	286°F (141°C)

### EXPOSURE LIMITS

<b>OSHA:</b>	N/A
<b>NIOSH:</b>	2 ppm, 10-hr TWA
<b>ACGIH:</b>	2 ppm, 8-hr TWA
<b>IDLH LEVEL:</b>	No information
<b>PAC LEVELS:</b>	PAC-1 = 1.5 ppm; PAC-2 = 46 ppm; PAC-3 = 180 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl, Neoprene
<b>Coveralls:</b>	DuPont Tychem® CPF-2, SL, CPF-4, Responder®, TK or F
<b>Boots:</b>	Butyl, Neoprene
<b>Respirator:</b>	>2 ppm - Full facepiece APR with OV cartridges >20 ppm - Pressure demand supplied-air

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation, burns and rash
<b>Acute:</b>	Nose, throat and lung irritation
<b>Chronic:</b>	Skin allergy with rash and itching

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention immediately.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water. Seek medical attention.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** to a medical facility.

Common Name: **ADIPONITRILE**

Synonyms: 1,4-Dicyanobutane; Hexanedinitrile Tetramethylene Cyanide

CAS No: 111-69-3

Molecular Formula: C<sub>6</sub>H<sub>8</sub>N<sub>2</sub>

RTK Substance No: 0027

Description: Colorless, nearly odorless, oily liquid

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>3 - Health</b></p> <p><b>2 - Fire</b></p> <p><b>1 - Reactivity</b></p> <p><b>DOT#:</b> UN 2205</p> <p><b>ERG Guide #:</b> 153</p> <p><b>Hazard Class:</b> 6.1 (Poison)</p>	<p>COMBUSTIBLE LIQUID</p> <p>Use dry chemical, CO<sub>2</sub>, water spray, or alcohol-resistant foam as extinguishing agents.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Hydrogen Cyanide</i>.</p> <p>Use water spray to keep fire-exposed containers cool.</p> <p>Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.</p>	<p><b>Adiponitrile</b> reacts violently with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).</p> <p><b>Adiponitrile</b> is not compatible with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) and STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE).</p> <p><b>Adiponitrile</b> decomposes above 194°F (90°C) to release toxic <i>Hydrogen Cyanide</i> gas.</p>

### SPILL/LEAKS

**Isolation Distance:**

Small Spill: 60 meters (200 feet)

Large Spill: 270 meters (900 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.

DO NOT wash into sewer.

Animals and aquatic life are endangered by potential *Cyanide* production.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Nearly odorless
<b>Flash Point:</b>	199°F (93°C)
<b>LEL:</b>	1 to 1.7%
<b>UEL:</b>	5%
<b>Auto Ignition Temp:</b>	1,022°F (550°C)
<b>Vapor Density:</b>	3.73 (air = 1)
<b>Vapor Pressure:</b>	0.002 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	0.97 (water = 1)
<b>Water Solubility:</b>	Slightly soluble
<b>Boiling Point:</b>	563°F (295°C)
<b>Freezing Point:</b>	34°F (1°C)
<b>Molecular Weight:</b>	108.1

### EXPOSURE LIMITS

**NIOSH:** 4 ppm, 10-hr TWA

**ACGIH:** 2 ppm, 8-hr TWA

**IDLH:** None

The Protective Action Criteria values are:

PAC-1 = 3.85 ppm PAC-2 = 3.85 ppm PAC-3 = 150 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl Rubber, Silver Shield®/4H® and Barrier® (>8-hr breakthrough for <i>Nitriles, aliphatic</i> )
<b>Coveralls:</b>	Tychem® BR, Responder® and TK; Zytron® 400 and 500; ONESuit®TEC; and Trelchem® HPS and VPS (>8-hr breakthrough for <i>Nitriles, aliphatic</i> )
<b>Respirator:</b>	>2 ppm - Supplied air >150 ppm - SCBA

### HEALTH EFFECTS

**Eyes:** Irritation and burns

**Skin:** Irritation and burns

**Inhalation:** Nose, throat and lung irritation with coughing, wheezing and shortness of breath

Headache, weakness, confusion, nausea and vomiting, pounding of the heart and trouble breathing, coma and death

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention immediately.

**Quickly** remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** to a medical facility.

Common Name: **AFLATOXINS**

Synonyms: Aflatoxins B1, B2, G1 and G2

CAS No: 1402-68-2

 Molecular Formula: C<sub>13</sub>H<sub>12</sub>O<sub>6</sub>; C<sub>17</sub>H<sub>14</sub>O<sub>7</sub>; C<sub>17</sub>H<sub>12</sub>O<sub>7</sub>; C<sub>17</sub>H<sub>14</sub>O<sub>6</sub>

RTK Substance No: 0029

Description: Colorless to pale yellow crystals when used in research

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>4 - Health</b> -- Fire -- Reactivity  DOT#: None ERG Guide #: None Hazard Class: 6.1 (Poison)	May be COMBUSTIBLE in <i>liquid</i> form. Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents.	<b>Aflatoxins</b> are not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); AMMONIA; and AMINES.

**SPILL/LEAKS**
**Isolation Distance:**

Spill: 75 meters (250 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and deposit into sealed containers.

Ventilate and wash area after clean-up is complete. DO NOT wash into sewer.

Bioaccumulation is low in aquatic life.

**PHYSICAL PROPERTIES**
**Odor Threshold:** Not available

**Flash Point:** May be combustible (liquid form)

**Water Solubility:** Soluble

**Melting Point:** 514° to 516°F (268° to 269°C)

**Molecular Weight:** 312 to 330

**EXPOSURE LIMITS**

 No occupational exposure limits have been established for **Aflatoxins**.

**PROTECTIVE EQUIPMENT**
**Gloves:** Nitrile and Natural Rubber

**Coveralls:** DuPont Tyvek®

**Respirator:** Supplied air

**HEALTH EFFECTS**
**Eyes:** No information

**Skin:** No information

**Inhalation:** Headache, nausea and vomiting

**Chronic:** Cancer (liver) in humans

**FIRST AID AND DECONTAMINATION**
**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Remove** contaminated clothing and wash contaminated skin with water.

**Transfer** promptly to a medical facility.

**Common Name: ALDICARB**

Synonyms: Temik; Union Carbide UC-21149  
 CAS Number: 116-06-3  
 Molecular Formula: C<sub>7</sub>H<sub>14</sub>N<sub>2</sub>O<sub>2</sub>S  
 RTK Number: 0031  
 Description: White, crystalline (sand-like) solid which is usually formulated into granules

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>Health:</b> 3 <b>Fire:</b> 0 <b>Reactivity:</b> 0 <b>DOT #:</b> UN 2757 <b>ERG #:</b> 151 <b>DOT Hazard:</b> 6.1 (poison)	POISONOUS FUMES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> and <i>Sulfur Oxides</i> . CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool. Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents.	<b>Aldicarb</b> is not compatible with HIGHLY ALKALINE SUBSTANCES.

### SPILLS/LEAKS

**Isolation Distances:**  
**Liquid Spill:** 50 meters (150 feet)  
**Solid Spill:** 25 meters (75 feet)  
**Fire:** 800 meters (1/2 mile)

Evacuate personnel.  
 Secure and control entrance to the area.  
 If it is safe to do so, remove potential ignition sources.  
 Collect *powdered* material in the most convenient and safe manner and deposit in sealed containers.  
**DO NOT DRY SWEEP.**  
 Use a vacuum with a high-efficiency particulate air (HEPA) filter to reduce *dust* during clean-up.  
 Do not allow this substance to enter waterways, including sewers, as it is very toxic to aquatic life with long-lasting effects.  
 Ventilate area after clean-up is complete.

### PHYSICAL PROPERTIES

**Boiling Point:** Decomposes  
**Molecular Weight:** 190.23  
**Melting Point:** 99-100 °C (210-214 °F)  
**Vapor Pressure:** 1 x 10<sup>-4</sup> mm Hg at 25 °C (77 °F)  
**Specific Gravity:** 1.195 at 25 °C (77 °F)  
**Water Solubility:** Insoluble

### EXPOSURE LIMITS

There are no occupational exposure limits for this substance.

**PAC:** PAC-1 = 0.027 mg/m<sup>3</sup>  
 PAC-2 = 0.3 mg/m<sup>3</sup>  
 PAC-3 = 1.8 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

**Gloves:** Nitrile, Neoprene  
**Coverall:** Tychem® BR, CSM and TK or the equivalent  
**Respirator:** High exposure - Supplied-air, full facepiece, pressure-demand or another positive-pressure mode

### ACUTE HEALTH EFFECTS

**Eyes:** Blurred vision  
**Skin:** Irritation  
**Inhalation:** Headache, dizziness, chest tightness, twitching, loss of coordination, convulsions, coma, death

### FIRST AID AND DECONTAMINATION

Immediately flush with large amounts of water for at least 15 minutes.  
 Quickly remove contaminated clothing. Immediately wash area with large amounts of water.  
 Shampoo hair promptly if contaminated.  
 Remove the person from exposure.  
 Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.  
 Transfer promptly to a medical facility.



Common Name: **ALDOL**

Synonyms: Acetaldo; 3-Hydroxybutanal

CAS No: 107-89-1

 Molecular Formula: C<sub>4</sub>H<sub>8</sub>O<sub>2</sub>

RTK Substance No: 0032

Description: Thick, colorless to pale yellow liquid

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>2 - Fire</b> <b>1 - Reactivity</b> DOT#: UN 2839 ERG Guide #: 153 Hazard Class: 6.1 (Toxic)	COMBUSTIBLE LIQUID Use dry chemical, CO <sub>2</sub> , water spray or alcohol-resistant foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE. Use water spray to keep fire-exposed containers cool.	<b>Aldol</b> reacts violently with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE). <b>Aldol</b> reacts with METALS to form flammable and explosive <i>Hydrogen gas</i> .

**SPILL/LEAKS**
**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in dry sand, earth, or a noncombustible material and place into sealed containers for disposal.

**PHYSICAL PROPERTIES**

<b>Flash Point:</b>	150 °F (66 °C)
<b>Auto Ignition Temp:</b>	482 °F (250 °C)
<b>Vapor Density:</b>	3 (air = 1)
<b>Vapor Pressure:</b>	21 mm Hg at 68 °F (20 °C)
<b>Specific Gravity:</b>	1.1 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	174 ° to 176 °F (79 ° to 80 °C)
<b>Molecular Weight:</b>	88.1

**EXPOSURE LIMITS**

 No occupational exposure limits have been established for **Aldol**.

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Butyl and Viton/Butyl (>8-hr breakthrough for <i>Aldehydes, aliphatic</i> )
<b>Coveralls:</b>	Tychem® BR, CSM and TK (>8-hr breakthrough for <i>Aldehydes, aliphatic</i> )
<b>Respirator:</b>	SCBA

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Headache, dizziness, and passing out

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.



Common Name: **ALDRIN**

Synonyms: HDDN; Octalene  
 CAS No: 309-00-2  
 Molecular Formula: C<sub>12</sub>H<sub>8</sub>Cl<sub>6</sub>  
 RTK Substance No: 0033

Description: White to brown, crystalline solid, or a brown liquid, with a mild chemical odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>0 (Solid) - Fire</b> <b>3 (Liquid)- Fire</b> <b>0 - Reactivity</b> <b>DOT#:</b> UN 2761 (Solid) UN 2762 (Liquid) <b>ERG Guide #:</b> 151 (Solid) 131 (Liquid) <b>Hazard Class:</b> 6.1 (Poison) (Solid) 3 (Flammable) (Liquid)	<p><b>Aldrin</b> does not burn, however, it is often dissolved in a liquid carrier which may be flammable or combustible.</p> <p>Use dry chemical, CO<sub>2</sub>, water spray, alcohol-resistant foam or other foam as extinguishing agents.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Hydrogen Chloride</i>.</p> <p>Use water spray to keep fire-exposed containers cool.</p>	<p><b>Aldrin</b> is not compatible with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); ACID CATALYSTS; and PHENOL.</p> <p><b>Aldrin</b> may attack METALS in the presence of WATER.</p>

### SPILL/LEAKS

**Isolation Distance:**  
 Spill (solid): 25 meters (75 feet)  
 Spill (liquid): 50 meters (150 feet)  
 Fire: 800 meters (1/2 mile)

Absorb **Aldrin** in *liquid solution* in vermiculite, dry sand, earth, or a similar material and place into sealed containers for disposal.

Moisten *solid Aldrin* first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal. DO NOT wash into sewer.

Keep **Aldrin** in *liquid solution* out of confined spaces, such as sewers, because of the possibility of an explosion.

Use only non-sparking tools and equipment, especially when opening and closing containers of **Aldrin** in *liquid solution*.

**Aldrin** is very toxic to aquatic organisms and the environment. It bioaccumulates and has long-term effects.

### PHYSICAL PROPERTIES

**Odor Threshold:** Mild chemical odor  
**Vapor Pressure:** 8 x 10<sup>-5</sup> mm Hg at 68°F (20°C)  
**Specific Gravity:** 1.6 (solid) (water = 1)  
**Water Solubility:** Very slightly soluble  
**Boiling Point:** Decomposes  
**Melting Point:** 219°F (104°C)  
**Molecular Weight:** 365

### EXPOSURE LIMITS

**OSHA:** 0.25 mg/m<sup>3</sup>, 8-hr TWA  
**NIOSH:** 0.25 mg/m<sup>3</sup>, 10-hr TWA  
**ACGIH:** 0.05 mg/m<sup>3</sup>, 8-hr TWA  
**IDLH:** 25 mg/m<sup>3</sup>

The Protective Action Criteria values are:  
 PAC-1 = 0.25 mg/m<sup>3</sup>    PAC-2 = 10 mg/m<sup>3</sup>  
 PAC-3 = 25 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

**Gloves:** Silver Shield®/4H®, Viton and Barrier® (>4-hr breakthrough for *Hydrocarbons, aliphatic, unsaturated*)

**Coveralls:** Tychem® BR, Responder®, and TK; Trelchem® HPS and VPS (>8-hr breakthrough for *Hydrocarbons, aliphatic, unsaturated*)

**Respirator:** SCBA

### HEALTH EFFECTS

**Eyes:** Irritation  
**Skin:** Irritation  
**Inhalation:** Headache, dizziness, nausea and vomiting, convulsions and even death  
**Chronic:** Cancer (liver) in animals

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.  
**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** promptly to a medical facility.

Common Name: **d-trans-ALLETHRIN**

Synonyms: d-Allethrolone Chrysanthemumate; Bioallethrin

CAS No: 28434-00-6

Molecular Formula: C<sub>19</sub>H<sub>26</sub>O<sub>3</sub>

RTK Substance No: 3647

Description: Clear to amber colored, thick liquid with a mild odor (*Pyrethroid* insecticide)

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 3352 ERG Guide #: 151 Hazard Class: 6.1 (Poison)	<b>d-trans-Allethrin</b> does not burn, however, it is often dissolved in a liquid carrier which may be flammable or combustible. Use dry chemical, CO <sub>2</sub> or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE. Use water spray to keep fire-exposed containers cool.	<b>d-trans-Allethrin</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC). <b>d-trans-Allethrin</b> can be decomposed by STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE) and ULTRAVIOLET LIGHT.

### SPILL/LEAKS

**Isolation Distance:**

**Spill:** 50 meters (150 feet)

**Fire:** 800 meters (1/2 mile)

Absorb liquids in dry sand, earth, or a similar material and place into sealed containers for disposal.

DO NOT wash into sewer.

**d-trans-Allethrin** is highly toxic to fish and aquatic animals.

### PHYSICAL PROPERTIES

**Flash Point:** 180° to 266°F (82° to 130°C) (dependent on "carrier" for a 90% solution)

**Specific Gravity:** 0.995 (water = 1)

**Water Solubility:** Insoluble

**Boiling Point:** 284° to 320°F (140° to 160°C)

**Molecular Weight:** 302.4

### EXPOSURE LIMITS

No occupational exposure limits have been established for **d-trans-Allethrin**.

### PROTECTIVE EQUIPMENT

**Gloves:** Butyl, Viton/Butyl, Nitrile, Silver Shield®/4H®, Viton and Barrier® (>8-hr breakthrough for *Hydrocarbons*)

**Coveralls:** Tychem® F, BR, CSM and TK (>8-hr breakthrough for *Hydrocarbons*)

**Respirator:** Spill - full facepiece APR with Organic vapor filters and P100 prefilters  
 Fire/Large Spill - SCBA

### HEALTH EFFECTS

**Eyes:** Irritation and burns

**Skin:** Irritation and burns with rash, itching and redness

**Inhalation:** Nose, throat and lung irritation with coughing, wheezing and shortness of breath

Headache, nausea, vomiting, dizziness, seizures, and a loss of consciousness

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **ALLYL ALCOHOL**

Synonyms: 2-Propen-1-ol; Allylic Alcohol; Vinylcarbinol

CAS No: 107-18-6

Molecular Formula: C<sub>3</sub>H<sub>6</sub>O

RTK Substance No: 0036

Description: Colorless liquid with a mustard-like odor

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>4 - Health</b> <b>3 - Fire</b> <b>1 - Reactivity</b>  DOT#: UN 1098 ERG Guide #: 131 Hazard Class: 6.1 (Poison)	<b>Allyl Alcohol</b> is a FLAMMABLE LIQUID. Use dry chemical, CO <sub>2</sub> , water spray or alcohol-resistant foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool. Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source. Vapors may travel to a source of ignition and flash back.	<b>Allyl Alcohol</b> will explode upon contact with SULFURIC ACID. <b>Allyl Alcohol</b> will react with CARBON TETRACHLORIDE to form potentially explosive <i>halogenated epoxides</i> (such as <i>Dichlorobutylene</i> and <i>Trichlorobutylene Oxides</i> ). <b>Allyl Alcohol</b> is not compatible with STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); TRIAZENES; BROMOMELAMINE; OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); NITRIC ACID; CHLOROSULFONIC ACID; PHOSPHORUS TRICHLORIDE; and DIALLYL PHOSPHITE.

### SPILL/LEAKS

**Isolation Distance:**

Small Spills: 30 meters (100 feet)

Large Spills: 60 meters (200 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.

Keep **Allyl Alcohol** out of confined spaces, such as sewers, because of the possibility of an explosion.

DO NOT wash into sewer.

Very toxic to aquatic organisms.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	0.8 to 1.1 ppm
<b>Flash Point:</b>	70°F (21°C)
<b>LEL:</b>	2.5%
<b>UEL:</b>	18%
<b>Auto Ignition Temp:</b>	713°F (378°C)
<b>Vapor Density:</b>	2 (air = 1)
<b>Vapor Pressure:</b>	17.2 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	0.9 (water = 1)
<b>Water Solubility:</b>	Miscible
<b>Boiling Point:</b>	206°F (97°C)
<b>Molecular Weight:</b>	58.1

### EXPOSURE LIMITS

<b>OSHA:</b>	2 ppm, 8-hr TWA
<b>NIOSH:</b>	2 ppm, 10-hr TWA; 4 ppm, STEL
<b>ACGIH:</b>	0.5 ppm, 8-hr TWA
<b>IDLH LEVEL:</b>	20 ppm
<b>PAC LEVELS:</b>	PAC-1 = 0.09 ppm; PAC-2 = 1.7 ppm; PAC-3 = 13 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl, Silver Shield®/4H® and Viton (>8-hr breakthrough)
<b>Coveralls:</b>	DuPont Tychem® CPF 4, BR and LV, CSM, Responder®, and TK; Kappler Zytron® 400; and Saint-Gobain ONESuit®PRO (>8-hr breakthrough)
<b>Respirator:</b>	>0.5 ppm -full facepiece APR with Organic vapor filters >5 ppm - Pressure demand supplied air >20 ppm – Pressure demand SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation, burns and blisters
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, phlegm and shortness of breath (pulmonary edema)  Headache, dizziness and passing out

### FIRST AID AND DECONTAMINATION

<b>Remove</b> the person from exposure.
<b>Flush</b> eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention immediately.
<b>Quickly</b> remove contaminated clothing. Wash contaminated skin with large amounts of water. Seek medical attention.
<b>Begin</b> artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b> to a medical facility.
<b>Medical</b> observation is recommended as symptoms may be delayed.

Common Name: **ALLYL CHLORIDE**

Synonyms: 3-Chloropropene; 1-Chloro-2-propene

CAS No: 107-05-1

 Molecular Formula: C<sub>3</sub>H<sub>5</sub>Cl

RTK Substance No: 0039

Description: Colorless, brown, yellow or purple liquid with a strong, unpleasant odor

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>3 - Fire</b> <b>1 - Reactivity</b>  DOT#: UN 1100 ERG Guide #: 131 Hazard Class: 3 (Flammable)	FLAMMABLE LIQUID Use dry chemical, CO <sub>2</sub> , foam or water spray as extinguishing agents. May polymerize and explode at elevated temperatures. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Hydrogen Chloride</i> and <i>Phosgene</i> . CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool. Vapors may travel to a source of ignition and flash back. Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.	<b>Allyl Chloride</b> may react violently with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); ACID CATALYSTS; AMINES; IRON or ALUMINUM CHLORIDES; CHEMICALLY ACTIVE METALS (such as POTASSIUM, SODIUM, MAGNESIUM and ZINC); and SODIUM HYDROXIDE.  <b>Allyl Chloride</b> may decompose in WATER or MOIST AIR to release <i>Hydrogen Chloride gas</i> . Attacks PLASTIC, RUBBER and COATINGS.

**SPILL/LEAKS**
**Isolation Distance:**

Small Spill: 60 meters (200 feet)

Large Spill: 270 meters (900 feet)

Absorb liquids in vermiculite, dry sand, earth, or activated carbon and deposit in sealed containers.

Liquid floats on water.

Harmful to aquatic life in very low concentrations.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	0.47 ppm
<b>Flash Point:</b>	-20°F (-29°C)
<b>LEL:</b>	2.9%
<b>UEL:</b>	11.1%
<b>Relative Vapor Density:</b>	2.6 (air = 1)
<b>Vapor Pressure:</b>	295 mm Hg at 68°F (20°C)
<b>Water Solubility:</b>	Slightly soluble
<b>Ionization Potential:</b>	10.05 eV
<b>Boiling Point:</b>	113°F (45°C)
<b>Molecular Weight:</b>	76.5

**EXPOSURE LIMITS**

<b>OSHA:</b>	1 ppm, 8-hr TWA
<b>NIOSH:</b>	1 ppm, 10-hr TWA, 2 ppm STEL
<b>ACGIH:</b>	1 ppm, 8-hr TWA; 2 ppm STEL
<b>IDLH LEVEL:</b>	250 ppm

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	4-H®/Silver Shield® (>4-hr breakthrough)
<b>Coveralls:</b>	DuPont Tychem®, CPF-4, BR and LV, Responder® and TK (>8-hr breakthrough)
<b>Boots:</b>	No information
<b>Respirator:</b>	>1 ppm - Full-facepiece APR with Organic Vapor cartridges >50 ppm - Supplied air

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation, burns leading to eye damage
<b>Skin:</b>	Irritation, severe burns
<b>Acute:</b>	Nose, throat and lung irritation with coughing and shortness of breath Headache, dizziness and unconsciousness
<b>Chronic:</b>	Limited evidence - Cancer in animals. May cause mutations Cough, phlegm and shortness of breath

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention immediately.  
**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention immediately.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** to a medical facility.  
**Medical** observation is recommended as symptoms may be delayed.

Common Name: **ALLYL FORMATE**

Synonyms: Formic Acid, Allyl Ester

CAS No: 1838-59-1

 Molecular Formula: C<sub>4</sub>H<sub>6</sub>O<sub>2</sub>

RTK Substance No: 0042

Description: Colorless, clear liquid

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>3 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 2336 ERG Guide #: 131 Hazard Class: 3 (Flammable)	<b>Allyl Formate</b> is a FLAMMABLE LIQUID. Use dry chemical, CO <sub>2</sub> , water spray or alcohol-resistant foam as extinguishing agents. Solid streams of water may spread fire. POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool. Vapors may travel to a source of ignition and flash back. <b>Allyl Formate</b> may form an ignitable vapor/air mixture in closed tanks or containers.	<b>Allyl Formate</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC).

**SPILL/LEAKS**
**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers for disposal.

 Keep **Allyl Formate** out of confined spaces, such as sewers, because of the possibility of an explosion.

 Use only non-sparking tools and equipment, especially when opening and closing containers of **Allyl Formate**.

**PHYSICAL PROPERTIES**
**Flash Point:** 5° to 67°F (-15° to 19.4°C)

**Specific Gravity:** 0.95 (water = 1)

**Water Solubility:** Slightly soluble

**Boiling Point:** 180° to 183°F (82° to 84°C)

**Molecular Weight:** 86.1

**EXPOSURE LIMITS**

 No occupational exposure limits have been established for **Allyl Formate**.

The Protective Action Criteria values are:

 PAC-1 = 12.5 mg/m<sup>3</sup> (4 ppm)

 PAC-2 = 75 mg/m<sup>3</sup> (21 ppm)

 PAC-3 = 400 mg/m<sup>3</sup> (114 ppm)

**PROTECTIVE EQUIPMENT**
**Gloves:** Butyl (1 to 4-hr breakthrough for *Esters, Carboxylic, Formates*)

**Coveralls:** Tychem® BR, Responder® and TK (>8-hr breakthrough for *Esters, Carboxylic*)

**Respirator:** SCBA

**HEALTH EFFECTS**
**Eyes:** Irritation

**Skin:** Irritation

**Inhalation:** Nose and throat irritation

**FIRST AID AND DECONTAMINATION**
**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Remove** contaminated clothing and wash contaminated skin with soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **ALLYL IODIDE**

Synonyms: 3-Iodopropene

CAS No: 556-56-9

Molecular Formula: C<sub>3</sub>H<sub>5</sub>I

RTK Substance No: 0044

Description: Yellowish, corrosive liquid that darkens on contact with air.

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>3 - Fire</b> <b>1 - Reactivity</b>  <b>DOT#:</b> UN 1723 <b>ERG Guide #:</b> 132 <b>Hazard Class:</b> 3 (Flammable)	Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Hydrogen Iodide</i> . CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool. Vapors may travel to a source of ignition and flash back. Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.	<b>Allyl iodide</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).  <b>Allyl iodide</b> is AIR and LIGHT sensitive.

### SPILL/LEAKS

**Isolation Distance:**

Small Spill - 60 m (200 feet)

Large Spill - 330 m (1,100 feet)

Cover with dry lime, sand or soda ash, and place in covered containers for disposal.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Unpleasant, irritating
<b>Flash Point:</b>	61°F (16°C)
<b>Specific Gravity:</b>	1.84 (water = 1)
<b>Vapor Density:</b>	5.8 (air = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	217°F (103°C)
<b>Molecular Weight:</b>	168

### EXPOSURE LIMITS

No occupational exposure limits have been established.

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Viton (31 minutes permeation) or Silver Shield®/4H® (240 minutes permeation)
<b>Coveralls:</b>	DuPont Tychem® F, CPF-4, BR and LV, Responder® and TK for <i>Alylic Halogens</i> (8-hr breakthrough)
<b>Boots:</b>	No information
<b>Respirator:</b>	Pressure demand supplied air

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation, burns and possible eye damage
<b>Skin:</b>	Irritation and burns
<b>Acute:</b>	Irritation of the nose, throat and lungs with coughing, wheezing and shortness of breath
<b>Chronic:</b>	Coughing, phlegm and/or shortness of breath

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention immediately.  
**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** to a medical facility.



Chemical Name: **ALLYL ISOTHIOCYANATE**

Synonyms: Mustard Oil

CAS No: 57-06-7

Molecular Formula: C<sub>4</sub>H<sub>5</sub>NS

RTK Substance No: 0045

Description: Colorless to pale yellow, oily liquid with an irritating odor.

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>2 - Fire</b> <b>1 - Reactivity</b>  <b>DOT#:</b> UN 1545 <b>ERG Guide #:</b> 155 <b>Hazard Class:</b> 6.1 (Poison)	<ul style="list-style-type: none"> <li>- Combustible liquid</li> <li>- Fire extinguishers – use dry chemical, CO<sub>2</sub>, or foam</li> <li>- DO NOT USE WATER</li> <li>- Decomposition Products - Nitrogen Oxides, Sulfur Oxides and Hydrogen Cyanide</li> <li>- Vapors may travel to a source of ignition and flash back.</li> <li>- Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.</li> </ul>	<ul style="list-style-type: none"> <li>- Reacts with WATER, ALCOHOLS, STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); AMINES; MOISTURE; and HEAT.</li> </ul>

**SPILL/LEAKS**

**Isolation Distance:** Isolate spill or leak in all directions for at least 50 meters (150 feet)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.

**PHYSICAL PROPERTIES**

**Odor Threshold:** No Information  
**Flash Point:** 115°F (46°C)  
**LEL:** No Information  
**UEL:** No Information  
**Vapor Density:** 3.4 (air = 1)  
**Vapor Pressure:** 3.7 mm Hg at 86°F (30°C)  
**Water Solubility:** Insoluble  
**Boiling Point:** 304°F (151°C)  
**Ionization Potential:** No Information

**EXPOSURE LIMITS**

**ACGIH:** N/A  
**OSHA:** N/A  
**NIOSH:** N/A  
**IDLH LEVEL:** N/A

**PROTECTIVE EQUIPMENT**

**Gloves:** No Information  
**Coveralls:** No Information  
**Boots:** No Information  
**Respirator:** Supplied air

**HEALTH EFFECTS**

**Eyes:** Irritation  
**Skin:** Irritation, burns and blisters  
**Acute:** Nose and throat irritation  
**Chronic:** Cancer -Tested (Not Classifiable)  
May damage the fetus  
Symptoms of asthma - coughing and wheezing

**FIRST AID AND DECONTAMINATION**

- Remove the person from exposure.
- Flush eyes with cool water for at least 15 minutes.
- Remove contaminated clothing and wash contaminated skin with soap and water.
- Begin rescue breathing and CPR if necessary.
- Transfer to a medical facility.



Common Name: **ALLYL TRICHLOROSILANE**

Synonyms: Allylsilicone Trichloride

CAS No: 107-37-9

 Molecular Formula: C<sub>3</sub>H<sub>5</sub>Cl<sub>3</sub>Si

RTK Substance No: 0047

Description: Colorless liquid with a pungent and irritating odor

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>3 - Fire</b> <b>2 W - Reactivity</b> DOT#: UN 1724 (Stabilized) ERG Guide #: 155 (page 258) Hazard Class: 8 (Corrosive)	Use dry chemical, CO <sub>2</sub> or dry sand to extinguish fire. DO NOT USE WATER or FOAM on material itself. Reignition may occur as <b>Allyl Trichlorosilane</b> is difficult to extinguish. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Hydrogen Chlorides</i> , <i>Phosgene</i> and <i>Silicon Dioxide</i> . CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool. DO NOT get water inside containers. Vapors may travel to a source of ignition and flash back. Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source. <b>Allyl Trichlorosilane</b> may autopolymerize.	<b>Allyl Trichlorosilane</b> reacts with WATER, MOIST AIR or STEAM to produce toxic and corrosive <i>Hydrogen Chloride gas</i> and flammable and explosive <i>Hydrogen gas</i> . <b>Allyl Trichlorosilane</b> is not compatible with ORGANIC ACIDS; OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); ALCOHOLS; AMINES; STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); AMMONIA; ALDEHYDES; KETONES; and METALS.

## SPILL/LEAKS

**Isolation Distance:**

Small Spills - 30 meters (100 feet)

Large Spills - 180 meters (600 feet)

Cover and neutralize spill with crushed limestone, soda ash, lime or cement powder.

Keep out of sewers to prevent explosions.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Pungent
<b>Flash Point:</b>	95°F (35°C)
<b>LEL:</b>	No Information
<b>UEL:</b>	No Information
<b>Vapor Density:</b>	6.05 (air = 1)
<b>Vapor Pressure:</b>	10 mm Hg at 61°F (16°C)
<b>Specific Gravity:</b>	1.2
<b>Water Solubility:</b>	Reactive
<b>Boiling Point:</b>	241°F (116°C)

## EXPOSURE LIMITS

<b>OSHA, NIOSH and ACGIH</b>	No occupational exposure limits established
<b>EPA Acute Exposure</b>	AEGL1 = 0.60 ppm (8-hr)
<b>Guideline Levels: (AEGLs)</b>	AEGL2 = 3.7 ppm (8-hr)
	AEGL3 = 8.7 ppm (8-hr)
	AEGL3 = 210 ppm (10 min)

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Viton® for <i>Organosilicon compounds</i>
<b>Coveralls:</b>	DuPont Tychem® Responder®, CSM, and TK (for heavy liquid chemicals which are toxic and corrosive)
<b>Boots:</b>	No Information
<b>Respirator:</b>	>1 ppm - Supplied Air

## HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing and severe shortness of breath (pulmonary edema)
<b>Chronic:</b>	No information

## FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention immediately.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention immediately.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** to a medical facility.

**Medical** observation is recommended as symptoms may be delayed.

Common Name: **ALUMINUM CHLORIDE**

Synonyms: Aluminum Trichloride; Anhydrous Aluminum Chloride

CAS No: 7446-70-0

 Molecular Formula:  $AlCl_3$ 

RTK Substance No: 0057

Description: Yellowish or grayish-white crystalline solid or powder with a sharp odor that is water reactive

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>0 - Fire</b> <b>2-W - Reactivity</b>  DOT#: UN 1726 ERG Guide #: 137 Hazard Class: 8 (Corrosive)	Non-flammable Use dry chemical or $CO_2$ as extinguishing agents. DO NOT USE WATER. Use water spray to keep fire-exposed containers cool. DO NOT get water inside tanks. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Hydrogen Chloride</i> . <b>Aluminum Chloride</b> may ignite combustibles (wood, paper and oil).	<b>Aluminum Chloride</b> may react violently with WATER and MOIST AIR to form toxic <i>Hydrogen Chloride</i> gas and heat. <b>Aluminum Chloride</b> is not compatible with ALUMINUM OXIDE; CARBON OXIDE; PHENYL AZIDE; GLYCIDOL; NITROBENZENE; ALKENES; BENZOYL CHLORIDE; NAPHTHALENE; ETHYLENE OXIDE; OXYGEN DIFLUORIDE; NITROMETHANE; ANILINES; ETHYLENIMINE; OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); EPICHLOROHYDRIN; HALOGENATED HYDROCARBONS; and ALCOHOL.

## SPILL/LEAKS

**Isolation Distance:**  
 Small Spills: 30 meters (100 feet) when spilled in water  
 Large Spills: 120 meters (400 feet) when spilled in water  
 Fire: 800 meters (1/2 mile)  
 Collect powdered material in the most convenient and safe manner and deposit in sealed containers.  
 Keep **Aluminum Chloride** out of confined spaces where water may be present (such as sewers), because of the possibility of an explosion.  
 Harmful to aquatic life at low concentrations.

## PHYSICAL PROPERTIES

**Odor Threshold:** Sharp  
**Flash Point:** Nonflammable  
**Vapor Density:** 2.5 (air = 1)  
**Vapor Pressure:** 1 mm Hg at 212°F (100°C)  
**Specific Gravity:** 2.7 (water = 1)  
**Water Solubility:** Decomposes  
**Boiling Point:** 360°F (182°C)  
**Melting Point:** 374°F (190°C)  
**Molecular Weight:** 133.34

## EXPOSURE LIMITS

**OSHA:** None  
**NIOSH:** 2 mg/m<sup>3</sup>, 10-hr TWA  
**ACGIH:** Withdrawn  
**IDLH:** None

## PROTECTIVE EQUIPMENT

**Gloves:** Natural Rubber and Nitrile (for *solid*) and Neoprene (if *HCl* gas is present)  
**Coveralls:** DuPont Tyvek® (for *solid*) and Tychem® Responder (if *Hydrogen Chloride* gas is present)  
**Respirator:** >2 mg/m<sup>3</sup> - Full facepiece APR with High efficiency filter  
 If *Hydrogen Chloride* gas is present, use Supplied air

## HEALTH EFFECTS

**Eyes:** Severe irritation and burns  
**Skin:** Severe irritation and burns  
**Inhalation:** Nose, throat and lung irritation with coughing, wheezing and severe shortness of breath (pulmonary edema)

## FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.  
**Quickly** brush off excess chemical from the face. Immediately flush with large amounts of water for at least 30 minutes, lifting upper and lower lids. Remove contact lenses, if worn, while flushing. Seek medical attention immediately.  
**Quickly** remove contaminated clothing. Immediately blot or brush off excess chemical and wash gently with large amounts of water for at least 30 minutes. Seek medical attention immediately.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** to a medical facility.  
**Medical** observation is recommended as symptoms may be delayed.

Common Name: **ALUMINUM FLUORIDE**

Synonyms: Aluminum Trifluoride

CAS No: 7784-18-1

 Molecular Formula:  $\text{AlF}_3$ 

RTK Substance No: 0059

Description: Odorless, white or colorless, crystalline powder

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 1759 ERG Guide #: 154 Hazard Class: 8 (Corrosive)	Extinguish fire using an agent suitable for type of surrounding fire. <b>Aluminum Fluoride</b> itself does not burn. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Aluminum Oxides</i> , <i>Fluorine</i> and <i>Hydrogen Fluoride</i> (in the presence of water). Use water spray to keep fire-exposed containers cool.	<b>Aluminum Fluoride</b> , in contact with SODIUM and POTASSIUM, is sensitive to impact and a violent reaction may occur. <b>Aluminum Fluoride</b> will explode when heated with REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINIUM and their HYDRIDES). <b>Aluminum Fluoride</b> is not compatible with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) and ACID FUMES.

**SPILL/LEAKS**
**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into covered containers for disposal.

Harmful to aquatic life in very low concentrations.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Noncombustible
<b>Vapor Density:</b>	2.9 (air = 1)
<b>Vapor Pressure:</b>	1 mm Hg at 2,260°F (1,238°C)
<b>Specific Gravity:</b>	3.1 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	2,799°F (1,537°C)
<b>Melting Point:</b>	2,356°F (1,291°C)
<b>Molecular Weight:</b>	84

**EXPOSURE LIMITS**
**OSHA:** 2.5 mg/m<sup>3</sup>, 8-hr TWA

**NIOSH:** 2.5 mg/m<sup>3</sup>, 10-hr TWA

**ACGIH:** 2.5 mg/m<sup>3</sup>, 8-hr TWA

**IDLH:** 250 mg/m<sup>3</sup>

 (All of the above are for *Fluorides*)

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Neoprene, Natural Rubber, Polyvinyl Chloride and Viton
<b>Coveralls:</b>	DuPont Tyvek®
<b>Respirator:</b>	>2.5 mg/m <sup>3</sup> - Full facepiece APR with High efficiency filter >25 mg/m <sup>3</sup> - Supplied air

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, wheezing and shortness of breath  Headache, nausea and vomiting, weakness, convulsions and collapse

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing. Immediately wash contaminated skin with large amounts of water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **ALUMINUM HYDRIDE**

Synonyms: Alane; Aluminum Trihydride

CAS No: 7784-21-6

 Molecular Formula:  $\text{AlH}_3$ 

RTK Substance No: 0060

Description: Colorless, white or gray powder which ignites spontaneously in air

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>1 - Health</b> <b>3 - Fire</b> <b>2-W - Reactivity</b> DOT#: UN 2463 ERG Guide #: 138 Hazard Class: 4.3 (Water Reactive/ Dangerous when wet)	FLAMMABLE and REACTIVE. Use dry chemical, soda ash, lime, or sand as extinguishing agents. DO NOT USE WATER OR FOAM. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Aluminum Oxides</i> . CONTAINERS MAY EXPLODE IN FIRE. FIRE MAY RESTART AFTER IT HAS BEEN EXTINGUISHED.	<b>Aluminum Hydride</b> ignites spontaneously in AIR or OXYGEN. <b>Aluminum Hydride</b> reacts explosively with WATER and MOISTURE to form flammable <i>Hydrogen gas</i> . <b>Aluminum Hydride</b> reacts violently with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); and ETHERS with CARBON DIOXIDE as an impurity. <b>Aluminum Hydride</b> is not compatible with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) and METAL SALTS.

**SPILL/LEAKS**
**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Collect powdered material in the most convenient and safe manner and deposit into sealed containers.

DO NOT USE WATER OR WET METHOD.

 Keep **Aluminum Hydride** out of confined spaces, such as sewers, because of the possibility of an explosion.

No information is available about environmental effects.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	Unknown
<b>Flash Point:</b>	Flammable
<b>Water Solubility:</b>	Reactive
<b>Boiling Point:</b>	Decomposes
<b>Melting Point:</b>	302°F (150°C)
<b>Molecular Weight:</b>	30

**EXPOSURE LIMITS**
**OSHA:** 5 mg/m<sup>3</sup>, 8-hr TWA (*respirable Aluminum*) and 15 mg/m<sup>3</sup>, 8-hr TWA (total *Aluminum*)

**NIOSH:** 5 mg/m<sup>3</sup>, 10-hr TWA (*Aluminum, pyro powders*)

**ACGIH:** 1 mg/m<sup>3</sup>, 8-hr TWA (*Aluminum, respirable fraction*)

**IDLH:** None

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Nitrile and Natural Rubber
<b>Coveralls:</b>	DuPont Tyvek®
<b>Respirator:</b>	>1 mg/m <sup>3</sup> - Full facepiece APR with High efficiency filters >10 mg/m <sup>3</sup> - Supplied air

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, wheezing and shortness of breath

**FIRST AID AND DECONTAMINATION**

<b>Remove</b>	the person from exposure.
<b>Flush</b>	eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.
<b>Quickly</b>	remove contaminated clothing and wash contaminated skin with large amounts of soap and water.
<b>Begin</b>	artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b>	promptly to a medical facility.

Common Name: **ALUMINUM NITRATE**

Synonyms: Aluminum Trinitrate

CAS No: 13473-90-0

Molecular Formula:  $Al_3HNO_3$

RTK Substance No: 0061

Description: Odorless, colorless to white solid

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 1438 ERG Guide #: 140 Hazard Class: 5.1 (Oxidizer)	<p><b>Aluminum Nitrate</b> is not combustible, but it is a STRONG OXIDIZER that enhances the combustion of other substances.</p> <p>Use water only. DO NOT USE CHEMICAL or CO<sub>2</sub> extinguishing agents.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Aluminum Oxide</i> and <i>Nitrogen Oxides</i>.</p> <p>Use water spray to keep fire-exposed containers cool.</p> <p><b>Aluminum Nitrate</b> may ignite combustibles (wood, paper and oil).</p>	<p><b>Aluminum Nitrate</b> dissolves in WATER to form <i>Nitric Acid</i>.</p> <p><b>Aluminum Nitrate</b> is not compatible with COMBUSTIBLE MATERIALS; STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); METALS; METAL SALTS; CYANIDES; THIOCYANATES; ORGANIC MATERIALS; and HALOGENATED HYDROCARBONS (such as METHYL CHLORIDE and TRICHLOROETHYLENE).</p>

### SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

DO NOT wash into sewer.

Neutralize water spills with Sodium Bicarbonate (soda ash).

**Aluminum Nitrate** is harmful to aquatic life at very low concentrations.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Noncombustible
<b>Specific Gravity:</b>	>1 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	302°F (150°C) (Decomposes)
<b>Melting Point:</b>	163°F (73°C)
<b>Molecular Weight:</b>	213

### EXPOSURE LIMITS

**OSHA:** 5 mg/m<sup>3</sup> (as *respirable dust*), 8-hr TWA

**NIOSH:** 2 mg/m<sup>3</sup> (as *soluble salt*), 10-hr TWA

**ACGIH:** 1 mg/m<sup>3</sup> (as the *respirable fraction*)

(All the above are for *Aluminum*)

The Protective Action Criteria values are:

PAC-1 = 50 mg/m<sup>3</sup>    PAC-2 = 350 mg/m<sup>3</sup>

PAC-3 = 500 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Nitrile and Natural Rubber
<b>Coveralls:</b>	Tyvek®
<b>Respirator:</b>	>1 mg/m <sup>3</sup> - full facepiece APR with <i>P100 filters</i> >50 mg/m <sup>3</sup> - SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Severe irritation and burns
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, wheezing and/or shortness of breath

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.

**Remove** contaminated clothing and wash contaminated skin with water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **ALUMINUM OXIDE**

Synonyms: alpha-Alumina; Aluminum Trioxide

CAS No: 1344-28-1

Molecular Formula: Al<sub>2</sub>O<sub>3</sub>

RTK Substance No: 2891

Description: White, odorless, crystalline powder

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b>  DOT#: None ERG Guide #: None Hazard Class: None	Extinguish fire using an agent suitable for type of surrounding fire. <b>Aluminum Oxide</b> itself does not burn.  Dusts may form explosive mixtures in air.	<b>Aluminum Oxide</b> is not compatible with CHLORINE TRIFLUORIDE; ETHYLENE OXIDE; OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); and HOT CHLORINATED RUBBER.

**SPILL/LEAKS**

**Isolation Distance:**

Spill: 25 meters (75 feet)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Noncombustible
<b>Vapor Pressure:</b>	0 mm Hg at 68 °F (20 °C)
<b>Specific Gravity:</b>	4 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	5,396 °F (2,980 °C)
<b>Melting Point:</b>	3,632 °F (2,030 °C)
<b>Molecular Weight:</b>	101.9

**EXPOSURE LIMITS**

**OSHA:** 5 mg/m<sup>3</sup> (as *respirable dust*) and 15 mg/m<sup>3</sup> (as *total dust*), 8-hr TWA

**ACGIH:** 1 mg/m<sup>3</sup> (as the *respirable fraction*), 8-hr TWA

The Protective Action Criteria values are:

PAC-1 = 15 mg/m<sup>3</sup>    PAC-2 = 170 mg/m<sup>3</sup>  
 PAC-3 = 990 mg/m<sup>3</sup>

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Nitrile, Neoprene and Natural Rubber
<b>Coveralls:</b>	Tyvek®
<b>Respirator:</b>	>1 mg/m <sup>3</sup> - full facepiece APR with <i>High efficiency filters</i> (N, R or P95)

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, wheezing and shortness of breath

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.  
**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** promptly to a medical facility.



Common Name: **ALUMINUM PHOSPHATE**

Synonyms: Aluminum Monophosphate

CAS No: 7784-30-7

 Molecular Formula:  $AlPO_4$ 

RTK Substance No: 0062

Description: Solid, corrosive chemical which may be in a liquid or gel form

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> <b>DOT ID #:</b> UN 1760 <b>ERG Guide #:</b> 154 <b>Hazard Class:</b> 8 (Corrosive)	Extinguish fire using an agent suitable for type of surrounding fire. <b>Aluminum Phosphate</b> itself does not burn.  POISONOUS GASES ARE PROCUED IN FIRE, including <i>Aluminum Oxides</i> and <i>Phosphorus Oxides</i> .	<b>Aluminum Phosphate</b> reacts violently with STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE) and STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC).

### SPILL/LEAKS

**Isolation Distance:** 25 to 50 meters  
(80 to 150 feet)

Collect powdered material in the most convenient and safe manner and deposit in sealed containers.

Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.

### PHYSICAL PROPERTIES

**Odor Threshold:** Odorless  
**Flash Point:** Not Combustible  
**LEL:** N/A  
**UEL:** N/A  
**Specific Gravity:** 2.56 (water = 1)  
**Vapor Pressure:** 0 mm Hg at 68°F (20°C)  
**Water Solubility:** Insoluble  
**Melting Point:** >2,732°F (1,500°C)

### EXPOSURE LIMITS

**OSHA:** 15 mg/m<sup>3</sup> 8-hr TWA (Total Dust)  
 5 mg/m<sup>3</sup> 8-hr TWA (Respirable Dust)  
**NIOSH:** 10 mg/m<sup>3</sup> 10-hr TWA (Total Dust)  
 5 mg/m<sup>3</sup> 10-hr TWA (Respirable Dust)  
**ACGIH:** 1 mg/m<sup>3</sup> 8-hr TWA (Respirable Fraction)

### PROTECTIVE EQUIPMENT

**Gloves:** No Information  
**Overall:** DuPont Tychem® Responder® for inorganic acid salts in solution, DuPont Tychem® for hazardous dusts  
**Boot:** No Information  
**Respirator:** >1 mg/m<sup>3</sup> N95  
 >10 mg/m<sup>3</sup> Supplied Air

### HEALTH EFFECTS

**Eyes:** Irritation and burns  
**Skin:** Irritation and burns  
**Acute:** Nose and throat irritation with coughing and wheezing  
**Chronic:** Bronchitis, coughing, wheezing and/or shortness of breath

### FIRST AID AND DECONTAMINATION

Remove the person from exposure.  
 Flush eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.  
 Immediate medical attention is necessary.  
 Remove contaminated clothing and wash contaminated skin with soap and water.  
 Begin artificial respiration if breathing has stopped and CPR if necessary.  
 Transfer to a medical facility.



Common Name: **ALUMINUM SULFATE**

Synonyms: Alum; Aluminum Trisulfate

CAS No: 10043-01-3

Molecular Formula:  $Al_2(SO_4)_3$

RTK Substance No: 0068

Description: Odorless, white or colorless, crystalline solid

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> <b>DOT#:</b> UN 3077 <b>ERG Guide #:</b> 171 <b>Hazard Class:</b> 9 (Environmentally Hazardous Material)	CORROSIVE when in a <i>water solution</i> . Extinguish fire using an agent suitable for type of surrounding fire. <b>Aluminum Sulfate</b> itself does not burn. DO NOT USE WATER directly on <b>Aluminum Sulfate</b> as heat and toxic <i>Sulfuric Acid</i> may form. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Aluminum Oxides</i> and <i>Sulfur Oxides</i> .	<b>Aluminum Sulfate</b> will react with WATER; MOISTURE; STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); AMMONIA; and AMINES. <b>Aluminum Sulfate</b> is corrosive to METALS in the presence of WATER and MOISTURE.

### SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Collect powdered material in the most convenient and safe manner and place into sealed containers for disposal.

DO NOT wash into sewer.

For water spills, neutralize with *Agricultural Lime*, *Crushed Limestone* or *Sodium Bicarbonate*.

**Aluminum Sulfate** may be hazardous to the environment, especially to fish.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Nonflammable
<b>Vapor Pressure:</b>	0 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	2.71 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	>2,912°F (1,600°C)
<b>Melting Point:</b>	1,292°F (700°C)
<b>Molecular Weight:</b>	342.1

### EXPOSURE LIMITS

**NIOSH:** 2 mg/m<sup>3</sup>, 10-hr TWA (as *Aluminum, soluble salts*)

**ACGIH:** 1 mg/m<sup>3</sup>, 8-hr TWA (as *Aluminum metal, respirable fraction*)

The Protective Action Criteria values are:

PAC-1 = 38 mg/m<sup>3</sup>      PAC-3 = 380 mg/m<sup>3</sup>

PAC-2 = 64 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Natural Rubber and Nitrile
<b>Coveralls:</b>	Tyvek®
<b>Respirator:</b>	>2 mg/m <sup>3</sup> - full facepiece APR with High efficiency filter >19 mg/m <sup>3</sup> - SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation with rash and burning feeling
<b>Inhalation:</b>	Nose, throat and lung irritation, with coughing, wheezing and shortness of breath

### FIRST AID AND DECONTAMINATION

<b>Remove</b> the person from exposure.
<b>Flush</b> eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention.
<b>Quickly</b> remove contaminated clothing and wash contaminated skin with large amounts of water. Seek medical attention.
<b>Begin</b> artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b> promptly to a medical facility.

Common Name: **2-AMINOANTHRAQUINONE**

Synonyms: AAQ; beta-Aminoanthraquinone

CAS No: 117-79-3

Molecular Formula: C<sub>14</sub>H<sub>9</sub>NO<sub>2</sub>

RTK Substance No: 0069

Description: Red, needle-shaped crystal or a dark brown powder

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b> <b>DOT#: None</b> <b>ERG Guide #: None</b> <b>Hazard Class: None</b>	May be combustible. Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> .	<b>2-Aminoanthraquinone</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).

### SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

### PHYSICAL PROPERTIES

**Vapor Pressure:** 5 x 10<sup>-11</sup> mm Hg at 77°F (25°C)

**Water Solubility:** Insoluble

**Boiling Point:** Sublimes

**Melting Point:** 558° to 583°F (292° to 306°C)

**Molecular Weight:** 223.23

### EXPOSURE LIMITS

No occupational exposure limits have been established for **2-Aminoanthraquinone**.

The Protective Action Criteria values are:

PAC-1 = 25 mg/m<sup>3</sup>

PAC-2 = 150 mg/m<sup>3</sup>

PAC-3 = 500 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

**Gloves:** Nitrile and Natural Rubber

**Coveralls:** Tyvek®

**Respirator:** Full facepiece APR with *Organic vapor and Acid gas* cartridges with *P100 prefilters*  
>25 mg/m<sup>3</sup> - SCBA

### HEALTH EFFECTS

**Eyes:** Irritation

**Skin:** Irritation

**Inhalation:** No information

**Chronic:** Cancer (liver, lymph) in animals

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **4-AMINODIPHENYL**

Synonyms: 4-Phenylaniline; 4-Aminobiphenyl

CAS No: 92-67-1

 Molecular Formula: C<sub>6</sub>H<sub>5</sub>C<sub>6</sub>H<sub>4</sub>NH<sub>2</sub>

RTK Substance No: 0072

Description: Colorless to tan, crystalline solid

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>4 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b>  DOT#: None ERG Guide #: N/A Hazard Class: N/A	Use dry chemical, CO <sub>2</sub> , water spray, alcohol-resistant foam or other foam as extinguishing agents.  POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> .	<b>4-Aminodiphenyl</b> may react violently with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); and HEXANITROETHANE.  <b>4-Aminodiphenyl</b> is not compatible with ANHYDRIDES; ORGANIC SUBSTANCES (such as CRESOLS, ISOCYANATES, KETONES, and ALDEHYDES); METALS (such as ALUMINUM, COPPER, ZINC and their ALLOYS); and GALVANIZED STEEL.

## SPILL/LEAKS

**Isolation Distance:** 25 meters to 50 meters (80 to 160 feet)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Floral odor
<b>Flash Point:</b>	>230° F (110 °C)
<b>LEL:</b>	No information
<b>UEL:</b>	No information
<b>Vapor Density:</b>	5.8 (air = 1)
<b>Vapor Pressure:</b>	1 mm Hg at 227°F (108.3°C)
<b>Water Solubility:</b>	Slightly soluble
<b>Boiling Point:</b>	576°F (302°C)
<b>Specific Gravity:</b>	1.16

## EXPOSURE LIMITS

<b>OSHA:</b>	Eliminate exposure
<b>NIOSH:</b>	Lowest feasible exposure
<b>ACGIH:</b>	Lowest level possible
<b>IDLH LEVEL:</b>	No information

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	<i>Silver Shield® (for aromatic Amines)</i>
<b>Coveralls:</b>	<i>DuPont Tychem® Polycoat, QC, CPF1, SL and CPF2 (for hazardous dry powders and solids)</i>
<b>Boots:</b>	No information
<b>Respirator:</b>	Supplied air

## HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Acute:</b>	Headache, dizziness, blue color to the skin and lips, trouble breathing, collapse, and even death
<b>Chronic:</b>	Cancer (bladder)

## FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Remove** contaminated clothing. Wash contaminated skin with soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** to a medical facility.

Common Name: **2-(2-AMINOETHOXY)ETHANOL**

Synonyms: DGA; Diglycolamine

CAS No: 929-06-6

 Molecular Formula: C<sub>4</sub>H<sub>11</sub>NO<sub>2</sub>

RTK Substance No: 0073

 Description: Colorless liquid with a faint, fish-like or *Amine* odor

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 3055 ERG Guide #: 154 Hazard Class: 8 (Corrosive)	<b>2-(2-Aminoethoxy)Ethanol</b> may burn, but does not readily ignite. Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. Water or foam may cause frothing. DO NOT use solid streams of water. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> and <i>Ammonia</i> . Use water spray to keep fire-exposed containers cool.	<b>2-(2-Aminoethoxy)Ethanol</b> reacts violently with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC). <b>2-(2-Aminoethoxy)Ethanol</b> reacts with REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES) to produce flammable and explosive <i>Hydrogen gas</i> . <b>2-(2-Aminoethoxy)Ethanol</b> is not compatible with ISOCYANATES; HALOGENATED ORGANICS (such as TRICHLOROETHANE and METHYLENE CHLORIDE); METALS and their ALLOYS (such as COPPER, ZINC, and GALVANIZED IRON); PHENOLS; ALCOHOLS; EPOXIDES; ANHYDRIDES; and ACID HALIDES.

## SPILL/LEAKS

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers for disposal.

Use only non-sparking tools and equipment, especially when opening and closing containers of

**2-(2-Aminoethoxy)Ethanol.**

DO NOT wash into sewer.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	<i>Amine</i> odor
<b>Flash Point:</b>	255°F (124°C)
<b>LEL:</b>	2.6%
<b>UEL:</b>	11.7%
<b>Auto Ignition Temp:</b>	694°F (368°C)
<b>Vapor Density:</b>	3.6 (air = 1)
<b>Vapor Pressure:</b>	0.01 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.1 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	430°F (221°C)
<b>Melting Point:</b>	10°F (-12°C)
<b>Molecular Weight:</b>	105.2
<b>pH:</b>	11.8

## EXPOSURE LIMITS

 No occupational exposure limits have been established for **2-(2-Aminoethoxy)Ethanol**.

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Silver Shield®/4H® (>4-hr breakthrough)
<b>Coveralls:</b>	Tychem® fabrics; Zytron® 300; Saint-Gobain ONESuit® TEC; and Trellechem® fabrics (>8-hr breakthrough for <i>Diethylamine</i> )
<b>Respirator:</b>	Supplied air or SCBA

## HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns with redness and blisters
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing and severe shortness of breath (pulmonary edema)

## FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water. Seek medical attention.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility

**Medical** observation is recommended as symptoms may be delayed.



Common Name: **AMINOETHYLETHANOLAMINE**

Synonyms: A-EA; (2-Hydroxyethyl)Ethylenediamine

CAS No: 111-41-1

Molecular Formula: C<sub>4</sub>H<sub>12</sub>N<sub>2</sub>O

RTK Substance No: 0074

Description: Clear, colorless, slightly thick liquid with an *Ammonia*-like odor

HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>3 - Health</b></p> <p><b>1 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p><b>DOT#:</b> UN 2735</p> <p><b>ERG Guide #:</b> 153</p> <p><b>Hazard Class:</b> 8 (Corrosive)</p>	<p>May burn, but does not readily ignite.</p> <p>Use dry chemical, CO<sub>2</sub>, water spray, alcohol-resistant foam or other foam as extinguishing agents.</p> <p>Using water or foam directly on <b>Aminoethylethanolamine</b> may cause frothing and solid streams of water may be ineffective.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i>.</p> <p>CONTAINERS MAY EXPLODE IN FIRE.</p> <p>Use water spray to keep fire-exposed containers cool.</p>	<p><b>Aminoethylethanolamine</b> reacts violently with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); and CELLULOSE NITRATE.</p> <p><b>Aminoethylethanolamine</b> is not compatible with HALOGENATED SOLVENTS (such as TRICHLOROETHANE and METHYLENE CHLORIDE); NITRITES; ALCOHOLS; ALDEHYDES; CRESOLS; EPICHLOROHYDRIN; ISOCYANATES; KETONES; PHENOL; and VINYL ACETATE.</p> <p>In the presence of ALUMINUM and HEAT, explosive and flammable Hydrogen gas may be formed.</p>

SPILL/LEAKS

**Isolation Distance:**

Small Spill: 30 meters (100 feet)

Large Spill: 60 meters (200 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers.

DO NOT wash into sewer.

PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	<i>Ammonia</i> -like
<b>Flash Point:</b>	270°F (132°C)
<b>LEL:</b>	1%
<b>UEL:</b>	8%
<b>Auto Ignition Temp:</b>	695°F (368°C)
<b>Vapor Density:</b>	3.6 (air = 1)
<b>Vapor Pressure:</b>	<0.01 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	470°F (243°C)
<b>Freezing Point:</b>	-49°F (-45°C)
<b>pH:</b>	11.5
<b>Molecular Weight:</b>	104

EXPOSURE LIMITS

The Protective Action Criteria values are:

PAC-1 = 35 mg/m<sup>3</sup>

PAC-2 = 250 mg/m<sup>3</sup>

PAC-3 = 500 mg/m<sup>3</sup>

PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Silver Shield®/4H® and Barrier® (>4-hr breakthrough)
<b>Coveralls:</b>	Tychem® BR, LV, Responder®, and TK; Zytron® 500; ONESuit® TEC; and Trelchem® HPS and VPS (>8-hr breakthrough for <i>Diethylamine</i> )
<b>Respirator:</b>	Supplied air or SCBA

HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, wheezing and shortness of breath.

FIRST AID AND DECONTAMINATION

<b>Remove</b> the person from exposure.
<b>Flush</b> eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention
<b>Quickly</b> remove contaminated clothing and wash contaminated skin with large amounts of water.
<b>Begin</b> artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b> promptly to a medical facility

Common Name: **N-AMINOETHYLPIPERAZINE**

Synonyms: 1-(2-Aminoethyl) Morpholine

CAS No: 140-31-8

Molecular Formula: C<sub>6</sub>H<sub>15</sub>N<sub>3</sub>

RTK Substance No: 0075

Description: Thick, colorless to light colored liquid with an *Ammonia*-like odor

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>2 - Fire</b> <b>0 - Reactivity</b>  <b>DOT#:</b> UN 2815 <b>ERG Guide #:</b> 153 <b>Hazard Class:</b> 8 (Corrosive)	<b>N-Aminoethylpiperazine</b> is a COMBUSTIBLE LIQUID. Use alcohol-resistant foam fire extinguishers. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> . CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool. <b>N-Aminoethylpiperazine</b> may ignite combustibles (wood, paper and oil).	<b>N-Aminoethylpiperazine</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); ACID CHLORIDES; ACID ANHYDRIDES; ISOCYANATES; VINYL ACETATE; ACRYLATES; SUBSTITUTED ALKYLs; ALKYLENE OXIDES; EPICHLOROHYDRIN; KETONES; ALDEHYDES; ALCOHOLS; CAPROLACTAM SOLUTION; CHLOROFORMATES; COMBUSTIBLES; CARBON MONOXIDE; and NITRITES.

### SPILL/LEAKS

**Isolation Distance:**

Small Spills: 60 meters (200 feet)

Large Spills: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.

Not readily biodegradable.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Ammonia-like odor
<b>Flash Point:</b>	200°F (93°C)
<b>LEL:</b>	1.6%
<b>UEL:</b>	6.5%
<b>Auto Ignition Temp:</b>	>572°F (300°C)
<b>Vapor Density:</b>	4.4 (air = 1)
<b>Vapor Pressure:</b>	0.1 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	0.1 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	432°F (222°C)
<b>Molecular Weight:</b>	129.24

### EXPOSURE LIMITS

No occupational exposure limits have been established for **N-Aminoethylpiperazine**.

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl (4 hour breakthrough)
<b>Coveralls:</b>	DuPont Tychem® Responder®, CSM and TK; Kappler Zytron® 300; and Saint-Gobain ONESuit® PRO (>8-hour breakthrough)
<b>Respirator:</b>	Pressure demand supplied air

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, wheezing and shortness of breath  Headache, nausea and vomiting

### FIRST AID AND DECONTAMINATION

<b>Remove</b> the person from exposure.
<b>Flush</b> eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention immediately.
<b>Quickly</b> remove contaminated clothing and wash contaminated skin with large amounts of water. Seek medical attention immediately.
<b>Begin</b> artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b> to a medical facility.



Common Name: **AMITROLE**

Synonyms: Aminotriazole; 3-Amino-1,2,4-Triazole

CAS No: 61-82-5

Molecular Formula: C<sub>2</sub>H<sub>4</sub>N<sub>4</sub>

RTK Substance No: 0083

Description: An odorless, colorless to off-white crystalline solid or chip

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> <b>DOT ID #:</b> UN 2588 <b>ERG Guide #:</b> 151 <b>Hazard Class:</b> 6.1 (Poison)	Not combustible but may be dissolved in flammable or combustible liquids.  Use dry chemical, CO <sub>2</sub> , water spray, alcohol foam or a foaming agent.  POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> .	<b>Amitrole</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDES); ACID ANHYDRIDES and ACID CHLORIDES.  Corrosive to IRON, COPPER and ALUMINUM.  Decomposes in LIGHT.

### SPILL/LEAKS

**Isolation Distance:** No Information

- May be hazardous to the environment, especially to plants.
- Severe marine pollutant.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Not Combustible
<b>LEL:</b>	N/A
<b>UEL:</b>	N/A
<b>Vapor Pressure:</b>	Less than 0.000008 mm Hg at 68°F (20°C)
<b>Water Solubility:</b>	Soluble
<b>Melting Point:</b>	318°F (159°C)
<b>Specific Gravity:</b>	1.14

### EXPOSURE LIMITS

<b>OSHA:</b>	N/A
<b>NIOSH</b>	0.2 mg/m <sup>3</sup> , 10-hr TWA
<b>ACGIH:</b>	0.2 mg/m <sup>3</sup> , 8-hr TWA
<b>IDLH LEVEL:</b>	No Information

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	No Information
<b>Coverall:</b>	No Information
<b>Boot:</b>	No Information
<b>Respirator:</b>	>0.2 mg/m <sup>3</sup> - Supplied air

### HEALTH EFFECTS

<b>Eyes:</b>	No Information
<b>Skin:</b>	No Information
<b>Acute:</b>	No Information
<b>Chronic:</b>	Carcinogen (thyroid and liver) in animals. May damage the developing fetus. May damage the liver and affect thyroid gland function.

### FIRST AID AND DECONTAMINATION

- Remove the person from exposure.
- Flush eyes with large amounts of water for at least 15 minutes.
- Remove contact lenses if worn.
- Remove contaminated clothing. Wash contaminated skin with water.
- Transfer to a medical facility.

Common Name: **AMMONIA**

Synonyms: Anhydrous Ammonia

CAS No: 7664-41-7

 Molecular Formula: NH<sub>3</sub>

RTK Substance No: 0084

Description: Colorless gas with a strong, sharp, irritating odor

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b>  DOT#: UN 1005 ERG Guide #: 125 Hazard Class: 2.3 (Toxic Gases)	Non-flammable gas which can ignite and burn with explosive force.  Stop the flow of gas or let burn.  POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> .  CONTAINERS MAY EXPLODE IN FIRE.  Use water spray to keep fire-exposed containers cool, and to absorb and disperse vapors.	<b>Ammonia</b> reacts violently with HALOGENS (such as FLUORINE, CHLORINE and BROMINE); ACIDS (such as HYDROGEN CHLORIDE, HYDROGEN FLUORIDE and HYDROGEN BROMIDE); NITROSYL CHLORIDE; CHROMYL CHLORIDE; TRIOXYGEN DICHLORIDE; NITROGEN DIOXIDE; NITROGEN TRICHLORIDE; BROMINE PENTAFLUORIDE; CHLORINE TRIFLUORIDE; CALCIUM HYPOCHLORITE; and forms explosive compounds that are pressure and temperature sensitive with MERCURY; GOLD OXIDES; and SILVER SALTS and OXIDES.  <b>Ammonia</b> is incompatible with CHLOROFORMATES; CYANIDES; OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES and NITRATES); DIMETHYL SULFATE; and MANY METALS and their ALLOYS (such as ZINC, COPPER and BRASS).  <b>Ammonia</b> dissolves in WATER to release heat. Keep away from HEAT, MOISTURE and DIRECT SUNLIGHT.

**SPILL/LEAKS**
**Isolation Distance:**

Small spills – 30 meters (100 feet)

Large spills – 60 meters (200 feet)

Stop flow of gas.

Use water spray to absorb and disperse vapors.

Hazardous to the environment.

DO NOT wash into sewer.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	Less than 5 ppm
<b>Flash Point:</b>	Non-flammable
<b>LEL:</b>	15%
<b>UEL:</b>	28%
<b>Vapor Density:</b>	0.6 (air = 1)
<b>Vapor Pressure:</b>	658 mm of Hg at 70°F (21°C)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	-28°F (-33.4°C)
<b>Ionization Potential:</b>	10.18 eV
<b>Autoignition:</b>	1,204°F (651°C)

**EXPOSURE LIMITS**

<b>OSHA:</b>	50 ppm (8-hr TWA)
<b>NIOSH:</b>	25 ppm (10-hr TWA), 35 ppm STEL
<b>ACGIH:</b>	25 ppm (8-hr TWA), 35 ppm STEL
<b>IDLH LEVEL:</b>	300 ppm
<b>ERPG-1:</b>	25 ppm
<b>ERPG-2:</b>	150 ppm
<b>ERPG-3:</b>	1,500 ppm

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Nitrile, Neoprene, Butyl, Butyl/Neoprene, Viton/Neoprene
<b>Coveralls:</b>	Dupont Tychem® CPE and Kappler Zytron® 500
<b>Boots:</b>	Butyl/Neoprene
<b>Respirator:</b>	> 25 ppm - APR with full-facepiece and cartridges for <b>Ammonia</b> >250 ppm - Supplied Air >300 ppm - SCBA

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns. Contact with liquid causes frostbite.
<b>Acute:</b>	Nose, throat and lung irritation with coughing and shortness of breath
<b>Chronic:</b>	An asthma-like allergy with shortness of breath, wheezing, coughing and/or chest tightness

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention immediately.

**Immerse** affected part in warm water if in contact with liquid.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** to a medical facility.

Common Name: **AMMONIUM ACETATE**

Synonyms: Acetic Acid, Ammonium Salt

CAS No: 631-61-8

Molecular Formula: C<sub>2</sub>H<sub>7</sub>NO<sub>2</sub>

RTK Substance No: 0085

Description: White, crystalline solid with a slight vinegar-like odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b> <b>DOT#:</b> UN 9079 <b>ERG Guide #:</b> 171 <b>Hazard Class:</b> 9 (Miscellaneous Hazardous Substance)	<b>Ammonium Acetate</b> may burn, but does not readily ignite. Use dry chemical, water spray or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Ammonia</i> and <i>Nitrogen Oxides</i> . Use water spray to keep fire-exposed containers cool.	<b>Ammonium Acetate</b> is not compatible with SODIUM HYPOCHLORITE and OTHER OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); and STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE). <b>Ammonium Acetate</b> readily absorbs moisture from the air and releases <i>Ammonia</i> under normal conditions.

### SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

**Ammonium Acetate** rapidly degrades in water.

### PHYSICAL PROPERTIES

**Odor Threshold:** Vinegar-like odor

**Specific Gravity:** 1.1 (water = 1)

**Water Solubility:** Soluble

**Melting Point:** 237°F (114°C)

**Molecular Weight:** 77.1

### EXPOSURE LIMITS

The Protective Action Criteria values are:

PAC-1 = 7.5 mg/m<sup>3</sup>

PAC-2 = 50 mg/m<sup>3</sup>

PAC-3 = 250 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

**Gloves:** Nitrile and Neoprene

**Coveralls:** Tyvek®

**Respirator:** Full facepiece APR with *High efficiency filters*  
>7.5 mg/m<sup>3</sup> - SCBA

### HEALTH EFFECTS

**Eyes:** Irritation and burns

**Skin:** Irritation and burns

**Inhalation:** Nose, throat and lung irritation with coughing, wheezing and/ shortness of breath

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **AMMONIUM ARSENATE**

Synonyms: Diammonium Arsenate

CAS No: 7784-44-3

Molecular Formula:  $(\text{NH}_4)_2 \text{HAsO}_4$

RTK Substance No: 0086

Description: White powder or colorless, crystalline solid with a characteristic Ammonia odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>4 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b>  DOT#: UN 1546 ERG Guide #: 151 Hazard Class: 6.1 (Poison)	Extinguish fire using an agent suitable for type of surrounding fire. <b>Ammonium Arsenate</b> itself does not burn.  POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Arsenic fumes, Ammonia</i> and <i>Nitrogen Oxides</i> .  Use water spray to keep fire-exposed containers cool.	<b>Ammonium Arsenate</b> reacts with STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE) to produce <i>Ammonia</i> .  <b>Ammonium Arsenate</b> reacts with METALS (such as IRON, ALUMINUM and ZINC), in the presence of WATER, to produce toxic <i>Arsine gas</i> .

### SPILL/LEAKS

**Isolation Distance:**

Spill: 25 to 50 meters (80 to 160 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up.

May be hazardous to the environment, especially to aquatic and soil organisms.

### PHYSICAL PROPERTIES

**Odor Threshold:** *Ammonia*-like odor

**Flash Point:** Noncombustible

**Vapor Density:** 2 (air = 1)

**Water Solubility:** Soluble

**Molecular Weight:** 176

### EXPOSURE LIMITS

**OSHA:** 0.01 mg/m<sup>3</sup>, 8-hr TWA

**NIOSH:** 0.002 mg/m<sup>3</sup>, Ceiling

**ACGIH:** 0.01 mg/m<sup>3</sup>, 8-hr TWA

**IDLH:** 5 mg/m<sup>3</sup>

**PAC LEVELS:** PAC-1 = 1.5 mg/m<sup>3</sup>; PAC-2 = 17 mg/m<sup>3</sup>;

PAC-3 = 100 mg/m<sup>3</sup>

(All of the above are for *inorganic Arsenic*)

### PROTECTIVE EQUIPMENT

**Gloves:** Nitrile and Natural Rubber

**Coveralls:** DuPont Tyvek®

**Respirator:** <0.1 mg/m<sup>3</sup> - Full facepiece APR with cartridges specific for Ammonia and High efficiency particulate pre-filters  
 <5 mg/m<sup>3</sup> - Supplied air  
 >5 mg/m<sup>3</sup> - SCBA

### HEALTH EFFECTS

**Eyes:** Irritation, burns, and red, watery eyes

**Skin:** Irritation, burns, rash and loss of pigment

**Inhalation:** Nose and throat irritation with coughing, wheezing and hoarseness

Weakness, headache, nausea, vomiting, and muscle cramps

**Chronic:** *Inorganic Arsenic compounds* cause skin, lung, and liver cancer in humans

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** to a medical facility.

Common Name: **AMMONIUM BISULFITE**

Synonyms: Ammonium Hydrogen Sulfite; Ammonium Sulfite

CAS No: 10192-30-0

Molecular Formula:  $NH_4HSO_3$

RTK Substance No: 0090

Description: Colorless to yellow, crystalline solid that is commonly used in a water solution

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>3 - Health</b></p> <p><b>0 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p>DOT#: UN 2693</p> <p>ERG Guide #: 154</p> <p>Hazard Class: 8 (Corrosive)</p>	<p>Extinguish fire using an agent suitable for type of surrounding fire. <b>Ammonium Bisulfite</b> itself does not burn.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Sulfur Oxides</i>, <i>Nitrogen Oxides</i> and <i>Ammonia</i>.</p> <p>Use water spray to keep fire-exposed containers cool.</p>	<p><b>Ammonium Bisulfite</b> reacts with WATER, STEAM and STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) to form <i>Ammonia</i> and other toxic gases.</p> <p><b>Ammonium Bisulfite</b> reacts violently with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) to form flammable and reactive gases.</p> <p><b>Ammonium Bisulfite</b> is not compatible with LEAD DIACETATE; ALUMINUM; and MERCURY CHLORIDE.</p>

### SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers for disposal.

Collect powdered material in the most convenient and safe manner and place into sealed containers for disposal.

DO NOT wash into sewer.

### PHYSICAL PROPERTIES

**Flash Point:** Nonflammable

**Specific Gravity:** 2 (water = 1)

**Water Solubility:** Soluble

**Boiling Point:** 302°F (150°C) (Sublimes)

**Molecular Weight:** 99.1

### EXPOSURE LIMITS

The Protective Action Criteria values are:

PAC-1 = 30 mg/m<sup>3</sup>

PAC-2 = 330 mg/m<sup>3</sup>

PAC-3 = 2,000 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

**Gloves:** Nitrile and Neoprene

**Coveralls:** Tyvek®

**Respirator:** Full facepiece APR with High efficiency filter or Supplied air

### HEALTH EFFECTS

**Eyes:** Irritation and burns

**Skin:** Irritation and burns

**Inhalation:** Nose, throat and lung irritation with coughing and severe shortness of breath (pulmonary edema)

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention immediately

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water. Seek medical attention.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

**Medical** observation is recommended as symptoms may be delayed.

**Common Name:** AMMONIUM CARBONATE

**Synonyms:** Diammonium Carbonate; Hartshorn

**CAS No:** 506-87-6

**Molecular Formula:** (NH<sub>4</sub>)<sub>2</sub>CO<sub>3</sub>

**RTK Substance No:** 0092

**Description:** Colorless or white, crystalline powder with a strong *Ammonia* odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>2 - Health</b></p> <p><b>0 - Fire</b></p> <p><b>1 - Reactivity</b></p> <p><b>DOT#:</b> UN 3077</p> <p><b>ERG Guide #:</b> 171</p> <p><b>Hazard Class:</b> 9 (Environmentally Hazardous Material)</p>	<p>Extinguish fire using an agent suitable for type of surrounding fire. <b>Ammonium Carbonate</b> itself does not burn.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> and <i>Ammonia</i>.</p> <p>Use water spray to knock down vapors.</p> <p>Sufficient amounts of <i>Ammonia gas</i> may be generated in a fire to become an explosion hazard.</p>	<p><b>Ammonium Carbonate</b> is not compatible with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); ACID SALTS; AMINES and other ALKALOIDS; ALUM; CALOMEL (MERCURY CHLORIDE); SODIUM HYPOCHLORITE; IRON SALTS; and ZINC SALTS.</p>

### SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Collect powdered material in the most convenient and safe manner and place into sealed containers for disposal.

Cover with plastic sheeting.

**Ammonium Carbonate** is hazardous to the environment

### PHYSICAL PROPERTIES

**Odor Threshold:** *Ammonia* odor

**Flash Point:** Nonflammable

**Specific Gravity:** 1.5 (water = 1)

**Water Solubility:** Soluble

**Boiling Point:** Decomposes

**Melting Point:** 136.4°F (58°C)

**Molecular Weight:** 157.1

### EXPOSURE LIMITS

**NIOSH:** 25 ppm, 10-hr TWA; 35 ppm, STEL (as *Ammonia*)

The Protective Action Criteria values are:

PAC-1 = 0.31 mg/m<sup>3</sup>

PAC-2 = 3.5 mg/m<sup>3</sup>

PAC-3 = 21 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

**Gloves:** Nitrile and Natural Rubber

**Coveralls:** Tyvek®

**Respirator:** >0.31 mg/m<sup>3</sup> - SCBA  
>25 ppm (as *Ammonia*) - SCBA

### HEALTH EFFECTS

**Eyes:** Irritation

**Skin:** Irritation

**Inhalation:** Nose, throat and lung irritation with coughing and shortness of breath.

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.



Common Name: **AMMONIUM CHLORIDE**

Synonym: Ammonium Muriate

CAS No: 12125-02-9

Molecular Formula: NH<sub>4</sub>Cl

RTK Substance No: 0093

Description: White powder or finely divided airborne particle.

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>2 - Health</b></p> <p><b>0 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p><b>DOT#:</b> UN 3077</p> <p><b>ERG Guide #:</b> 171</p> <p><b>Hazard Class:</b> 9 (Environmentally Hazardous Substance)</p>	<ul style="list-style-type: none"> <li>- Extinguish fire using an agent suitable for type of surrounding fire. <b>Ammonium Chloride</b> itself does not burn.</li> <li>- POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides, Hydrogen Chloride</i> and <i>Ammonia</i>.</li> <li>- CONTAINERS MAY EXPLODE IN FIRE.</li> </ul>	<ul style="list-style-type: none"> <li>- Reacts violently with AMMONIUM NITRATE; POTASSIUM CHLORATE; BROMINE TRIFLUORIDE; and BROMINE PENTAFLUORIDE causing fire and explosion.</li> <li>- Incompatible with ALKALIES and their CARBONATES; LEAD SALTS; SILVER SALTS; OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); and STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC).</li> <li>- Reacts with HYDROGEN CYANIDE to form explosive <i>Nitrogen Trichloride</i>.</li> </ul>

### SPILL/LEAKS

**Isolation Distance:** 10 to 25 meters (30 to 80 feet)

- Sweep spilled substance into containers.
- Keep out of waterways as this substance is toxic to aquatic organisms.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Noncombustible
<b>LEL:</b>	N/A
<b>UEL:</b>	N/A
<b>Vapor Density:</b>	<b>1.9 (air = 1)</b>
<b>Vapor Pressure:</b>	1 mm Hg at 321°F (161°C)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	968°F (520°C)
<b>Melting Point:</b>	640°F (338°C) (decomposes)

### EXPOSURE LIMITS

**ACGIH:** 10 mg/m<sup>3</sup> 8-hr TWA, 20 mg/m<sup>3</sup> STEL

**NIOSH:** 10 mg/m<sup>3</sup> 10-hr TWA, 20 mg/m<sup>3</sup> STEL

**IDLH LEVEL:** No Information

(All the above are for *Ammonium Chloride fume*)

**PAC:** PAC-1 = 20 ppm; PAC-2 = 110 ppm;

PAC-3 = 330 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Natural Rubber, Neoprene, Nitrile, 4H® (for <i>Inorganic Salts</i> )
<b>Coverall:</b>	Dupont Tychem® CPF3
<b>Boot:</b>	Rubber or Neoprene
<b>Respirator:</b>	>10 mg/m <sup>3</sup> N95 or N95 plus Ammonia Cartridge if a liquid >100 mg/m <sup>3</sup> SA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation and possible eye damage
<b>Skin:</b>	Irritation
<b>Acute:</b>	Nose, throat and lung irritation, headache, drowsiness and confusion
<b>Chronic:</b>	Cancer - Not tested. Asthma-like allergy. May affect the kidneys.

### FIRST AID AND DECONTAMINATION

- Remove person from exposure.
- Flush eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
- Remove contaminated clothing and wash contaminated skin with soap and water.
- Begin artificial respiration if breathing has stopped and CPR if necessary.
- Transfer to a medical facility.

Common Name: **AMMONIUM DICHROMATE**

Synonyms: Ammonium Bichromate; Chromic Acid, Diammonium Salt

CAS No: 7789-09-5

Molecular Formula:  $(\text{NH}_4)_2\text{Cr}_2\text{O}_7$

RTK Substance No: 0097

Description: Odorless, bright orange to red, crystalline solid

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<p><b>4 - Health</b></p> <p><b>1 - Fire</b></p> <p><b>1 - Reactivity</b></p> <p>DOT#: UN 1439</p> <p>ERG Guide #: 141</p> <p>Hazard Class: 5.1 (Oxidizer)</p>	<p>COMBUSTIBLE SOLID that can be readily ignited and burning produces a large cloud of green residue.</p> <p><b>Ammonium Dichromate</b> is a STRONG OXIDIZER that enhances the combustion of other substances.</p> <p>Use water in flooding amounts to extinguish fire.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Chromic Oxide</i> and <i>Nitrogen Oxides</i>.</p> <p>CONTAINERS MAY EXPLODE IN FIRE.</p> <p>Use water spray to keep fire-exposed containers cool.</p>	<p><b>Ammonium Dichromate</b> is a STRONG OXIDIZER that reacts violently with REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES); HYDRAZINE; and STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); and can ignite by friction with CARBIDE.</p> <p>Violent combustion may occur on contact with <i>finely divided</i> COMBUSTIBLES and ORGANICS (such as PAPER and WOOD).</p> <p><b>Ammonium Dichromate</b> is not compatible with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); ALCOHOLS; ETHYLENE GLYCOL and MERCURY CYANIDE.</p>

**SPILL/LEAKS**

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

Neutralize liquid spills with agricultural lime ( $\text{CaCO}_3$ ) or sodium bicarbonate ( $\text{NaHCO}_3$ ).

DO NOT wash into sewer.

**Ammonium Dichromate** is dangerous to aquatic life at high concentrations.

**PHYSICAL PROPERTIES**

**Odor Threshold:** Odorless

**Flash Point:** Combustible

**Auto Ignition Temp:** 374° to 437°F (190° to 225°C)

**Specific Gravity:** 2.15 (water = 1)

**Water Solubility:** Soluble

**Boiling Point:** Decomposes

**Melting Point:** 338°F (170°C) (Decomposes)

**Molecular Weight:** 252.1

**EXPOSURE LIMITS**

**OSHA:** 0.005  $\text{mg}/\text{m}^3$ , 8-hr TWA

**NIOSH:** 0.0002  $\text{mg}/\text{m}^3$ , 8-hr TWA

**ACGIH:** 0.01  $\text{mg}/\text{m}^3$ , 8-hr TWA

**IDLH:** 15  $\text{mg}/\text{m}^3$

(All the above are for *Chromium VI*)

The Protective Action Criteria values are:

PAC-1 = 0.37  $\text{mg}/\text{m}^3$     PAC-2 = 6.3  $\text{mg}/\text{m}^3$

PAC-3 = 38  $\text{mg}/\text{m}^3$

**PROTECTIVE EQUIPMENT**

**Gloves:** Nitrile, Neoprene and Natural Rubber (>8-hr breakthrough for **Ammonium Dichromate** in *solution*)

**Coveralls:** Tyvek® (for *solid Ammonium Dichromate*) and Tychem® BR, CSM and TK (>8-hr breakthrough for **Ammonium Dichromate** in *solution*)

**Respirator:** >0.0002  $\text{mg}/\text{m}^3$  – Pressure demand SCBA

**HEALTH EFFECTS**

**Eyes:** Irritation, burns and possible eye damage

**Skin:** Irritation and burns (skin absorbable)

**Inhalation:** Nose and throat irritation with coughing and wheezing

**Chronic:** Cancer (lung and stomach) in humans

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention.

**Quickly** remove contaminated clothing. Immediately wash contaminated skin with large amounts of water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility

Common Name: **AMMONIUM HYDROXIDE**

Synonyms: Ammonia Water; Aqua Ammonia

CAS No: 1336-21-6

 Molecular Formula: NH<sub>4</sub>OH

RTK Substance No: 0103

 Description: Colorless solution of *Ammonia* in water with a pungent odor

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 2672 ERG Guide #: 154 Hazard Class: 8 (Corrosive)	<b>Ammonium Hydroxide</b> is not combustible, however in a fire <i>Ammonia</i> vapors are formed that can be ignited and may result in an explosion. Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Ammonia</i> and <i>Nitrogen Oxides</i> . Use water spray to keep fire-exposed containers cool. DO NOT get water inside containers.	<b>Ammonium Hydroxide</b> reacts with many HEAVY METALS (such as SILVER, COPPER, LEAD and ZINC) and their SALTS to form explosive compounds and flammable and explosive <i>Hydrogen gas</i> . <b>Ammonium Hydroxide</b> may react violently with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); DIMETHYL SULFATE; and HALOGENS. <b>Ammonium Hydroxide</b> will react with STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE) to produce <i>Ammonia gas</i> .

## SPILL/LEAKS

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in dry sand, earth, or a similar material and place into sealed containers for disposal.

 DO NOT use COPPER, ALUMINUM or GALVANIZED METALS when handling **Ammonium Hydroxide**.

 Neutralize with a weak acid such as vinegar (*Acetic Acid*).

DO NOT wash into sewer.

**Ammonium Hydroxide** is harmful to aquatic life in very low concentrations.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	50 ppm
<b>Flash Point:</b>	Noncombustible
<b>LEL:</b>	16%
<b>UEL:</b>	27%
<b>Auto Ignition Temp:</b>	1,202°F (650°C) (25% Solution)
<b>Vapor Density:</b>	0.6 to 1.2 (air = 1)
<b>Vapor Pressure:</b>	360 mm Hg at 68°F (20°C) (25% Solution)
<b>Specific Gravity:</b>	0.9 (water = 1)
<b>Water Solubility:</b>	Miscible
<b>Boiling Point:</b>	100.4°F (38°C) (25% Solution)
<b>Freezing Point:</b>	-72.4°F (-58°C) (25% Solution)
<b>Ionization Potential:</b>	10.18 eV (as <i>Ammonia</i> )
<b>Molecular Weight:</b>	35.06
<b>pH:</b>	13.6

## EXPOSURE LIMITS

**OSHA:** 50 ppm, 8-hr TWA

**NIOSH:** 25 ppm, 10-hr TWA; 35 ppm, STEL

**ACGIH:** 25 ppm, 8-hr TWA; 35 ppm, STEL

**IDLH:** 300 ppm

 (All the above are for *Ammonia*)

The Protective Action Criteria values are:

PAC-1 = 6 ppm    PAC-2 = 40 ppm    PAC-3 = 100 ppm

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl, Nitrile, Neoprene and Viton (>8-hr breakthrough for <b>Ammonium Hydroxide</b> in less than 30% solution)
<b>Coveralls:</b>	Tychem® SL, F, Responder® and TK (>8-hr breakthrough for <b>Ammonium Hydroxide</b> in less than 30% solution)
<b>Respirator:</b>	>25 ppm - full facepiece APR with cartridges specific for <i>Ammonia</i> >100 ppm - SCBA

## HEALTH EFFECTS

**Eyes:** Irritation, burns and possible eye damage

**Skin:** Irritation and burns

**Inhalation:** Nose, throat and lung irritation, with coughing, and severe shortness of breath (pulmonary edema)

## FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

**Medical** observation is recommended as symptoms may be delayed.

Common Name: **AMMONIUM METAVANADATE**

Synonyms: Ammonium Vanadate

CAS No: 7803-55-6

 Molecular Formula:  $H_4NO_3V$ 

RTK Substance No: 0104

Description: Clear, white or yellow, crystalline powder

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 2859 ERG Guide #: 154 Hazard Class: 6.1 (Poison)	Extinguish fire using an agent suitable for type of surrounding fire. <b>Ammonium Metavanadate</b> itself does not burn. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Ammonia</i> , <i>Vanadium fumes</i> and <i>Nitrogen Oxides</i> . Use water spray to keep fire-exposed containers cool.	<b>Ammonium Metavanadate</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); LITHIUM; and CHLORINE TRIFLUORIDE.

## SPILL/LEAKS

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Collect powdered material in the most convenient and safe manner and place into sealed containers for disposal.

DO NOT wash into sewer.

## PHYSICAL PROPERTIES

**Flash Point:** Nonflammable

**Specific Gravity:** 2.3 (water = 1)

**Water Solubility:** Slightly soluble

**Boiling Point:** 410°F (210°C) (Decomposes)

**Melting Point:** 392°F (200°C)

**Molecular Weight:** 117

## EXPOSURE LIMITS

**NIOSH:** 0.05 mg/m<sup>3</sup>, 15-min Ceiling (as *Vanadium dust and fume*)

**IDLH:** 35 mg/m<sup>3</sup> (as *Vanadium*)

## PROTECTIVE EQUIPMENT

**Gloves:** Nitrile and Natural Rubber

**Coveralls:** Tyvek®

**Respirator:** <0.5 mg/m<sup>3</sup> - Full facepiece APR with High efficiency particulate filter  
 >0.5 mg/m<sup>3</sup> (as *Vanadium*) or potential exposure to *Ammonia* - Supplied air or SCBA

## HEALTH EFFECTS

**Eyes:** Irritation

**Skin:** Irritation, rash and redness

**Inhalation:** Nose, throat and lung irritation with coughing and severe shortness of breath (pulmonary edema)

Headache, dizziness, nausea and vomiting

## FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

**Medical** observation is recommended as symptoms may be delayed.

Common Name: **AMMONIUM MOLYBDATE**

Synonyms: Ammonium Paramolybdate; Diammonium Molybdate

CAS No: 13106-76-8

 Molecular Formula:  $(\text{NH}_4)_2\text{MoO}_4$ 

RTK Substance No: 0105

Description: White to colorless or greenish-yellow, odorless powder

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>0 - Fire</b> <b>1 - Reactivity</b> DOT#: None ERG Guide #: None Hazard Class: None	Extinguish fire using an agent suitable for type of surrounding fire. <b>Ammonium Molybdate</b> itself does not burn. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Ammonia</i> and <i>Nitrogen Oxides</i> . Use water spray to keep fire-exposed containers cool.	<b>Ammonium Molybdate</b> is not compatible with ALKALI METALS (such as LITHIUM, SODIUM and POTASSIUM); OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); and MOLTEN MAGNESIUM.

## SPILL/LEAKS

## Isolation Distance:

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

DO NOT wash into sewer.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Nonflammable
<b>Specific Gravity:</b>	1.4 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Molecular Weight:</b>	123.6

## EXPOSURE LIMITS

**OSHA:** 5 mg/m<sup>3</sup>, 8-hr TWA (as *Molybdenum*)

**ACGIH:** 0.5 mg/m<sup>3</sup>, 8-hr TWA (as *Molybdenum*)

The Protective Action Criteria values are:

 PAC-1 = 30.7 mg/m<sup>3</sup>

 PAC-2 = 51.1 mg/m<sup>3</sup>

 PAC-3 = 500 mg/m<sup>3</sup>

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Nitrile and Natural Rubber
<b>Coveralls:</b>	Tyvek®
<b>Respirator:</b>	>0.5 mg/m <sup>3</sup> - full facepiece APR with High efficiency particulate filters >30 mg/m <sup>3</sup> - SCBA

## HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose and throat irritation with coughing and wheezing Headache, weakness, and fatigue

## FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **AMMONIUM NITRATE**

Synonyms: Nitram; Ammonia Nitrate

CAS No: 6484-52-2

Molecular Formula: NH<sub>4</sub>NO<sub>3</sub>

RTK Substance No: 0106

Description: A colorless to white or gray, crystalline solid or granule

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>2 - Health</b></p> <p><b>0 - Fire</b></p> <p><b>3- Reactivity</b></p> <p><b>DOT ID #:</b> UN 1942</p> <p><b>ERG Guide #:</b> 140</p> <p><b>Hazard Class:</b> 5.1 (Oxidizer)</p>	<p>Flood with water.</p> <p>DO NOT USE dry chemical, CO<sub>2</sub> or halogenated extinguishing agents.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> and <i>Ammonia</i>.</p> <p>CONTAINERS MAY EXPLODE IN FIRE</p> <p>Use water spray to keep fire-exposed containers cool.</p> <p>Evacuate in all directions for 1,600 meters (1 mile) if fire cannot be controlled.</p> <p>Protect from shock.</p>	<p><b>Ammonium Nitrate</b> is a STRONG OXIDIZER and when contaminated with OIL, CHARCOAL or other ORGANIC MATERIALS, can EXPLODE and become SENSITIVE TO SHOCK.</p> <p><b>Ammonium Nitrate</b> must be stored to avoid contact with REDUCING AGENTS; COMBUSTIBLES; STRONG ACID (such as HYDROCHLORIC, SULFURIC and NITRIC); POWDERED METALS; METAL SALTS; OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); PHOSPHORUS; UREA; and SULFUR.</p> <p><b>Ammonium Nitrate</b> reacts with STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE).</p>

### SPILL/LEAKS

**Isolation Distance:** 10 to 25 meters (30 to 80 feet)

Collect with a clean shovel and place in noncombustible containers.

Keep **Ammonium Nitrate** out of a confined space, such as a sewer, because of the possibility of an explosion.

This material may be hazardous to water quality but will biodegrade.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Nonflammable
<b>LEL:</b>	N/A
<b>UEL:</b>	N/A
<b>Density:</b>	1.7 g/cm <sup>3</sup>
<b>Water Solubility:</b>	Soluble
<b>Melting Point:</b>	336°F (169°C) Decomposes at 410°F (210°C)
<b>Ionization Potential:</b>	No Information
<b>pH:</b>	5.4

### EXPOSURE LIMITS

<b>ACGIH:</b>	N/A
<b>OSHA:</b>	N/A
<b>NIOSH:</b>	N/A
<b>IDLH LEVEL:</b>	N/A
<b>PAC1:</b>	6.7 mg/m <sup>3</sup>
<b>PAC2:</b>	73 mg/m <sup>3</sup>
<b>PAC3:</b>	440 mg/m <sup>3</sup>

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl or Neoprene
<b>Coverall:</b>	CHEMFAB Challenger® 5200
<b>Boot:</b>	Butyl or Neoprene
<b>Respirator:</b>	N95 for dusts or mists Supplied air for unknown levels or emergency

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns
<b>Acute:</b>	Nose, throat and lung irritation Methemoglobinemia with headache, fatigue and blue color to the skin and lips
<b>Chronic:</b>	Cancer - Not tested No information available

### FIRST AID AND DECONTAMINATION

Remove the person from exposure.

Flush eyes with large amounts of water for at least 15 minutes.

Remove contact lenses if worn.

Remove contaminated clothing. Wash contaminated skin with water.

Begin artificial respiration if breathing has stopped and CPR if necessary.

Transfer to a medical facility.



Common Name: **AMMONIUM OXALATE**

Synonym: Diammonium Oxalate

CAS No: 1113-38-8

Molecular Formula: C<sub>2</sub>H<sub>8</sub>N<sub>2</sub>O<sub>4</sub>

RTK Substance No: 0108

Description: Odorless, colorless, crystalline powder

**HAZARD DATA**

<b>Hazard Rating</b>	<b>Firefighting</b>	<b>Reactivity</b>
<p><b>2 - Health</b></p> <p><b>1 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p><b>DOT#:</b> UN 2811</p> <p><b>ERG Guide #:</b> 154</p> <p><b>Hazard Class:</b> 6.1 (Poison)</p>	<p><b>Ammonium Oxalate</b> may burn, but does not readily ignite.</p> <p>Use dry chemical, CO<sub>2</sub>, water spray or foam as extinguishing agents.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Ammonia</i> and <i>Nitrogen Oxides</i>.</p> <p>Use water spray to keep fire-exposed containers cool.</p>	<p><b>Ammonium Oxalate</b> will react with solutions of SODIUM HYPOCHLORITE; AMMONIUM ACETATE; and STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC).</p> <p><b>Ammonium Oxalate</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).</p>

**SPILL/LEAKS**

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Collect powdered material in the most convenient and safe manner and place into sealed containers for disposal.

DO NOT wash into sewer.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	Odorless
<b>Specific Gravity:</b>	1.5 (water = 1)
<b>Water Solubility:</b>	Slightly soluble
<b>Melting Point:</b>	158°F (70°C)
<b>Molecular Weight:</b>	124.1
<b>pH:</b>	6.4

**EXPOSURE LIMITS**

The Protective Action Criteria values are:

PAC-1 = 0.5 mg/m<sup>3</sup>

PAC-2 = 4 mg/m<sup>3</sup>

PAC-3 = 20 mg/m<sup>3</sup>

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Nitrile and Natural Rubber
<b>Coveralls:</b>	Tyvek®
<b>Respirator:</b>	>0.5 mg/m <sup>3</sup> - SCBA

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, wheezing and shortness of breath
	Headache, dizziness, nausea and vomiting, convulsions, coma and even death

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **AMMONIUM PERSULFATE**

Synonyms: Ammonium Peroxydisulfuric Acid; Diammonium Persulfate

CAS No: 7727-54-0

Molecular Formula: N<sub>2</sub>H<sub>8</sub>S<sub>2</sub>O<sub>8</sub>

RTK Substance No: 0111

Description: Colorless, white or straw-colored, crystalline powder with a mild, unpleasant odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>2 - Health</b></p> <p><b>0 - Fire</b></p> <p><b>1 - Reactivity</b></p> <p><b>DOT#:</b> UN 1444</p> <p><b>ERG Guide #:</b> 140</p> <p><b>Hazard Class:</b> 5.1 (Oxidizer)</p>	<p><b>Ammonium Persulfate</b> is not combustible, but it is a <b>STRONG OXIDIZER</b> that enhances the combustion of other substances.</p> <p>Use water only. <b>DO NOT USE CO<sub>2</sub></b> as an extinguishing agent.</p> <p><b>POISONOUS GASES ARE PRODUCED IN FIRE</b>, including <i>Sulfur Oxides</i>, <i>Nitrogen Oxides</i>, and <i>Ammonia</i>.</p> <p><b>CONTAINERS MAY EXPLODE IN FIRE.</b></p> <p>Use water spray to keep fire-exposed containers cool.</p> <p><b>Ammonium Persulfate</b> may ignite combustibles (wood, paper and oil).</p>	<p><b>AIR, LIGHT, WATER, MOISTURE, CONTAMINATION, and HEAT</b> will cause <b>Ammonium Persulfate</b> to decompose and become unstable.</p> <p><b>Ammonium Persulfate</b> reacts violently <i>in solution</i> with <b>IRON</b>; <b>POWDERED ALUMINUM</b>; and <b>SILVER SALTS</b>.</p> <p><b>Ammonium Persulfate</b> will react with <b>COMBUSTIBLE</b> and <b>ORGANIC MATERIALS (PAPER, GAS and FUELS)</b> to cause fires.</p> <p><b>Ammonium Persulfate</b> is not compatible with <b>OXIDIZING AGENTS</b> (such as <b>PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE</b>); <b>STRONG ACIDS</b> (such as <b>HYDROCHLORIC, SULFURIC and NITRIC</b>); <b>STRONG BASES</b> (such as <b>SODIUM HYDROXIDE and POTASSIUM HYDROXIDE</b>); <b>REDUCING AGENTS</b> (such as <b>LITHIUM, SODIUM, ALUMINUM and their HYDRIDES</b>); and <b>HEAVY and POWDERED METALS</b> (such as <b>COPPER, NICKEL and ZINC</b>).</p>

### SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Collect powdered material in the most convenient and safe manner and place into sealed containers for disposal.

DO NOT wash into sewer.

**Ammonium Persulfate** is harmful to aquatic organisms.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Mild, unpleasant
<b>Flash Point:</b>	Noncombustible
<b>Specific Gravity:</b>	1.98 (water = 1)
<b>Water Solubility:</b>	Soluble/Reactive
<b>Boiling Point:</b>	Decomposes
<b>Melting Point:</b>	Decomposes
<b>Molecular Weight:</b>	228.18

### EXPOSURE LIMITS

**ACGIH:** 0.1 mg/m<sup>3</sup> (as *Persulfate*)

The Protective Action Criteria values are:

PAC-1 = 0.3 mg/m<sup>3</sup>

PAC-2 = 22 mg/m<sup>3</sup>

PAC-3 = 130 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Neoprene and Natural Rubber
<b>Coveralls:</b>	DuPont Tyvek®
<b>Respirator:</b>	>0.1 mg/m <sup>3</sup> - full facepiece APR with High efficiency filter >0.3 mg/m <sup>3</sup> - SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing and severe shortness of breath (pulmonary edema)

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

**Medical** observation is recommended as symptoms may be delayed.

Common Name: **AMMONIUM POLYSULFIDE**

Synonyms: Ammonium Sulfide; Diammonium Polysulfide

CAS No: 9080-17-5

Molecular Formula:  $(\text{NH}_4)_2\text{S}_x$

RTK Substance No: 0113

Description: Clear, yellow to red liquid with a rotten egg or *Ammonia*-like odor

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>0 - Fire</b> <b>1 - Reactivity</b> DOT#: UN 2818 ERG Guide #: 154 Hazard Class: 8 (Corrosive)	<p><b>Ammonium Polysulfide</b> is noncombustible but can decompose upon heating to release highly flammable gases.</p> <p>Use dry chemical, CO<sub>2</sub>, water spray, alcohol-resistant foam or other foam as extinguishing agents.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i>, <i>Sulfur Oxides</i>, and <i>Hydrogen Sulfide</i>.</p> <p>Use water spray to keep fire-exposed containers cool.</p>	<p><b>Ammonium Polysulfide</b> reacts with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) to form flammable and toxic <i>Hydrogen Sulfide gas</i>.</p> <p><b>Ammonium Polysulfide</b> reacts with STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE) to form <i>Ammonia</i>.</p> <p><b>Ammonium Polysulfide</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and METALS.</p> <p>Keep <b>Ammonium Polysulfide</b> away from AIR, HEAT, LIGHT and WATER.</p>

**SPILL/LEAKS**

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquid with fly ash, cement powder or commercial sorbent and place into sealed containers for disposal.

DO NOT wash into sewer.

**PHYSICAL PROPERTIES**

**Odor Threshold:** Rotten egg or *Ammonia*-like

**Flash Point:** Noncombustible

**Boiling Point:** Decomposes

**Molecular Weight:** Varies

**EXPOSURE LIMITS**

**ACGIH:** 1 ppm, 8-hr TWA; 5 ppm, Ceiling (for *Hydrogen Sulfide*)

**PROTECTIVE EQUIPMENT**

**Gloves:** Butyl and Viton (>8-hr breakthrough for *liquid Ammonia*)

**Coveralls:** Tychem® BR, Responder®, and TK (>8-hr breakthrough for *liquid Ammonia* and *Hydrogen Sulfide*)

**Respirator:** SCBA

**HEALTH EFFECTS**

**Eyes:** Irritation and burns

**Skin:** Irritation and burns

**Inhalation:** Nose, throat and lung irritation with coughing, wheezing and shortness of breath

Headache, dizziness, nausea and vomiting

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water. Seek medical attention.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **AMMONIUM SULFIDE**

Synonyms: Ammonium Monosulfide; Diammonium Sulfide

CAS No: 12135-76-1

Molecular Formula: (NH<sub>4</sub>)<sub>2</sub>S

RTK Substance No: 0115

Description: Yellow, crystalline solid, usually in a water solution, with a very strong rotten egg and *Ammonia*-like odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>3 - Health</b></p> <p><b>3 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p><b>DOT#:</b> UN 2683</p> <p><b>ERG Guide #:</b> 132</p> <p><b>Hazard Class:</b> 8 (Corrosive)</p>	<p>CORROSIVE AND FLAMMABLE LIQUID</p> <p>Use dry chemical, water spray or foam as extinguishing agents.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Hydrogen Sulfide</i>, <i>Sulfur Oxides</i>, <i>Nitrogen Oxides</i> and <i>Ammonia</i>.</p> <p>CONTAINERS MAY EXPLODE IN FIRE.</p> <p>Use water spray to keep fire-exposed containers cool.</p> <p>Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source and flash back.</p> <p><b>Ammonium Sulfide</b> may form an ignitable vapor/air mixture in closed tanks or containers.</p>	<p><b>Ammonium Sulfide</b> reacts explosively with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).</p> <p><b>Ammonium Sulfide</b> reacts with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) to produce toxic and flammable <i>Hydrogen Sulfide</i> gas.</p> <p><b>Ammonium Sulfide</b> reacts with STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE) to produce <i>Ammonia</i>.</p> <p><b>Ammonium Sulfide</b> slowly produces <i>Hydrogen Sulfide</i> and <i>Ammonia</i> in the presence of MOISTURE.</p> <p><b>Ammonium Sulfide</b> corrodes COPPER and ZINC and their ALLOYS.</p>

### SPILL/LEAKS

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in dry sand, earth, or a noncombustible material and place into sealed containers for disposal.

Collect *solid* material in the most convenient and safe manner and place into sealed containers for disposal.

Use only non-sparking tools and equipment.

Keep **Ammonium Sulfide** out of confined spaces, such as sewers, because of the possibility of an explosion.

Dangerous to aquatic life at high concentrations.

### PHYSICAL PROPERTIES

**Odor Threshold:** Rotten egg and *Ammonia*-like odor

**Flash Point:** 72°F (22°C)

**LEL:** 4%

**UEL:** 46%

**Specific Gravity:** 1.0 (water = 1)

**Water Solubility:** Soluble

**Boiling Point:** Decomposes

**Melting Point:** Decomposes

**pH:** 9.5 (45% aqueous solution)

**Molecular Weight:** 68.14

### EXPOSURE LIMITS

**NIOSH:** 10 ppm, 10-minute Ceiling

**ACGIH:** 1 ppm, 8-hr TWA; 5 ppm STEL

**IDLH:** 100 ppm

The Protective Action Criteria values are:

PAC-1 = 10 ppm    PAC-2 = 15 ppm    PAC-3 = 15 ppm

### PROTECTIVE EQUIPMENT

**Gloves:** Silver Shield®/4H®, Viton and Barrier® (>8-hr breakthrough for *Sulfur compounds*)

**Coveralls:** Tychem® BR, Responder and TK (>8-hr breakthrough for *Hydrogen Sulfide*)

**Respirator:** >10 ppm - SCBA  
**Use turn out gear or flash protection if fire/ignition is the greatest hazard**

### HEALTH EFFECTS

**Eyes:** Irritation and burns with possible eye damage

**Skin:** Irritation and burns

**Inhalation:** Nose, throat and lung irritation, with coughing, wheezing and shortness of breath

Headache, dizziness, lightheadedness, and passing out

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water. Seek medical attention.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **AMMONIUM SULFITE**

Synonyms: Ammonium Hydrogen Sulfite; Diamonium Sulfite

CAS No: 10196-04-0

Molecular Formula:  $(\text{NH}_4)_2\text{SO}_3$ 

RTK Substance No: 0116

Description: Odorless, colorless, crystalline solid

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> <b>DOT#:</b> UN 3077 <b>ERG Guide #:</b> 171 <b>Hazard Class:</b> 9 (Environmentally Hazardous Substance)	Extinguish fire using an agent suitable for type of surrounding fire. <b>Ammonium Sulfite</b> itself does not burn. <b>POISONOUS GASES ARE PRODUCED IN FIRE</b> , including <i>Sulfur Dioxide</i> and <i>Nitrogen Oxides</i> . Use water spray to keep fire-exposed containers cool.	<b>Ammonium Sulfite</b> reacts with <b>STRONG ACIDS</b> (such as <b>HYDROCHLORIC</b> , <b>SULFURIC</b> and <b>NITRIC</b> ) to form toxic <i>Hydrogen Sulfide gas</i> . <b>Ammonium Sulfite</b> is not compatible with <b>OXIDIZING AGENTS</b> (such as <b>PERCHLORATES</b> , <b>PEROXIDES</b> , <b>PERMANGANATES</b> , <b>CHLORATES</b> , <b>NITRATES</b> , <b>CHLORINE</b> , <b>BROMINE</b> and <b>FLUORINE</b> ). Protect from <b>WATER</b> and <b>MOISTURE</b> .

## SPILL/LEAKS

**Isolation Distance:**

Spills: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Collect powdered material in the most convenient and safe manner and place into sealed containers for disposal.

DO NOT wash into sewer.

**Ammonium Sulfite** is dangerous to aquatic life in high concentrations.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Nonflammable
<b>Specific Gravity:</b>	1.41 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	302°F (150°C) (Sublimes)
<b>Melting Point:</b>	140° to 158°F (60° to 70°C) (Decomposes)
<b>Molecular Weight:</b>	116.14

## EXPOSURE LIMITS

The Protective Action Criteria values are:

PAC-1 = 10 mg/m<sup>3</sup>PAC-2 = 10 mg/m<sup>3</sup>PAC-3 = 10 mg/m<sup>3</sup>

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Nitrile and Natural Rubber
<b>Coveralls:</b>	Tyvek®
<b>Respirator:</b>	>10 mg/m <sup>3</sup> - SCBA

## HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, wheezing and shortness of breath

## FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **AMYL ALCOHOL**

Synonyms: 1-Pentanol; Pentyl Alcohol

CAS No: 71-41-0

 Molecular Formula:  $\text{CH}_3(\text{CH}_2)_3\text{CH}_2\text{OH}$ 

RTK Substance No: 0124

Description: Clear liquid with a mild alcohol odor

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>1 - Health</b> <b>3 - Fire</b> <b>0 - Reactivity</b>  DOT#: UN 1105 ERG Guide #: 129 Hazard Class: 3 (Flammable)	FLAMMABLE LIQUID Use dry chemical, CO <sub>2</sub> or alcohol-resistant foam as extinguishing agents. Water may not be effective in fighting fires. POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool. Vapors may travel to a source of ignition and flash back. Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.	<b>Amyl Alcohol</b> reacts violently with HYDROGEN TRISULFIDE and OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE). <b>Amyl Alcohol</b> attacks ALKALINE and EARTH ALKALINE METALS (such as BERYLLIUM, MAGNESIUM and CALCIUM) to form flammable and explosive <i>Hydrogen gas</i> . <b>Amyl Alcohol</b> is not compatible with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); ALIPHATIC AMINES; ISOCYANATES; and ACETALDEHYDE.

**SPILL/LEAKS**
**Isolation Distance:**

Small Spills - 60 meters (200 feet)

Large Spills - 330 meters (1,100 feet)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	0.12 to 10 ppm
<b>Flash Point:</b>	91°F (33°C)
<b>LEL:</b>	1.2%
<b>UEL:</b>	10.5%
<b>Relative Density:</b>	0.18 (water = 1)
<b>Vapor Density:</b>	3 (air = 1)
<b>Vapor Pressure:</b>	2 mm Hg at 77°F (25°C)
<b>Water Solubility:</b>	Slightly soluble
<b>Boiling Point:</b>	280°F (138°C)
<b>Melting Point:</b>	-110°F (-79°C)
<b>Molecular Weight:</b>	88.2

**EXPOSURE LIMITS**

No occupational exposure limits have been established.

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Viton, Butyl, Nitrile and Neoprene (>8-hr breakthrough)
<b>Coveralls:</b>	DuPont Tychem®, CPF-2, SL, CPF-4, Responders® and TK for <i>Aliphatic Hydroxylic compounds</i> (>8-hr breakthrough)
<b>Boots:</b>	Neoprene and Butyl
<b>Respirator:</b>	Supplied air

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Acute:</b>	Irritation of the nose, throat and lungs with coughing, wheezing, and shortness of breath  Headache, dizziness, confusion and passing out
<b>Chronic:</b>	No information

**FIRST AID AND DECONTAMINATION**

<b>Remove</b> the person from exposure.
<b>Flush</b> eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
<b>Remove</b> contaminated clothing and wash contaminated skin with soap and water.
<b>Begin</b> artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b> to a medical facility.



Common Name: **ANILINE**

Synonyms: Aminobenzene; Phenylamine

CAS No: 62-53-3

 Molecular Formula: C<sub>6</sub>H<sub>5</sub>NH<sub>2</sub>

RTK Substance No: 0135

Description: Colorless to brown, oily liquid

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>2 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 1547 ERG Guide #: 153 Hazard Class: 6.1 (Poisonous)	COMBUSTIBLE LIQUID Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> . Use water spray to keep fire-exposed containers cool. Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.	<b>Aniline</b> reacts violently with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) and may cause fires and explosions. <b>Aniline</b> is not compatible with ACETIC ANHYDRIDE; CHLOROSULFONIC ACID; STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); ALKALIES (such as METAL HYDROXIDES and METAL CARBONATES); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); and TOLUENE DIISOCYANATES.

**SPILL/LEAKS**
**Isolation Distance:**

Small Spills: 60 meters (200 feet)

Large Spills: 270 meters (900 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.

This substance is very toxic to aquatic organisms.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	0.58 to 10 ppm
<b>Flash Point:</b>	158°F (70°C)
<b>LEL:</b>	1.3%
<b>UEL:</b>	11%
<b>Vapor Density:</b>	3.2 (air = 1)
<b>Vapor Pressure:</b>	0.6 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1 (water = 1)
<b>Water Solubility:</b>	Slightly soluble
<b>Boiling Point:</b>	363°F (184°C)
<b>Ionization Potential:</b>	7.7 eV
<b>Molecular Weight:</b>	93.1

**EXPOSURE LIMITS**

<b>OSHA:</b>	5 ppm, 8-hr TWA
<b>NIOSH:</b>	Lowest feasible concentration
<b>ACGIH:</b>	2 ppm, 8-hr TWA
<b>IDLH LEVEL:</b>	100 ppm

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Butyl, Silver Shield®/4H® and Viton (>8-hr breakthrough)
<b>Coveralls:</b>	DuPont Tychem® CPF 2, CPF 4, BR, LV, SL, TK and Responder®; Kappler Zytron® 200; and Saint-Gobain ONESuit®/TEC or equivalent (>8-hr breakthrough)
<b>Respirator:</b>	>2 ppm - full facepiece APR with Organic vapor cartridge >20 ppm - Supplied air

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation with possible eye damage
<b>Skin:</b>	Irritation and skin rash
<b>Inhalation:</b>	Nose and throat irritation with coughing and wheezing Headache, dizziness and blue color to the skin and lips (methemoglobinemia) Fatigue, drowsiness, convulsions, disturbance of speech, upset stomach and unconsciousness

**FIRST AID AND DECONTAMINATION**

<b>Remove</b> the person from exposure.
<b>Flush</b> eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention immediately.
<b>Quickly</b> remove contaminated clothing. Wash contaminated skin with large amounts of soap and water. Seek medical attention immediately.
<b>Begin</b> artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b> to a medical facility.

Common Name: **ANTIMONY**

Synonyms: Antimony Metal; Antimony Powder

CAS No: 7440-36-0

Molecular Formula: Sb

RTK Substance No: 0141

 Description: Naturally occurring, silvery-white, hard, brittle metal that is also formed from smelting *Lead* and other metals

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>2 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 2871 ERG Guide #: 170 Hazard Class: 6.1 (Toxic)	<b>Antimony</b> is not combustible in bulk form. However, <b>Antimony powder</b> and <i>dust</i> may be COMBUSTIBLE. Use sand, dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. DO NOT USE WATER on <i>molten Antimony</i> . POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Antimony Oxide</i> and <i>Antimony Hydride (Stibine)</i> . <b>Antimony</b> may form an ignitable dust/air mixture in closed tanks or containers. <i>Finely dispersed Antimony powder</i> and <i>dust</i> may form explosive mixtures in air.	<b>Antimony</b> reacts violently with HALOGENS (such as FLUORINE, CHLORINE and BROMINE) and STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) to cause fires and explosions. Contact with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) and freshly formed (nascent) HYDROGEN can also form toxic <i>Antimony Hydride (Stibine) gas</i> . <b>Antimony</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, and NITRATES); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); IODINE; and POWDERED METALS.

## SPILL/LEAKS

**Isolation Distance:**
**Spill:** 25 meters (75 feet)

**Fire:** 800 meters (1/2 mile)

 Moisten *solid* spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

 Ground and bond containers when transferring **Antimony powder**.

Use only non-sparking tools and equipment.

DO NOT wash into sewer.

## PHYSICAL PROPERTIES

**Flash Point:** Noncombustible (*bulk form*)  
 Combustible (*powder and dust*)

**Vapor Pressure:** 1 mm Hg at 1,627°F (886°C)

**Specific Gravity:** 6.69 (water = 1)

**Water Solubility:** Insoluble

**Boiling Point:** 2,975°F (1,635°C)

**Melting Point:** 1,166°F (630°C)

**Molecular Weight:** 121.8

## EXPOSURE LIMITS

**OSHA:** 0.5 mg/m<sup>3</sup>, 8-hr TWA

**NIOSH:** 0.5 mg/m<sup>3</sup>, 10-hr TWA

**ACGIH:** 0.5 mg/m<sup>3</sup>, 8-hr TWA

**IDLH:** 50 mg/m<sup>3</sup>

The Protective Action Criteria values are:

 PAC-1 = 1.5 mg/m<sup>3</sup> PAC-2 = 20 mg/m<sup>3</sup>

 PAC-3 = 50 mg/m<sup>3</sup>

## PROTECTIVE EQUIPMENT

**Gloves:** Nitrile, Neoprene and Natural Rubber

**Coveralls:** Tyvek

**Respirator:** Spill or >0.5 mg/m<sup>3</sup>: full facepiece APR with *P100 filters*  
 Fire or >5 mg/m<sup>3</sup>: SCBA

## HEALTH EFFECTS

**Eyes:** Irritation

**Skin:** Irritation, redness and itchy skin rash

**Inhalation:** Nose, throat and lung irritation, with coughing, wheezing and shortness of breath

Headache, dizziness, nausea, vomiting, and abdominal pain

## FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **ANTIMONY POTASSIUM TARTRATE**

Synonyms: Potassium Antimony Tartrate; Tartar Emetic

CAS No: 28300-74-5

Molecular Formula: C<sub>4</sub>H<sub>4</sub>KO<sub>7</sub>Sb

RTK Substance No: 0145

Description: Odorless, colorless to white, crystalline powder

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 1551 ERG Guide #: 151 Hazard Class: 6.1 (Poison)	Extinguish fire using an agent suitable for type of surrounding fire. <b>Antimony Potassium Tartrate</b> itself does not burn. POISONOUS GASES ARE PRODUCED IN FIRE. Use water spray to keep fire-exposed containers cool.	<b>Antimony Potassium Tartrate</b> is not compatible with MINERAL ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); TANNIC ACID, PERCHLORIC ACID; ALKALI METALS (such as LITHIUM, SODIUM and POTASSIUM); CARBONATES (such as LIME WATER); LEAD; MERCURY; SILVER SALTS; and OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE). <b>Antimony Potassium Tartrate</b> can react with freshly formed HYDROGEN to form extremely flammable and poisonous <i>Stibine gas</i> .

### SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

DO NOT wash into sewer.

**Antimony Potassium Tartrate** is harmful to aquatic life at very low concentrations.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Nonflammable
<b>Specific Gravity:</b>	2.6 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Melting Point:</b>	630° to 635°F (332° to 335°C)
<b>Molecular Weight:</b>	324.9

### EXPOSURE LIMITS

**OSHA:** 0.5 mg/m<sup>3</sup>, 8-hr TWA

**NIOSH:** 0.5 mg/m<sup>3</sup>, 10-hr TWA

**ACGIH:** 0.5 mg/m<sup>3</sup>, 8-hr TWA

**IDLH:** 50 mg/m<sup>3</sup>

The Protective Action Criteria values are:

PAC-1 = 4.11 mg/m<sup>3</sup>    PAC-2 = 6.86 mg/m<sup>3</sup>

PAC-3 = 137 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Nitrile and Natural Rubber
<b>Coveralls:</b>	Tyvek®
<b>Respirator:</b>	>0.5 mg/m <sup>3</sup> - full facepiece APR with <i>P100 filters</i> >50 mg/m <sup>3</sup> - SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation, burns and rash
<b>Inhalation:</b>	Nose, throat and lung irritation, with coughing, wheezing and shortness of breath  Headache, dizziness, nausea and vomiting

### FIRST AID AND DECONTAMINATION

<b>Remove</b> the person from exposure.
<b>Flush</b> eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
<b>Remove</b> contaminated clothing and wash contaminated skin with water.
<b>Begin</b> artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b> promptly to a medical facility.

Common Name: **ARGON**

Synonyms: None

CAS No: 7440-37-1

Molecular Formula: Ar

RTK Substance No: 0151

Description: Odorless, tasteless, and colorless asphyxiant gas

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>1 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b>  <b>DOT#:</b> UN 1006 (Compressed) UN 1951 (Cryogenic)  <b>ERG Guide #:</b> 121  <b>Hazard Class:</b> 2.2 (Nonflammable)	Extinguish fire using an agent suitable for type of surrounding fire. <b>Argon</b> itself does not burn. CONTAINERS MAY EXPLODE IN FIRE.  Use water spray to keep fire-exposed containers cool.	<b>Argon</b> may react explosively with <i>liquid</i> NITROGEN. Keep temperatures below 125°F (52°C).

### SPILL/LEAKS

**Isolation Distance:**

Spill: 100 meters (330 feet)

Fire: 800 meters (1/2 mile)

Stop flow of gas. If source of leak is a cylinder and the leak cannot be stopped in place, remove the leaking cylinder to a safe place in the open air, and repair leak or allow cylinder to empty.

Turn leaking cylinder with leak up to prevent escape of gas in liquid state.

Before entering a confined space where **Argon** is present, check to make sure sufficient *Oxygen* (19.5%) exists.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Noncombustible
<b>Vapor Density:</b>	1.38 (air = 1)
<b>Vapor Pressure:</b>	>760 mm Hg at 68°F (20°C)
<b>Water Solubility:</b>	Slightly soluble
<b>Boiling Point:</b>	-302°F (-186°C)
<b>Melting Point:</b>	-308°F (-189°C)
<b>Molecular Weight:</b>	39.9

### EXPOSURE LIMITS

**Argon** decreases the amount of available *Oxygen*. Routinely measure *Oxygen* content to make sure it is at least 19.5% by volume.

The Protective Action Criteria values are:

- PAC-1 = 65,000 ppm
- PAC-2 = 230,000 ppm
- PAC-3 = 400,000 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Insulated materials
<b>Coveralls:</b>	Turn Out Gear
<b>Respirator:</b>	< 19.5% <i>Oxygen</i> - SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns, contact with liquid causes frostbite
<b>Inhalation:</b>	Headache, rapid breathing, dizziness, confusion, loss of coordination and judgment, unconsciousness, coma and death

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.  
**Immerse** affected part in warm water. Seek medical attention.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** promptly to a medical facility.

Common Name: **ARSENIC**

Synonyms: Gray Arsenic; Arsen

CAS No: 7440-38-2

Molecular Formula: As

RTK Substance No: 0152

Description: Silver-gray or white metallic, odorless, brittle solid

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>4 - Health</b></p> <p><b>0 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p><b>DOT#:</b> UN 1558</p> <p><b>ERG Guide #:</b> 152</p> <p><b>Hazard Class:</b> 6.1 (Poison)</p>	<p><b>Arsenic</b> is noncombustible, however, <i>Arsenic dust</i> or <i>fine powder</i> can explode when exposed to heat, flame or hot surfaces.</p> <p>Use dry chemical, CO<sub>2</sub>, water spray or foam as extinguishing agents.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Arsenic Oxides</i>.</p> <p>Use water spray to keep fire-exposed containers cool.</p>	<p><b>Arsenic</b> reacts with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) to cause fires and explosions.</p> <p><b>Arsenic</b> reacts with ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) and HYDROGEN GAS to produce toxic <i>Arsine gas</i>.</p> <p><b>Arsenic</b> is not compatible with <i>powdered</i> METALS (such as ZINC, LITHIUM, RUBIDIUM and PLATINUM); BROMINE AZIDE; LEAD MONOXIDE; and MERCURY OXIDE.</p>

### SPILL/LEAKS

**Isolation Distance:**

Spills: 25 to 50 meters (75 to 150 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up.

DO NOT wash into sewer.

Toxic to aquatic organisms.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Noncombustible solid
<b>Vapor Pressure:</b>	1 mm Hg at 701°F (372°C)
<b>Specific Gravity:</b>	5.7 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	1,350°F (613°C)
<b>Ionization Potential:</b>	9.87 eV
<b>Molecular Weight:</b>	74.9

### EXPOSURE LIMITS

**OSHA:** 0.01 mg/m<sup>3</sup>, 8-hr TWA

**NIOSH:** 0.002 mg/m<sup>3</sup>, 15-min Ceiling

**ACGIH:** 0.01 mg/m<sup>3</sup>, 8-hr TWA

**IDLH:** 5 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Natural Rubber, Nitrile or Silver Shield®
<b>Coveralls:</b>	DuPont Tyvek®
<b>Respirator:</b>	<0.1 mg/m <sup>3</sup> - Full facepiece APR with High efficiency filter <0.5 mg/m <sup>3</sup> -Supplied air

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation, burns, red and watery eyes
<b>Skin:</b>	Irritation, burns, itching, rash and loss of pigment
<b>Inhalation:</b>	Nose and throat irritation with coughing, wheezing and hoarseness Weakness, headache, nausea, vomiting, and muscle cramps
<b>Chronic:</b>	Cancer (skin and lung) in humans

### FIRST AID AND DECONTAMINATION

<b>Remove</b> the person from exposure.
<b>Flush</b> eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.
<b>Quickly</b> remove contaminated clothing and wash contaminated skin with large amounts of soap and water.
<b>Begin</b> artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b> to a medical facility.

Common Name: **ARSENIC DISULFIDE**

Synonyms: Red Arsenic Glass; Realgar

CAS No: 56320-22-0

Molecular Formula:  $As_2S_2$

RTK Substance No: 0156

Description: Reddish brown, odorless solid

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b>  <b>DOT#:</b> UN 1557 <b>ERG Guide #:</b> 152 <b>Hazard Class:</b> 6.1 (Poison)	Extinguish fire using an agent suitable for type of surrounding fire. <b>Arsenic Disulfide</b> itself does not burn.  POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Sulfur Oxides</i> and <i>Arsenic fumes</i> .  Use water spray to keep fire-exposed containers cool.	<b>Arsenic Disulfide</b> may react violently with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); BROMINE AZIDE; SODIUM SULFIDE; SULFUR; and POTASSIUM NITRATE.  <b>Arsenic Disulfide</b> reacts with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) and ACID FUMES to form toxic <i>Arsenic</i> , <i>Hydrogen Sulfide</i> and <i>Sulfur Dioxide fumes</i> and <i>vapors</i> .  Contact with WATER or STEAM releases toxic <i>Hydrogen Sulfide gas</i> .

### SPILL/LEAKS

**Isolation Distance:**

Spills: 25 to 50 meters (80 to 160 feet)

Fire: 800 meters (1/2 mile)

Collect solid material in the most convenient and safe manner, or use a HEPA-filter vacuum to clean-up, and deposit in sealed containers.

Harmful to aquatic life at very low concentrations.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Nonflammable
<b>Vapor Pressure:</b>	<0 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	3.5 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	1,049°F (565°C)
<b>Melting Point:</b>	585°F (307°C)
<b>Molecular Weight:</b>	214

### EXPOSURE LIMITS

<b>OSHA:</b>	0.01 mg/m <sup>3</sup> , 8-hr TWA
<b>NIOSH:</b>	0.002 mg/m <sup>3</sup> , 15-min Ceiling
<b>ACGIH:</b>	0.01 mg/m <sup>3</sup> , 8-hr TWA
<b>IDLH LEVEL:</b>	5 mg/m <sup>3</sup>
	(All of the above are for <i>inorganic Arsenic compounds</i> measured as <i>Arsenic</i> )

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Nitrile and Natural Rubber
<b>Coveralls:</b>	DuPont Tyvek®
<b>Respirator:</b>	<0.1 mg/m <sup>3</sup> - APR with High efficiency filter <0.5 mg/m <sup>3</sup> - Supplied air

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation, burns, red and watery eyes
<b>Skin:</b>	Irritation, burns, itching, rash and loss of pigment
<b>Inhalation:</b>	Nose and throat irritation with coughing, wheezing, and hoarseness Weakness, nausea and vomiting, headache and muscle cramps
<b>Chronic:</b>	<i>Arsenic compounds</i> cause lung and skin cancer in humans

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.  
**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** to a medical facility.



Common Name: **ARSENIC PENTAFLUORIDE**

Synonyms: Arsenic Fluoride

CAS No: 7784-36-3

Molecular Formula:  $AsF_5$

RTK Substance No: 4171

Description: Colorless gas that forms white fumes in air

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>4 - Health</b> <b>0 - Fire</b> <b>1 - Reactivity</b>  <b>DOT#:</b> UN 1955 <b>ERG Guide #:</b> 123 <b>Hazard Class:</b> 2.3 (Poison Gas)	Stop flow of gas and use fine water spray to disperse and knock down acid vapors.  Extinguish fire using an agent suitable for type of surrounding fire. <b>Arsenic Pentafluoride</b> itself does not burn.  POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Hydrogen Fluoride</i> and <i>Arsenic</i> .  CONTAINERS MAY EXPLODE IN FIRE.  Use water spray to keep fire-exposed containers cool.	<b>Arsenic Pentafluoride</b> reacts with WATER; MOIST AIR; STEAM; and STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) to form toxic <i>Hydrogen Fluoride</i> and <i>Arsenic Pentoxide</i> .  <b>Arsenic Pentafluoride</b> reacts violently with DIACETYLENE.  <b>Arsenic Pentafluoride</b> is not compatible with REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); ORGANIC MATERIALS; and MATERIALS containing SILICA (such as GLASS).  <b>Arsenic Pentafluoride</b> reacts with NICKEL; NICKEL ALLOYS; and COPPER in the presence of SULFUR DIOXIDE.

### SPILL/LEAKS

**Isolation Distance:**

Small Spill: 100 meters (300 feet)

Large Spill: 800 meters (1/2 mile)

Fire: 800 meters (1/2 mile)

Stop flow of gas. If source of leak is a cylinder and the leak cannot be stopped in place, remove the leaking cylinder to a safe place in the open air, and repair leak or allow cylinder to empty.

Use water spray to knock down vapors.

Turn leaking cylinder with leak up to prevent escape of gas in liquid state.

### PHYSICAL PROPERTIES

<b>Flash Point:</b>	Noncombustible
<b>Vapor Density:</b>	5.86 (air = 1)
<b>Vapor Pressure:</b>	>760 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	6.27 (water = 1)
<b>Water Solubility:</b>	Decomposes
<b>Boiling Point:</b>	-63°F (-53°C)
<b>Freezing Point:</b>	-112°F (-80°C)
<b>Molecular Weight:</b>	169.9

### EXPOSURE LIMITS

**OSHA:** 3 ppm, 8-hr TWA

**NIOSH:** 3 ppm, 10-hr TWA; 6 ppm, 15-min Ceiling

**ACGIH:** 0.5 ppm, 8-hr TWA; 2 ppm, Ceiling

**IDLH:** 30 ppm

The Protective Action Criteria values are:

PAC-1 = 1 ppm PAC-2 = 24 ppm PAC-3 = 44 ppm

(All of the above are for *Hydrogen Fluoride*)

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Barrier®, Teflon® and Kel-F® (>8-hr breakthrough for <i>Hydrogen Fluoride</i> )
<b>Coveralls:</b>	Tychem® Responder® and TK; and Trelchem® HPS (>8-hr breakthrough for <i>Hydrogen Fluoride</i> )
<b>Respirator:</b>	SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation, burns, red and watery eyes
<b>Skin:</b>	Irritation, burns, itching, rash and loss of pigment
<b>Inhalation:</b>	Nose and throat irritation with coughing, wheezing and hoarseness  Weakness, headache, nausea, vomiting, and muscle cramps
<b>Chronic:</b>	<i>Arsenic compounds</i> cause skin, liver, and lung cancer in humans

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention immediately.  
**Immediately** flush with large amounts of water. Apply 2.5% *Calcium Gluconate* gel to the affected skin. Seek medical assistance immediately.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** to a medical facility.

Common Name: **ARSENIC TRIOXIDE**

Synonyms: Arsenous Oxide; White Arsenic

CAS No: 1327-53-3

 Molecular Formula: As<sub>2</sub>O<sub>3</sub>

RTK Substance No: 0161

Description: Odorless, colorless to white crystal or powder

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 1561 ERG Guide #: 151 Hazard Class: 6.1 (Poison)	Extinguish fire using an agent suitable for type of surrounding fire. <b>Arsenic Trioxide</b> itself does not burn. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Arsenic fumes</i> . Use water spray to keep fire-exposed containers cool.	<b>Arsenic Trioxide</b> reacts with CHEMICALLY ACTIVE METALS (such as POTASSIUM, SODIUM, MAGNESIUM and ZINC); METALS (such as ALUMINUM, COPPER, IRON and ZINC FILINGS); and COMPOUNDS CONTAINING CHLORINE and FLUORINE to produce toxic <i>Arsine gas</i> . <b>Arsenic Trioxide</b> is not compatible with STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE) and OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES).

## SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

DO NOT wash into sewer.

**Arsenic Trioxide** is harmful to aquatic life and may persist in the environment.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Noncombustible
<b>Vapor Pressure:</b>	66 mm Hg at 594°F (312°C)
<b>Specific Gravity:</b>	3.74 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	869°F (465°C)
<b>Melting Point:</b>	379°F (193°C)
<b>Molecular Weight:</b>	197.8

## EXPOSURE LIMITS

**OSHA:** 0.01 mg/m<sup>3</sup>, 8-hr TWA

**NIOSH:** 0.002 mg/m<sup>3</sup>, 15-min Ceiling

**ACGIH:** 0.01 mg/m<sup>3</sup>, 8-hr TWA

**IDLH:** 5 mg/m<sup>3</sup>

 (All of the above are for *inorganic Arsenic*)

The Protective Action Criteria values are:

 PAC-1 = 0.4 mg/m<sup>3</sup> PAC-2 = 3 mg/m<sup>3</sup> PAC-3 = 9.1 mg/m<sup>3</sup>

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Nitrile and Natural Rubber
<b>Coveralls:</b>	Tyvek®
<b>Respirator:</b>	SCBA

## HEALTH EFFECTS

<b>Eyes:</b>	Irritation, burns, red and watery eyes
<b>Skin:</b>	Irritation, burns, itching, rash and loss of pigment
<b>Inhalation:</b>	Nose and throat irritation with coughing, wheezing and hoarseness Weakness, headache, nausea, vomiting, and muscle cramps
<b>Chronic:</b>	Cancer (lung) in humans and animals

## FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.  
**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** to a medical facility.

Common Name: **ARSENIC TRISULFIDE**

Synonyms: Arsenic Sesquisulfide; Arsenous Sulfide; King's Gold

CAS No: 1303-33-9

Molecular Formula:  $As_2S_3$

RTK Substance No: 0162

Description: Odorless, yellow or orange, crystalline powder

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<p><b>3 - Health</b></p> <p><b>0 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p><b>DOT#:</b> UN 1557</p> <p><b>ERG Guide #:</b> 152</p> <p><b>Hazard Class:</b> 6.1 Poison)</p>	<p>Extinguish fire using an agent suitable for type of surrounding fire. <b>Arsenic Trisulfide</b> itself does not burn.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Arsenic Oxides, Sulfur Oxides, Hydrogen Sulfide</i> and <i>Arsine</i>.</p> <p>Use water spray to keep fire-exposed containers cool.</p>	<p><b>Arsenic Trisulfide</b> may react violently with POTASSIUM CHLORATE and other OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); SULFUR; and SODIUM SULFIDE.</p> <p><b>Arsenic Trisulfide</b> reacts with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) and ACID FUMES to produce highly toxic gases and fumes such as <i>Hydrogen Sulfide, Arsine, and Arsenic</i>.</p> <p>When water solutions of <b>Arsenic Trisulfide</b> contact METALS (such as IRON, ALUMINUM and ZINC), highly toxic <i>Arsine gas</i> may be released.</p> <p><b>Arsenic Trisulfide</b> reacts with WATER, STEAM or MOIST AIR to produce <i>Hydrogen Sulfide gas</i>.</p>

**SPILL/LEAKS**

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Harmful to aquatic life in very low concentrations.  
DO NOT wash into sewer.

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and deposit in sealed containers.

**PHYSICAL PROPERTIES**

**Odor Threshold:** Odorless

**Flash Point:** Nonflammable

**Specific Gravity:** 3.4 (water = 1)

**Water Solubility:** Slightly soluble

**Boiling Point:** 1,305°F (707°C)

**Melting Point:** 594°F (312°C)

**Molecular Weight:** 246

**EXPOSURE LIMITS**

**OSHA:** 0.01 mg/m<sup>3</sup>, 8-hr TWA

**NIOSH:** 0.002 mg/m<sup>3</sup>, 15-min Ceiling

**ACGIH:** 0.01 mg/m<sup>3</sup>, 8-hr TWA

**IDLH:** 5 mg/m<sup>3</sup>

(All of the above are for *inorganic Arsenic*)

**PROTECTIVE EQUIPMENT**

**Gloves:** Nitrile and Natural Rubber

**Coveralls:** DuPont Tyvek®

**Respirator:** <0.1 mg/m<sup>3</sup> - Full facepiece APR with High efficiency filter  
<0.5 mg/m<sup>3</sup> - Supplied air

**HEALTH EFFECTS**

**Eyes:** Irritation, burns, red and watery eyes

**Skin:** Irritation, burns, itching, rash and loss of pigment

**Inhalation:** Nose and throat irritation with coughing, wheezing, and hoarseness

Weakness, nausea and vomiting, headache and muscle cramps

**Chronic:** *Arsenic compounds* cause skin, liver, and lung cancer in humans

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **ARSINE**

Synonyms: Arsenic Hydride; Hydrogen Arsenide

CAS No: 7784-42-1

Molecular Formula: AsH<sub>3</sub>

RTK Substance No: 0163

Description: Colorless gas with a garlic-like odor

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<p><b>4 - Health</b></p> <p><b>4 - Fire</b></p> <p><b>2 - Reactivity</b></p> <p><b>DOT#:</b> UN 2188</p> <p><b>ERG Guide #:</b> 119</p> <p><b>Hazard Class:</b> 2.3 (Toxic gas)</p>	<p><b>FLAMMABLE GAS</b></p> <p>Stop flow of gas or allow fire to burn itself out.</p> <p><b>POISONOUS GASES ARE PRODUCED IN FIRE,</b> including <i>Arsenic Oxide</i> and <i>Arsenic Trioxide</i>.</p> <p><b>CONTAINERS MAY VENT RAPIDLY AND EXPLODE IN FIRE.</b></p> <p>Use water spray to keep fire-exposed containers cool and "wash" the aerosol particulate from the air.</p> <p>Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.</p>	<p><b>Arsine</b> reacts with <b>OXIDIZING AGENTS</b> (such as <b>PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE</b>); <b>STRONG ACIDS</b> (such as <b>HYDROCHLORIC, SULFURIC and NITRIC</b>); <b>POTASSIUM</b>; and <b>AMMONIA</b>.</p>

SPILL/LEAKS
<p><b>Isolation Distance:</b></p> <p>Small Spills: 60 meters (200 feet)</p> <p>Large Spills: 420 meters (1,400 feet)</p> <p>Fire: 9.5 km (5.9 miles)</p> <p>Keep <b>Arsine</b> out of confined spaces, such as sewers, because of the possibility of an explosion.</p> <p>Can contaminate ground water with <i>Arsenic Trioxide</i> if water is used during a fire.</p>

PHYSICAL PROPERTIES	
<b>Odor Threshold:</b>	Does not provide adequate warning
<b>Flash Point:</b>	Flammable
<b>LEL:</b>	5.1%
<b>UEL:</b>	78%
<b>Vapor Density:</b>	2.7 (air = 1)
<b>Vapor Pressure:</b>	11,000 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	2.69 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	-67°F (-55°C)
<b>Ionization Potential:</b>	9.89 eV
<b>Molecular Weight:</b>	77.95

EXPOSURE LIMITS	
<b>OSHA:</b>	0.05 ppm, 8-hr TWA
<b>NIOSH:</b>	0.0006 ppm, Ceiling (15-min)
<b>ACGIH:</b>	0.005 ppm, 8-hr TWA
<b>IDLH:</b>	3 ppm

PROTECTIVE EQUIPMENT	
<b>Gloves:</b>	Teflon® (inner glove); insulated (outer glove)
<b>Coveralls:</b>	DuPont Tychem® BR, LV, Responder® and TK; Kappler Zytron® 500; and Saint-Gobain ONESuit®TEC (>8-hr breakthrough)
<b>Respirator:</b>	>0.0006 ppm - Supplied air

HEALTH EFFECTS	
<b>Eyes:</b>	Contact with liquid can cause frostbite
<b>Skin:</b>	Contact with liquid can cause frostbite
<b>Inhalation:</b>	Lung irritation with coughing and/or shortness of breath
<b>Chronic:</b>	<i>Inorganic Arsenic compounds</i> cause liver, kidney, lung and bladder cancer in humans

FIRST AID AND DECONTAMINATION	
<b>Remove</b> the person from exposure.	
<b>Flush</b> eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.	
<b>Immerse</b> affected part in warm water.	
<b>Begin</b> artificial respiration if breathing has stopped and CPR if necessary.	
<b>Transfer</b> to a medical facility.	
<b>Medical</b> observation is recommended as symptoms may be delayed.	

Common Name: **ASBESTOS**

Synonyms: Actinolite; Amosite; Anthophyllite; Chrysotile; Crocidolite; Tremolite

CAS No: 1332-21-4

Molecular Formula: Varies

RTK Substance No: 0164

Description: Group of six naturally occurring, fibrous *Silicate* minerals that range in color from white to gray, green blue or brown

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>4 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b>  <b>DOT#:</b> NA 2212 <b>ERG Guide #:</b> 171 <b>Hazard Class:</b> 9 (Miscellaneous Hazardous Substance)	Extinguish fire using an agent suitable for type of surrounding fire. <b>Asbestos</b> itself does not burn.	Not reactive

**SPILL/LEAKS**

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

**DO NOT USE COMPRESSED AIR.**

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Noncombustible
<b>Vapor Pressure:</b>	0 mm Hg at 8°F (20°C) (approx.)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	Decomposes
<b>Melting Point:</b>	1,112°F (600°C)
<b>Molecular Weight:</b>	277 (for <i>Chrysotile Asbestos</i> )

**EXPOSURE LIMITS**

**OSHA:** 0.1 f/cc, 8-hr TWA; 1 f/cc, 30 min. Ceiling

**NIOSH:** 0.1 f/cc, 10-hr TWA

**ACGIH:** 0.1 f/cc, 8-hr TWA

The Protective Action Criteria values are:

PAC-1 = 0.05 mg/m<sup>3</sup>

PAC-2 = 0.06 mg/m<sup>3</sup>

PAC-3 = 0.3 mg/m<sup>3</sup>

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Nitrile and Natural Rubber
<b>Coveralls:</b>	Tyvek®
<b>Respirator:</b>	>0.1 f/cc - full facepiece APR with <i>High efficiency filter</i> >1 f/cc (0.05 mg/m <sup>3</sup> ) - SCBA

**HEALTH EFFECTS**

<b>Eyes:</b>	No acute health effects known
<b>Skin:</b>	No acute health effects known
<b>Inhalation:</b>	No acute health effects known
<b>Chronic:</b>	Cancer (lung and gastrointestinal tract) in humans

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Remove** contaminated clothing and wash contaminated skin with soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **ASPHALT, OXIDIZED**

Synonyms: Bitumens, Oxidized; Blown Asphalt

CAS No: 64742-93-4

Molecular Formula: Mixture

RTK Substance No: 3197

Description: Air-refined or air-blown type of *Bitumens* which are blackish-brown, cement-like solids, semi-solids or liquids depending on the formulation or mixture of Asphalt used

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<p><b>3 - Health</b></p> <p><b>1 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p>DOT#: UN 1999</p> <p>ERG Guide #: 130</p> <p>Hazard Class: 3 (Flammable)</p>	<p>Use dry chemical, CO<sub>2</sub>, or foam as extinguishing agents.</p> <p>DO NOT use straight water streams. Water spray and foam must be applied carefully to avoid frothing.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Sulfur Oxides</i>, <i>Hydrogen Sulfide</i> and <i>Formaldehyde</i>.</p> <p>Use water spray to keep fire-exposed containers cool.</p> <p>DO NOT direct water directly into any container, vessel or tank containing HOT <i>Asphalt</i> as violent eruptions may occur.</p>	<p><b>Asphalt, Oxidized</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).</p> <p>HOT <b>Asphalt, Oxidized</b> may ignite flammables on contact.</p> <p>Significant concentrations of <i>Hydrogen Sulfide</i> can occur and accumulate in storage tanks and bulk transport containers.</p> <p>Use only non-sparking tools and equipment, especially when opening and closing containers of <b>Asphalt, Oxidized</b>.</p>

SPILL/LEAKS
<p><b>Isolation Distance:</b></p> <p>Spills: 50 meters (150 feet)</p> <p>Fire: 800 meters (1/2 mile)</p> <p>Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers. Hot product can harm plant life.</p> <p>This chemical does not accumulate in the food chain or environment.</p>

PHYSICAL PROPERTIES	
<b>Odor Threshold:</b>	Petroleum odor
<b>Flash Point:</b>	>400°F (204°C)
<b>LEL:</b>	0.9%
<b>UEL:</b>	7%
<b>Autoignition Temperature:</b>	905°F (485°C)
<b>Vapor Pressure:</b>	3 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	0.95 to 1.1 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	700°F (371°C)
<b>Melting Point:</b>	86°F to 266°F, (54°C to 173°C)

EXPOSURE LIMITS	
<b>NIOSH:</b>	5 mg/m <sup>3</sup> , 15-minute Ceiling (as <i>Asphalt fume</i> )
<b>ACGIH:</b>	0.5 mg/m <sup>3</sup> , 8-hr TWA (as <i>Asphalt fume</i> ) 1 ppm, 8-hr TWA; 5 ppm STEL (as <i>Hydrogen Sulfide</i> )
<b>IDLH:</b>	100 ppm (as <i>Hydrogen Sulfide</i> )

PROTECTIVE EQUIPMENT	
<b>Gloves:</b>	Insulated Rubber
<b>Coveralls:</b>	DuPont Tychem® F, Responder® and CPF 2, CPF 3, CPF 4; ONESuit® TEC; and Kappler Zytron® 300 and 500
<b>Boots:</b>	Insulated Rubber
<b>Respirator:</b>	>0.5 mg/m <sup>3</sup> (as <i>Asphalt fume</i> ) or >1 ppm <i>Hydrogen Sulfide</i> gas - Supplied air

HEALTH EFFECTS	
<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation, severe burns, dermatitis and pigment change
<b>Acute:</b>	Nose, throat and lung irritation with coughing, wheezing and/or shortness of breath  Headache, dizziness, nausea and vomiting
<b>Chronic:</b>	Cancer (skin) in animals.  Bronchitis with cough, phlegm, and/or shortness of breath.

FIRST AID AND DECONTAMINATION	
<b>Remove</b> the person from exposure.	
<b>Immediately</b> flush with large amounts of water for at least 15 minutes, lifting upper and lower lids. Remove contact lenses, if worn, while flushing.	
<b>Quickly</b> remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water. Seek medical attention.	
<b>Begin</b> rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.	
<b>Transfer</b> promptly to a medical facility.	



Common Name: **ATRAZINE**

Synonyms: AAtrex®, Gesaprim®, Vectal

CAS No: 1912-24-9

Molecular Formula: C<sub>8</sub>H<sub>14</sub>ClN<sub>5</sub>

RTK Substance No: 0171

Description: White, crystalline solid which is often mixed with a liquid (carrier).

**HAZARD DATA**

<b>Hazard Rating</b>	<b>Firefighting</b>	<b>Reactivity</b>
<b>3 - Health</b> <b>0 - Fire</b> <b>1 - Reactivity</b>  <b>DOT#:</b> UN 2763 (Solid) UN 2998 (Liquid)  <b>ERG Guide #:</b> 151 <b>Hazard Class:</b> 6.1 (Poison)	- <b>Atrazine</b> is a noncombustible solid. However, it may be mixed with flammable or combustible "carrier" liquids.  - Use dry chemical, CO <sub>2</sub> , water spray or a foaming agent.  - POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Hydrogen Chloride</i> and <i>Nitrogen Oxides</i> .  - CONTAINERS MAY EXPLODE IN FIRE	- Incompatible with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) and STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE).

<b>SPILLS/LEAKS</b>
<p><b>Isolation Distance:</b> 50 meters for liquids (150 feet) 25 meters for solids (75 feet)</p> <ul style="list-style-type: none"> <li>- Dampen solid spills with water before collection.</li> <li>- Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.</li> <li>- DO NOT wash into sewer.</li> <li>- Hazardous to plants, soil organisms and aquatic organisms.</li> </ul>

<b>PHYSICAL PROPERTIES</b>	
<b>Odor Threshold:</b>	No information
<b>Flash Point:</b>	Noncombustible
<b>LEL:</b>	No information
<b>UEL:</b>	No information
<b>Vapor Density:</b>	No information
<b>Vapor Pressure:</b>	0.000003 mm Hg at 68°F (20°C)
<b>Water Solubility:</b>	Slightly soluble
<b>Boiling Point:</b>	Decomposes
<b>Ionization Potential:</b>	No information

<b>EXPOSURE LIMITS</b>	
<b>OSHA:</b>	N/A
<b>NIOSH:</b>	5 mg/m <sup>3</sup> 10-hr TWA
<b>ACGIH:</b>	5 mg/m <sup>3</sup> 8-hr TWA
<b>IDLH LEVEL:</b>	N/A

<b>PROTECTIVE EQUIPMENT</b>	
<b>Gloves:</b>	No information
<b>Coverall:</b>	No information
<b>Boot:</b>	No information
<b>Respirator:</b>	Supplied air

<b>HEALTH EFFECTS</b>	
<b>Eyes:</b>	Irritant
<b>Skin:</b>	Irritant
<b>Acute:</b>	Skin and eye irritation
<b>Chronic:</b>	Cancer - tested (Not Classifiable). Skin allergy, may affect the nervous system.

<b>FIRST AID AND DECONTAMINATION</b>	
<ul style="list-style-type: none"> <li>- Flush eyes with large amounts of water for at least 15 minutes.</li> <li>- Remove contact lenses, if worn, while rinsing.</li> <li>- Remove contaminated clothing. Wash contaminated skin with soap and water.</li> <li>- Remove the person from exposure.</li> <li>- Transfer to a medical facility.</li> </ul>	

Common Name: **BARIUM**

Synonyms: None

CAS No: 7440-39-3

Molecular Formula: Ba

RTK Substance No: 0180

Description: Silver to white, metallic, powder or solid

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<p><b>2 - Health</b></p> <p><b>3 - Fire</b></p> <p><b>2-W - Reactivity</b></p> <p><b>DOT#:</b> UN 1400</p> <p><b>ERG Guide #:</b> 138</p> <p><b>Hazard Class:</b> 4 (Flammable Solid)</p>	<p><b>Barium</b> is a <b>FLAMMABLE SOLID</b> that may ignite spontaneously in <b>AIR</b> or on contact with <b>WATER</b>.</p> <p>Use dry chemicals appropriate for extinguishing metal fires.</p> <p>DO NOT USE WATER, CO<sub>2</sub> or FOAM.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE.</p> <p>CONTAINERS MAY EXPLODE IN FIRE.</p>	<p><b>Barium</b> reacts violently with <b>WATER</b> and <b>MOIST AIR</b> to generate flammable and explosive <i>Hydrogen gas</i>.</p> <p>Mixtures of <i>finely divided Barium</i> and <b>HALOGENATED HYDROCARBONS</b> (such as <b>TRICHLOROETHYLENE</b> and <b>CARBON TETRACHLORIDE</b>) are explosive.</p> <p><b>Barium</b> is not compatible with <b>OXIDIZING AGENTS</b> (such as <b>PERCHLORATES</b>, <b>PEROXIDES</b>, <b>PERMANGANATES</b>, <b>CHLORATES</b>, <b>NITRATES</b>, <b>CHLORINE</b>, <b>BROMINE</b> and <b>FLUORINE</b>); <b>STRONG ACIDS</b> (such as <b>HYDROCHLORIC</b>, <b>SULFURIC</b> and <b>NITRIC</b>); <b>STRONG BASES</b> (such as <b>SODIUM HYDROXIDE</b> and <b>POTASSIUM HYDROXIDE</b>); <b>AMMONIA</b>; and <b>OXYGEN</b>.</p>

**SPILL/LEAKS**

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Cover with dry sand or earth to prevent ignition and place into sealed containers for disposal.

DO NOT wash into sewer.

**PHYSICAL PROPERTIES**

<b>Flash Point:</b>	Flammable solid
<b>Vapor Pressure:</b>	10 mm Hg at 1,920°F (1,049°C)
<b>Specific Gravity:</b>	3.5 (water = 1)
<b>Water Solubility:</b>	Reactive
<b>Boiling Point:</b>	2,084° to 2,979°F (1,140° to 1,637°C)
<b>Melting Point:</b>	1,310°F (710°C)
<b>Molecular Weight:</b>	137.34

**EXPOSURE LIMITS**

**ACGIH:** 0.5 mg/m<sup>3</sup>, 8-hr TWA

**IDLH:** 50 mg/m<sup>3</sup>

The Protective Action Criteria values are:

PAC-1 = 1.5 mg/m<sup>3</sup>

PAC-2 = 180 mg/m<sup>3</sup>

PAC-3 = 1,100 mg/m<sup>3</sup>

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Nitrile and Natural Rubber
<b>Coveralls:</b>	Tyvek®
<b>Respirator:</b>	>0.5 mg/m <sup>3</sup> - full facepiece APR with High efficiency filters >5 mg/m <sup>3</sup> - SCBA

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, wheezing and shortness of breath  Nausea, vomiting, irregular heartbeat, muscle weakness, tremors, paralysis and even death

**FIRST AID AND DECONTAMINATION**

- Remove** the person from exposure.
- Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
- Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.
- Begin** artificial respiration if breathing has stopped and CPR if necessary.
- Transfer** promptly to a medical facility.

Common Name: **BARIUM NITRATE**

Synonyms: Barium Dinitrate; Nitric Acid, Barium Salt

CAS No: 10022-31-8

Molecular Formula: BaN<sub>2</sub>O<sub>6</sub>

RTK Substance No: 0186

Description: Colorless to white, odorless, crystalline powder

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>2 - Health</b></p> <p><b>0 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p>DOT#: UN 1446</p> <p>ERG Guide #: 141</p> <p>Hazard Class: 5.1 (Oxidizer)</p>	<p><b>Barium Nitrate</b> is not combustible, but it is a STRONG OXIDIZER that enhances the combustion of other substances.</p> <p>Use water only. DO NOT USE CO<sub>2</sub> as an extinguishing agent.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> and <i>Barium Oxides</i>.</p> <p>Use water spray to keep fire-exposed containers cool.</p> <p><b>Barium Nitrate</b> may ignite combustibles (wood, paper and oil).</p>	<p><b>Barium Nitrate</b> may react with COMBUSTIBLES; CHEMICALLY ACTIVE METALS (such as ALUMINUM, MAGNESIUM and ZINC); and METAL POWDERS to cause a fire or explosion.</p> <p><b>Barium Nitrate</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC).</p>

### SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

DO NOT wash into sewer.

**Barium Nitrate** is a marine pollutant and may bioaccumulate.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Noncombustible
<b>Specific Gravity:</b>	3.24 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	Decomposes
<b>Melting Point:</b>	1,098°F (610°C)
<b>Molecular Weight:</b>	261.35

### EXPOSURE LIMITS

**OSHA:** 0.5 mg/m<sup>3</sup>, 8-hr TWA

**NIOSH:** 0.5 mg/m<sup>3</sup>, 10-hr TWA

**ACGIH:** 0.5 mg/m<sup>3</sup>, 8-hr TWA

**IDLH:** 50 mg/m<sup>3</sup>

(All the above are for *Barium*)

The Protective Action Criteria values are:

PAC-1 = 2.5 mg/m<sup>3</sup>    PAC-2 = 20 mg/m<sup>3</sup>

PAC-3 = 95.2 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Nitrile and Natural Rubber
<b>Coveralls:</b>	Tyvek®
<b>Respirator:</b>	>0.5 mg/m <sup>3</sup> - Full facepiece APR with <i>P100 filters</i> >50 mg/m <sup>3</sup> - SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, wheezing and shortness of breath  Nausea, vomiting, irregular heartbeat, muscle weakness, tremors, paralysis and death

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **BENDIOCARB**

Synonyms: Carbamic Acid, Methyl-, 2,3-(Dimethylenedioxy)Phenyl Ester; Ficam

CAS No: 22781-23-3

Molecular Formula: C<sub>11</sub>H<sub>13</sub>NO<sub>4</sub>

RTK Substance No: 0191

Description: Colorless to white, odorless powder

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b> <b>DOT#:</b> UN 2757 <b>ERG Guide #:</b> 151 <b>Hazard Class:</b> 6.1 (Poison)	Although <b>Bendiocarb</b> does not burn, it is often dissolved in a liquid carrier that may be flammable or combustible. Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> . Use water spray to keep fire-exposed containers cool.	<b>Bendiocarb</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); and REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES).

### SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

DO NOT wash into sewer.

**Bendiocarb** is toxic to birds and is a regulated marine pollutant.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Vapor Pressure:</b>	3.45 x 10 <sup>-5</sup> mm Hg at 77°F (25°C)
<b>Specific Gravity:</b>	1.25 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Melting Point:</b>	265°F (129°C)
<b>Molecular Weight:</b>	223.2

### EXPOSURE LIMITS

No occupational exposure limits have been established for **Bendiocarb**.

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Nitrile and Neoprene
<b>Coveralls:</b>	Tyvek®
<b>Respirator:</b>	Spill: full facepiece APR with <i>P100 High efficiency filter</i> cartridges  Fire: SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Mild irritation
<b>Skin:</b>	Mild irritation (skin absorbable)
<b>Inhalation:</b>	Headache, dizziness, blurred vision, tightness in the chest, sweating, muscle twitching and loss of coordination, convulsions, coma and death ( <i>Carbamate poisoning</i> )

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.  
**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.  
**Shampoo** hair immediately if contaminated.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** promptly to a medical facility.  
**Use** Atropine if symptoms develop.

Common Name: **BENZ(a)ANTHRACENE**

Synonyms: Naphthanthracene; Tetraphene

CAS No: 56-55-3

Molecular Formula: C<sub>18</sub>H<sub>12</sub>

RTK Substance No: 0193

Description: Odorless, colorless to yellow brown flake, plate or powder

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b>  <b>DOT#:</b> UN 3077 <b>ERG Guide #:</b> 171  <b>Hazard Class:</b> 9 (Environmentally hazardous substance)	<b>Benz(a)Anthracene</b> may burn, but does not readily ignite.  Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents.  <b>POISONOUS GASES ARE PRODUCED IN FIRE.</b>  Use water spray to keep fire-exposed containers cool.	<b>Benz(a)Anthracene</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).

**SPILL/LEAKS**

**Isolation Distance:**

Small Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and deposit in sealed containers.

Bioaccumulation may occur in seafood.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	May burn
<b>Vapor Pressure:</b>	2 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.3 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	820°F (438°C)
<b>Melting Point:</b>	324°F (162°C)
<b>Molecular Weight:</b>	228.3

**EXPOSURE LIMITS**

<b>OSHA:</b>	0.2 mg/m <sup>3</sup> , 8-hr TWA (as <i>Coal Tar Pitch Volatiles, Benzene soluble fraction</i> )
<b>NIOSH:</b>	0.1 mg/m <sup>3</sup> , 10-hr TWA (as <i>Coal Tar Pitch Volatiles, Cyclohexane-extractable fraction</i> )
<b>ACGIH:</b>	Lowest level possible
<b>IDLH:</b>	80 mg/m <sup>3</sup> (as <i>Coal Tar Pitch Volatiles</i> )
<b>PAC LEVELS:</b>	PAC-1 = 0.6 mg/m <sup>3</sup> ; PAC-2 = 120 mg/m <sup>3</sup> ; PAC-3 = 700 mg/m <sup>3</sup>

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Nitrile and Natural Rubber
<b>Coveralls:</b>	DuPont Tyvek®
<b>Respirator:</b>	>0.1 mg/m <sup>3</sup> - Supplied Air

**HEALTH EFFECTS**

<b>Eyes:</b>	No information available
<b>Skin:</b>	No information available
<b>Inhalation:</b>	No information available
<b>Chronic:</b>	Cancer (liver and lung) in animals

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Remove** contaminated clothing and wash contaminated skin with soap and water.

**Transfer** to a medical facility.

Common Name: **BENZ(a)ANTHRACENE, 7,12-DIMETHYL-**

Synonyms: 7,12 DMBA; 9,10-Dimethyl-1,2-Benzanthracene

CAS No: 57-97-6

 Molecular Formula: C<sub>20</sub>H<sub>16</sub>

RTK Substance No: 0194

Description: Yellow to greenish-yellow, crystalline solid or yellow powder

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>2 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 3077 ERG Guide #: 171 Hazard Class: 9 (Environmentally Hazardous Material)	COMBUSTIBLE SOLID Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> and <i>Sulfur Oxides</i> . Use water spray to keep fire-exposed containers cool.	<b>Benz(a)Anthracene, 7,12-Dimethyl-</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); and STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE).

**SPILL/LEAKS**
**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and deposit into sealed containers.

DO NOT wash into sewer.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	187°F (86°C)
<b>Water Solubility:</b>	Insoluble
<b>Melting Point:</b>	252° to 253°F (122° to 123°C)
<b>Molecular Weight:</b>	256.4

**EXPOSURE LIMITS**
**OSHA:** 0.2 mg/m<sup>3</sup>, 8-hr TWA

**NIOSH:** 0.1 mg/m<sup>3</sup>, 10-hr TWA

**ACGIH:** Lowest level possible

**IDLH:** 80 mg/m<sup>3</sup>

 (All the above are for *Coal Tar Pitch Volatiles*)

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Polyvinyl Alcohol, Silver Shield®/4H® and Viton
<b>Coveralls:</b>	DuPont Tyvek®
<b>Respirator:</b>	>0.1 mg/m <sup>3</sup> (as <i>Coal Tar Pitch Volatiles</i> ) - Supplied air

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, wheezing and shortness of breath
<b>Chronic:</b>	Cancer (skin, lung, mammary) in animals

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.  
**Quickly** remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** promptly to a medical facility.



Common Name: **BENZENE**

Synonyms: Benzin; Benzol; Phenyl Hydride

CAS No: 71-43-2

 Molecular Formula: C<sub>6</sub>H<sub>6</sub>

RTK Substance No: 0197

 Description: Clear, colorless liquid with a sweet *Petroleum*-like odor

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>4 - Health</b> <b>3 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 1114 ERG Guide #: 130 Hazard Class: 3 (Flammable)	<b>FLAMMABLE LIQUID</b> Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. Use water as fog, as spray may be ineffective and may scatter and spread fire. POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE. Use water spray to reduce vapors and keep containers cool. Vapors may travel to a source of ignition and flash back. Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.	<b>Benzene</b> reacts violently or explosively with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC). <b>Benzene</b> ignites on contact with CHROMIC ANHYDRIDE. <b>Benzene</b> is not compatible with LIQUID OXYGEN, HYDROGEN, and RANEY NICKEL.

**SPILL/LEAKS**
**Isolation Distance:**

Small Spill: 30 meters (100 feet)

Large Spill: 60 meters (200 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.

 Keep **Benzene** out of confined spaces, such as sewers, because of the possibility of an explosion.

DO NOT wash into sewer.

**Benzene** is very toxic to aquatic organisms.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	12 ppm
<b>Flash Point:</b>	12°F (-11°C)
<b>LEL:</b>	1%
<b>UEL:</b>	8%
<b>Auto Ignition Temp:</b>	928° to 1,076°F (498° to 580°C)
<b>Vapor Density:</b>	2.7 (air = 1)
<b>Vapor Pressure:</b>	75 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	0.88 (water = 1)
<b>Water Solubility:</b>	Slightly soluble
<b>Boiling Point:</b>	176°F (80°C)
<b>Freezing Point:</b>	42°F (6°C)
<b>Ionization Potential:</b>	9.24 eV
<b>Molecular Weight:</b>	78.1

**EXPOSURE LIMITS**

<b>OSHA:</b>	1 ppm, 8-hr TWA; 5 ppm, 15-min STEL
<b>NIOSH:</b>	0.1 ppm, 10-hr TWA; 1 ppm, 15-min STEL
<b>ACGIH:</b>	0.5 ppm, 8-hr TWA; 2.5 ppm, 15-min STEL
<b>IDLH:</b>	500 ppm
	ERPG-1: 50 ppm; ERPG-2: 150 ppm
	ERPG-3: 1,000 ppm

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Polyvinyl Alcohol, Silver Shield®/4H®, Viton and Fluoroelastomer (>8-hr breakthrough)
<b>Coveralls:</b>	Tychem® CPF 3, F, BR, LV, Responder®, and TK; Zytron® 300; and ONESuit® TEC (>8-hr breakthrough for <i>Hydrocarbons, Aromatic</i> )
<b>Respirator:</b>	>0.5 ppm - Supplied air or SCBA

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose and throat irritation with coughing and wheezing Headache, dizziness, convulsions and coma
<b>Chronic:</b>	Cancer (leukemia) in humans

**FIRST AID AND DECONTAMINATION**

<b>Remove</b>	the person from exposure.
<b>Flush</b>	eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
<b>Quickly</b>	remove contaminated clothing and wash contaminated skin with large amounts of soap and water.
<b>Begin</b>	artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b>	promptly to a medical facility.

Common Name: **BENZIDINE**

Synonyms: 4,4'-Bianiline; Diphenylenediamine

CAS No: 92-87-5

Molecular Formula: C<sub>12</sub>H<sub>12</sub>N<sub>2</sub>

RTK Substance No: 0204

Description: White to grayish-yellow or reddish powder, darkens on exposure to light or air.

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>4 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b>  <b>DOT ID #: UN 1885</b> <b>ERG Guide #: 153</b> <b>Hazard Class: 6.1</b> (Poisonous Material)	<b>Benzidine</b> may burn, but does not readily ignite. Use dry chemical, CO <sub>2</sub> , water spray, an alcohol-resistant foam or other foaming agent. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> . Use water spray to keep fire-exposed containers cool.	<b>Benzidine</b> may react violently with NITRIC ACID and OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).  <b>Benzidine</b> is not compatible with HEAT and SUNLIGHT.

### SPILL/LEAKS

**Isolation Distance:** 25 to 50 meters  
(80 to 160 feet)

Use a vacuum with a HEPA filter or a wet method to reduce dust during clean-up. **DO NOT DRY SWEEP.**

Toxic to aquatic organisms.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	No Information
<b>Flash Point:</b>	No Information
<b>LEL:</b>	N/A
<b>UEL:</b>	N/A
<b>Relative Density:</b>	1.25 (water = 1)
<b>Relative Vapor Density:</b>	6.36 (air = 1)
<b>Water Solubility:</b>	Soluble in hot water
<b>Boiling Point:</b>	752°F (400°C)
<b>Melting Point:</b>	239°F (115°C)

### EXPOSURE LIMITS

<b>OSHA:</b>	Lowest feasible level
<b>NIOSH:</b>	Lowest feasible level
<b>ACGIH:</b>	Eliminate exposure if possible
<b>IDLH LEVEL:</b>	No Information

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Rubber, Nitrile
<b>Coverall:</b>	DuPont Tychem® fabrics (for <b>Benzidine</b> in 25% <i>Methanol</i> )
<b>Boot:</b>	Rubber
<b>Respirator:</b>	Supplied air

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Acute:</b>	Nose and throat irritation
<b>Chronic:</b>	Cancer (bladder) in humans Skin allergy with itching and rash

### FIRST AID AND DECONTAMINATION

Remove the person from exposure.  
 Flush eyes with large amounts of water for at least 15 minutes.  
 Remove contact lenses if worn.  
 Remove contaminated clothing. Wash contaminated skin with soap and water.  
 Transfer promptly to a medical facility.

Common Name: **BENZIMIDAZOLE, 4,5-DICHLORO-2-TRIFLUOROMETHYL)-**

Synonyms: Chloroflurazole

CAS No: 3615-21-2

Molecular Formula: C<sub>8</sub>H<sub>3</sub>Cl<sub>2</sub>F<sub>3</sub>N<sub>2</sub>

RTK Substance No: 2908

Description: White, crystalline solid or the commercial product may be brownish

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>1 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b> <b>DOT#:</b> UN 3077 <b>ERG Guide #:</b> 151 <b>Hazard Class:</b> 9 (Environmentally Hazardous Material)	<b>Benzimidazole, 4,5-Dichloro-2-(Trifluoromethyl)-</b> may burn, but does not readily ignite. Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. <b>POISONOUS GASES ARE PRODUCED IN FIRE,</b> including <i>Nitrogen Oxides, Chlorine and Fluorine.</i>	<b>Benzimidazole, 4,5-Dichloro-2-(Trifluoromethyl)-</b> may not be compatible with ISOCYANATES; OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES); HALOGENATED ORGANICS (such as METHYLENE CHLORIDE); EPOXIDES; PHENOLS; and ACID HALIDES (such as ACETYL CHLORIDE).

### SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

DO NOT wash into sewer.

### PHYSICAL PROPERTIES

**Flash Point:** May burn

**Vapor Pressure:** 4 x 10<sup>-5</sup> mm Hg at 72.5°F (22.5°C)

**Water Solubility:** Very slightly soluble

**Melting Point:** 415° to 417°F (213° to 214°C)

**Molecular Weight:** 255

### EXPOSURE LIMITS

No occupational exposure limits have been established for **Benzimidazole, 4,5-Dichloro-2-(Trifluoromethyl)-**.

The Protective Action Criteria values are:

PAC-1 = 7.5 mg/m<sup>3</sup>

PAC-2 = 13 mg/m<sup>3</sup>

PAC-3 = 13 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

**Gloves:** Nitrile and Natural Rubber

**Coveralls:** Tyvek®

**Respirator:** Full facepiece APR with *High efficiency filters*  
>7.5 mg/m<sup>3</sup> - SCBA

### HEALTH EFFECTS

**Eyes:** Irritation

**Skin:** Irritation

**Inhalation:** Nose and throat irritation.

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Remove** contaminated clothing and wash contaminated skin with water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **BENZOIC ACID**

Synonyms: Benzenecarboxylic Acid; Benzoate; Carboxybenzene

CAS No: 65-85-0

Molecular Formula: C<sub>7</sub>H<sub>6</sub>O<sub>2</sub>

RTK Substance No: 0209

Description: White, crystalline powder with a faint, pleasant odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>1 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b> <b>DOT#:</b> UN 3077 <b>ERG Guide #:</b> 171 <b>Hazard Class:</b> 9 (Miscellaneous Hazardous Materials)	<b>Benzoic Acid</b> may burn, but does not readily ignite. Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. Water or foam may cause frothing. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Phenol</i> and <i>Benzene</i> . Use water spray to keep fire-exposed containers cool. <i>Vapor</i> from <i>molten Benzoic Acid</i> may form explosive mixtures.	<b>Benzoic Acid</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE). Water solutions of <b>Benzoic Acid</b> can react with METALS to form flammable and explosive <i>Hydrogen gas</i> .

### SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

DO NOT wash into sewer.

**Benzoic Acid** may damage the environment.

### PHYSICAL PROPERTIES

**Odor Threshold:** Faint, pleasant odor

**Flash Point:** 250°F (121°C)

**Auto Ignition Temp:** 1,058°F (570°C)

**Vapor Density:** 4.2 (air = 1)

**Vapor Pressure:** 1 mm Hg at 205°F (96°C)

**Specific Gravity:** 1.3 (water = 1)

**Water Solubility:** Slightly soluble

**Boiling Point:** 482°F (250°C)

**Melting Point:** 252°F (122°C)

**Molecular Weight:** 122.1

### EXPOSURE LIMITS

The Protective Action Criteria values are:

PAC-1 = 12.5 mg/m<sup>3</sup>

PAC-2 = 75 mg/m<sup>3</sup>

PAC-3 = 400 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

**Gloves:** Butyl and Neoprene

**Coveralls:** Tychem® BR, Responder® and TK; and Trelchem® HPS and VPS (>8-hr breakthrough for *Acids, Carboxylic*)

**Respirator:** >12.5 mg/m<sup>3</sup> - SCBA

### HEALTH EFFECTS

**Eyes:** Irritation and possible damage

**Skin:** Irritation, rash, redness and burning feeling on contact

**Inhalation:** Nose, throat and lung irritation with coughing, wheezing and shortness of breath

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **BENZO(a)PYRENE**

Synonyms: 3,4-Benzopyrene; B[a]P

CAS No: 50-32-8

Molecular Formula: C<sub>20</sub> H<sub>12</sub>

RTK Substance No: 0207

Description: Pale yellow, crystalline solid or powder

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>4 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b>  DOT#: UN 3077 ERG Guide #: 171 Hazard Class: 9 (Miscellaneous Hazardous Materials)	<b>Benzo(a)pyrene</b> may burn, but does not readily ignite.  Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents.  POISONOUS GASES ARE PRODUCED IN FIRE.	<b>Benzo(a)pyrene</b> reacts with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) to cause fires and explosions.

### SPILL/LEAKS

**Isolation Distance:** 50 meters (150 feet)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up.

Toxic to aquatic organisms.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Faint aromatic odor
<b>Flash Point:</b>	No information
<b>Specific Gravity:</b>	1.35
<b>Vapor Density:</b>	8.7 (air = 1)
<b>Vapor Pressure:</b>	5.49 X 10 <sup>9</sup> mm Hg at 77°F (25°C)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	590° - 594°F (310° - 312°C)
<b>Melting Point:</b>	347° - 354 F (175° - 179°C)

### EXPOSURE LIMITS

<b>OSHA:</b>	0.2 mg/m <sup>3</sup> , 8-hr TWA (as Benzene soluble fraction)
<b>NIOSH:</b>	0.1 mg/m <sup>3</sup> , 10-hr TWA (as Cyclohexane-extractable fraction)
<b>ACGIH:</b>	0.2 mg/m <sup>3</sup> , 8-hr TWA (as Benzene soluble aerosol)
<b>IDLH LEVEL:</b>	80 mg/m <sup>3</sup> (All above as <i>Coal Tar Pitch Volatiles</i> )
<b>PAC LEVELS:</b>	PAC-1 = 0.6 mg/m <sup>3</sup> ; PAC-2 = 120 mg/m <sup>3</sup> ; PAC-3 = 700 mg/m <sup>3</sup>

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Ansell Barrier, Polyvinyl Alcohol, Viton
<b>Coveralls:</b>	DuPont Tychem® C3, TF, Responder® (all >8-hr permeation time)
<b>Boots:</b>	No information
<b>Respirator:</b>	>0.1 mg/m <sup>3</sup> -Pressure demand supplied-air >80 mg/m <sup>3</sup> - Pressure demand SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation, rash and burning feeling
<b>Chronic:</b>	Cancer (skin and lung) in humans. May affect the developing fetus Thickening and darkening of the skin and warts.

### FIRST AID AND DECONTAMINATION

<b>Remove</b>	the person from exposure.
<b>Flush</b>	eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
<b>Remove</b>	contaminated clothing and wash contaminated skin with soap and water.
<b>Transfer</b>	to a medical facility.

Common Name: **BENZOYL CHLORIDE**

Synonyms: Benzene Carbonyl Chloride; alpha-Chlorobenzaldehyde

CAS No: 98-88-4

Molecular Formula: C<sub>7</sub>H<sub>5</sub>OCl

RTK Substance No: 0214

Description: Clear, colorless, fuming liquid with a pungent odor

**HAZARD DATA**

<b>Hazard Rating</b>	<b>Firefighting</b>	<b>Reactivity</b>
<p><b>3 - Health</b></p> <p><b>2 - Fire</b></p> <p><b>2-W - Reactivity</b></p> <p><b>DOT#:</b> UN 1736</p> <p><b>ERG Guide #:</b> 137</p> <p><b>Hazard Class:</b> 8 (Corrosive)</p>	<p>COMBUSTIBLE AND REACTIVE LIQUID Use dry chemical or CO<sub>2</sub> as extinguishing agents. DO NOT USE WATER or FOAM.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Hydrogen Chloride</i> and <i>Phosgene</i>. CONTAINERS MAY EXPLODE IN FIRE.</p> <p>Use water spray only to keep fire-exposed containers cool.</p>	<p><b>Benzoyl Chloride</b> reacts violently with WATER and STEAM to produce toxic <i>Hydrogen Chloride gas</i>.</p> <p><b>Benzoyl Chloride</b> reacts with and/or decomposes on contact with ALCOHOLS; STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); DIMETHYL SULFOXIDE; mixtures of ALUMINUM CHLORIDE and NAPHTHALENE; OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); ALKALI METALS (such as LITHIUM, SODIUM and POTASSIUM); and AMINES.</p> <p><b>Benzoyl Chloride</b> will react with METALS (in the presence of MOISTURE or WATER) to form flammable and explosive <i>Hydrogen gas</i>.</p>

**SPILL/LEAKS**

**Isolation Distance:**

Small Spill: 150 meters (500 feet)

Large Spill: 1,000 meters (3,000 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.

DO NOT USE WATER OR WET METHOD.

DO NOT wash into sewer.

Harmful to aquatic life at low concentrations.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	Pungent
<b>Flash Point:</b>	162°F (72°C)
<b>LEL:</b>	1.2%
<b>UEL:</b>	4.9%
<b>Vapor Density:</b>	4.9 (air = 1)
<b>Vapor Pressure:</b>	0.4 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.2 (water = 1)
<b>Water Solubility:</b>	Reactive/Decomposes
<b>Boiling Point:</b>	387°F (197°C)
<b>Melting Point:</b>	30°F (-1°C)
<b>Ionization Potential:</b>	9.53 +/- 1
<b>Molecular Weight:</b>	140.6

**EXPOSURE LIMITS**

<b>OSHA:</b>	None
<b>NIOSH:</b>	None
<b>ACGIH:</b>	0.5 ppm, Ceiling
<b>IDLH:</b>	None

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Polyvinyl Alcohol and Viton (>8-hr breakthrough)
<b>Coveralls:</b>	DuPont Tychem® F, CPF 3, BR, LV, CSM, Responder®, and TK; Kappler® Zytron® 500; and Saint-Gobain® ONE Suit® TEC (8-hr breakthrough for <i>aromatic Acid Halides, Carboxylic</i> )
<b>Respirator:</b>	>0.5 ppm - Supplied air

**HEALTH EFFECTS**

<b>Eyes:</b>	Severe irritation and burns
<b>Skin:</b>	Severe irritation and burns
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, wheezing and severe shortness of breath (pulmonary edema)
<b>Chronic:</b>	<i>alpha-Chlorinated Toluenes</i> and <i>Benzoyl Chlorides</i> cause cancer (lung) in humans

**FIRST AID AND DECONTAMINATION**

<b>Remove</b> the person from exposure.
<b>Flush</b> eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention immediately.
<b>Quickly</b> remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention immediately.
<b>Begin</b> artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b> promptly to a medical facility.
<b>Medical</b> observation is recommended as symptoms may be delayed.



Common Name: **BENZOYL PEROXIDE**

Synonyms: Benoxyl; Benzoperoxide; Dibenzoyl Peroxide

CAS No: 94-36-0

Molecular Formula: C<sub>14</sub>H<sub>10</sub>O<sub>4</sub>

RTK Substance No: 0215

Description: White, granular or crystalline solid with a faint odor, which is often diluted with an unreactive organic solvent, such as *Phthalate Ester*

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>2 - Health</b></p> <p><b>4 - Fire</b></p> <p><b>4 - Reactivity</b></p> <p><b>DOT#:</b> UN 3104</p> <p><b>ERG Guide #:</b> 146</p> <p><b>Hazard Class:</b> 5.2 (Organic Peroxide)</p>	<p>Use water or water spray. <b>DO NOT USE HALOGENATED AGENTS.</b></p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Benzoic Acid</i>.</p> <p>CONTAINERS MAY EXPLODE IN FIRE.</p> <p>Use water spray to keep fire-exposed containers cool.</p> <p><b>Benzoyl Peroxide</b> may ignite combustibles (wood, paper and oil).</p>	<p><b>Benzoyl Peroxide</b> is a STRONG OXIDIZER which can react violently with COMBUSTIBLES (such as WOOD, OIL and PAPER); LITHIUM; ALUMINUM HYDRIDE; DIMETHYL ANILINE; AMINES; METALLIC NAPHTHENATES; ALCOHOLS; INORGANIC and ORGANIC ACIDS; STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); ETHERS, OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); and REDUCING AGENTS.</p> <p>Containers of <b>Benzoyl Peroxide</b> must be protected from HEAT, IMPACT, BLOWS, SHOCKS, FRICTION or STATIC DISCHARGE since explosions may occur.</p> <p><b>Benzoyl Peroxide</b> is not compatible with METALS, DIRECT SUNLIGHT, RUBBER, and COATINGS.</p>

### SPILL/LEAKS

**Isolation Distance:** 50 meters or 150 feet for liquids

25 meters or 75 feet for solids

Mix spilled material with water or wetted vermiculite and deposit into polyethylene-lined or plastic containers.

### PHYSICAL PROPERTIES

**Odor Threshold:** Faint odor

**Flash Point:** 104°F (40°C)

**Auto ignition Temperature:** 176°F (80°C)

**Specific Gravity:** 1.334

**Vapor Pressure:** Less than 1 mm Hg at 68°F (20°C)

**Water Solubility:** Slightly soluble

**Melting Point:** Decomposes explosively at 217° to 223°F (103°C to 106°C)

### EXPOSURE LIMITS

**OSHA:** 5 mg/m<sup>3</sup>, 8-hr TWA

**NIOSH:** 5 mg/m<sup>3</sup>, 10-hr TWA

**ACGIH:** 5 mg/m<sup>3</sup>, 8-hr TWA

**IDLH LEVEL:** 1,500 mg/m<sup>3</sup>

The Protective Action Criteria values are:  
 PAC-1 = 15 mg/m<sup>3</sup>    PAC-2 = 1,200 mg/m<sup>3</sup>  
 PAC-3 = 7,000 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

**Gloves:** Neoprene

**Coveralls:** *DuPont Tychem® Polycoat, QC, CPF1, SL* and *CPF2* for solid **Benzoyl Peroxide**

**Boots:** Neoprene

**Respirator:** > 5 mg/m<sup>3</sup> APR with High Efficiency filters  
> 50 mg/m<sup>3</sup> SA, > 1500 mg/m<sup>3</sup> SCBA

### HEALTH EFFECTS

**Eyes:** Irritation

**Skin:** Irritation

**Acute:** Nose and throat irritation with coughing and wheezing

**Chronic:** Skin allergy with itching and skin rash. Asthma-like allergy with shortness of breath, wheezing and coughing.

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.

**Remove** contaminated clothing. Wash contaminated skin with soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** to a medical facility.

Common Name: **BENZYL CHLORIDE**

Synonyms: Chloromethyl Benzene; alpha-Chlorotoluene

CAS No: 100-44-7

Molecular Formula: C<sub>6</sub>H<sub>5</sub>CH<sub>2</sub>Cl

RTK Substance No: 0217

Description: Colorless liquid with a strong, irritating odor that causes tearing of the eyes

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>2 - Fire</b> <b>1 - Reactivity</b> <b>DOT#:</b> UN 1738 <b>ERG Guide #:</b> 156 <b>Hazard Class:</b> 6.1 (Toxic)	COMBUSTIBLE LIQUID Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Hydrogen Chloride</i> . CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool. Unstabilized <b>Benzyl Chloride</b> may violently decompose, especially in the presence of METALS.	<b>Benzyl Chloride</b> reacts with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC). <b>Benzyl Chloride</b> polymerizes and releases heat and Hydrogen Chloride when in contact with most COMMON METALS (such as ALUMINUM, COPPER, IRON, TIN and ZINC). This reaction DOES NOT occur with <i>Nickel</i> and <i>Lead</i> . Sodium Carbonate, Triethylamine or Propylene Oxide can be used to stabilize <b>Benzyl Chloride</b> .

### SPILL/LEAKS

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in dry sand, earth, or a similar material and place into sealed containers for disposal.

Place into nonmetallic containers for disposal.

Use only non-sparking tools and equipment, especially when opening and closing containers of **Benzyl Chloride**.

DO NOT wash into sewer.

For water spills apply activated carbon at 10 times the spilled amount.

**Benzyl Chloride** is toxic to aquatic organisms.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	0.041 ppm
<b>Flash Point:</b>	153°F (67°C)
<b>LEL:</b>	1.1%
<b>UEL:</b>	14%
<b>Auto Ignition Temp:</b>	977° to 1,161°F (525° to 627°C)
<b>Vapor Density:</b>	4.4 (water = 1)
<b>Vapor Pressure:</b>	11.8 mm Hg at 77°F (25°C)
<b>Specific Gravity:</b>	1.1 (air = 1)
<b>Water Solubility:</b>	Very slightly soluble
<b>Boiling Point:</b>	354°F (178.9°C)
<b>Freezing Point:</b>	-45° to -54°F (-43° to -48°C)
<b>Ionization Potential:</b>	<10.6 (can be detected by a PID)
<b>Molecular Weight:</b>	126.58

### EXPOSURE LIMITS

**OSHA:** 1 ppm, 8-hr TWA

**NIOSH:** 1 ppm, 15-min Ceiling

**ACGIH:** 1 ppm, 8-hr TWA

**IDLH:** 10 ppm

The Protective Action Criteria values are:

PAC-1 = 1 ppm    PAC-2 = 10 ppm    PAC-3 = 50 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	SilverShield®/4H® (>8-hr breakthrough)
<b>Coveralls:</b>	Tychem® BR, CSM and TK (>8-hr breakthrough)
<b>Respirator:</b>	SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Severe irritation, burns and possible eye damage
<b>Skin:</b>	Irritation and burns (skin absorption possible)
<b>Inhalation:</b>	Nose, throat and lung irritation, with coughing, and severe shortness of breath (pulmonary edema) Headache, dizziness, weakness and irritability
<b>Chronic:</b>	Cancer (thyroid) in animals

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention immediately.  
**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** promptly to a medical facility.  
**Medical** observation is recommended as symptoms may be delayed.

Common Name: **BERYLLIUM SULFATE**

Synonyms: Beryllium Sulphate

CAS No: 13510-49-1

 Molecular Formula: BeSO<sub>4</sub>

RTK Substance No: 3084

Description: Odorless, colorless, crystalline solid

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>4 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 1566 ERG Guide #: 154 Hazard Class: 6.1 (Poison)	Extinguish fire using an agent suitable for type of surrounding fire. <b>Beryllium Sulfate</b> itself does not burn. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Beryllium Oxide</i> , <i>Sulfur Oxides</i> , and <i>Sulfuric Acid</i> . Use water spray to keep fire-exposed containers cool.	<b>Beryllium Sulfate</b> reacts violently with CARBON DUST; and FINELY DIVIDED ALUMINUM, MAGNESIUM and POTASSIUM. <b>Beryllium Sulfate</b> is not compatible with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); MOLTEN LITHIUM; and CHLORINATED HYDROCARBONS.

## SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and deposit into sealed containers.

DO NOT wash into sewer.

**Beryllium Sulfate** is very toxic to the aquatic environment.

## PHYSICAL PROPERTIES

**Odor Threshold:** Odorless

**Flash Point:** Nonflammable

**Specific Gravity:** 2.4 (water = 1)

**Water Solubility:** Soluble

**Melting Point:** 1,004°F to 1,022°F (540° to 550°C)

**Molecular Weight:** 105

## EXPOSURE LIMITS

**OSHA:** 0.002 mg/m<sup>3</sup>, 8-hr TWA; 0.005 mg/m<sup>3</sup>, 30-min Ceiling; 0.025 mg/m<sup>3</sup>, Peak

**NIOSH:** 0.0005 mg/m<sup>3</sup>, Ceiling

**ACGIH:** 0.00005 mg/m<sup>3</sup>, 8-hr TWA; 0.0002 mg/m<sup>3</sup>, STEL

**IDLH:** 4 mg/m<sup>3</sup>

 (All of the above are for *Beryllium*)

## PROTECTIVE EQUIPMENT

**Gloves:** Nitrile and Natural Rubber

**Coveralls:** Tyvek®

**Respirator:** Supplied air or SCBA

## HEALTH EFFECTS

**Eyes:** Irritation, redness, itching and burning

**Skin:** Irritation and burns

**Inhalation:** Nose, throat and lung irritation with nasal discharge, tightness in the chest, cough, shortness of breath, and fever

**Chronic:** *Beryllium* and *Beryllium compounds* cause lung cancer in humans and animals

## FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention

**Quickly** remove contaminated clothing, and wash contaminated skin with large amounts of water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility

Common Name: **BIPHENTHRIN**

Synonyms: Bifenthrin; Scorpion®; Talstar®

CAS No: 82657-04-3

 Molecular Formula:  $C_{23}H_{22}ClF_3O_2$ 

RTK Substance No: 3194

Description: Off-white to tan, waxy solid with a faint, slightly sweet odor, often found in a thick, brown, oily solution

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>2 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 3349 ERG Guide #: 151 Hazard Class: 6.1 (Poison)	COMBUSTIBLE SOLID or LIQUID Use dry chemical, CO <sub>2</sub> , alcohol-resistant foam or other foam extinguishing agents, as water may not be effective in fighting fires. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Chlorine</i> , <i>Fluorine</i> , <i>Hydrogen Chloride</i> and <i>Hydrogen Fluoride</i> . Use water spray to keep fire-exposed containers cool.	<b>Bifenthrin</b> may react with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) to cause a fire or explosion. <b>Bifenthrin</b> is not compatible with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); LIME; and OXYGEN.

## SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids with clay, dry sand or soil.

 Wash area with a solution of caustic or soda ash and an alcohol (such as *Methanol* or *Isopropanol*). Then wash area with soap and water.

DO NOT wash into sewer.

**Bifenthrin** is highly toxic to fish and aquatic life.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Slightly sweet odor
<b>Flash Point:</b>	165°F (74°C) (Technical grade)
<b>Vapor Pressure:</b>	$1.8 \times 10^{-7}$ mm Hg at 77°F (25°C)
<b>Specific Gravity:</b>	1.2 (water = 1)
<b>Water Solubility:</b>	Insoluble (disperses)
<b>Melting Point:</b>	135° to 158°F (57° to 70°C)
<b>Molecular Weight:</b>	422.9
<b>pH:</b>	6.7

## EXPOSURE LIMITS

**OSHA:** 5 mg/m<sup>3</sup>, 8-hr TWA

**NIOSH:** 5 mg/m<sup>3</sup>, 10-hr TWA

**ACGIH:** 5 mg/m<sup>3</sup>, 8-hr TWA

**IDLH:** 5,000 mg/m<sup>3</sup>

 (All of the above are for *Pyrethrum*)

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Nitrile, Neoprene, Natural Rubber and Polyvinyl Chloride
<b>Coveralls:</b>	Tyvek®
<b>Respirator:</b>	> 5 mg/m <sup>3</sup> - Full facepiece APR with Organic vapor cartridge and particulate prefilters >50 mg/m <sup>3</sup> - Supplied air

## HEALTH EFFECTS

<b>Eyes:</b>	Irritation, burning and itching
<b>Skin:</b>	Rash, redness, burning feeling, tingling and itching
<b>Inhalation:</b>	Nose and throat irritation with sneezing, coughing and wheezing Headache, nausea and vomiting, dizziness and convulsions

## FIRST AID AND DECONTAMINATION

<b>Remove</b> the person from exposure.
<b>Flush</b> eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
<b>Quickly</b> remove contaminated clothing and wash contaminated skin with large amounts of soap and water.
<b>Begin</b> artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b> promptly to a medical facility

Common Name: **BIS(2-CHLOROETHYL) ETHER**

Synonyms: DCEE; 2,2-Dichlorodiethyl Ether; Diethylene Glycol Dichloride

CAS No: 111-44-4

 Molecular Formula: C<sub>4</sub>H<sub>8</sub>Cl<sub>2</sub>O

RTK Substance No: 0232

Description: Clear, colorless liquid with a strong odor

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>2 - Fire</b> <b>1 - Reactivity</b> DOT#: UN 1916 ERG Guide #: 152 Hazard Class: 6.1 (Poison)	COMBUSTIBLE LIQUID Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Hydrogen Chloride</i> . Use water spray to keep fire-exposed containers cool. <b>Bis(2-Chloroethyl) Ether</b> may form an ignitable vapor/air mixture in closed tanks or containers at temperatures above 131°F (55°C).	Uninhibited <b>Bis(2-Chloroethyl) Ether</b> can form explosive <i>Peroxides</i> on exposure to AIR and LIGHT. <b>Bis(2-Chloroethyl) Ether</b> reacts violently with CHLOROSULFONIC ACID and OLEUM. <b>Bis(2-Chloroethyl) Ether</b> decomposes with exposure to WATER, MOISTURE or STEAM to form toxic and corrosive <i>Hydrogen Chloride gas</i> . <b>Bis(2-Chloroethyl) Ether</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); METALS; and METAL POWDERS.

## SPILL/LEAKS

## Isolation Distance:

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in dry sand, earth, or a similar material and place into sealed containers for disposal.

DO NOT wash into sewer.

**Bis(2-Chloroethyl) Ether** is a marine pollutant.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	0.049 ppm
<b>Flash Point:</b>	131°F (55°C)
<b>LEL:</b>	2.7%
<b>UEL:</b>	Not determined
<b>Auto Ignition Temp:</b>	696°F (367°C)
<b>Vapor Density:</b>	4.9 (air = 1)
<b>Vapor Pressure:</b>	0.7 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.22 (water = 1)
<b>Water Solubility:</b>	Very slightly soluble/Reactive
<b>Boiling Point:</b>	352°F (178°C)
<b>Freezing Point:</b>	-62°F (-52°C)
<b>Molecular Weight:</b>	143

## EXPOSURE LIMITS

**OSHA:** 15 ppm, 8-hr TWA

**NIOSH:** 5 ppm, 10-hr TWA; 10 ppm, STEL

**ACGIH:** 5 ppm, 8-hr TWA; 10 ppm, STEL

**IDLH:** 100 ppm

The Protective Action Criteria values are:

PAC-1 = 10 ppm PAC-2 = 25.7 ppm PAC-3 = 100 ppm

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	SilverShield®/4H® and Barrier (>8-hr breakthrough for <i>Ethers, aliphatic</i> )
<b>Coveralls:</b>	Tychem® BR, Responder® and TK (>8-hr breakthrough)
<b>Respirator:</b>	SCBA

## HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns
<b>Inhalation:</b>	Nose, throat and lung irritation, with coughing, and severe shortness of breath (pulmonary edema)
<b>Chronic:</b>	Cancer (liver) in animals

## FIRST AID AND DECONTAMINATION

<b>Remove</b>	the person from exposure.
<b>Flush</b>	eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.
<b>Quickly</b>	remove contaminated clothing and wash contaminated skin with large amounts of soap and water.
<b>Begin</b>	artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b>	promptly to a medical facility.
<b>Medical</b>	observation is recommended as symptoms may be delayed.



Common Name: **BIS(CHLOROMETHYL) ETHER**

Synonyms: BCME; 1,1'-Dichlorodimethyl Ether

CAS No: 542-88-1

 Molecular Formula: (CH<sub>2</sub>Cl)<sub>2</sub>O

RTK Substance No: 0234

Description: Colorless liquid with an irritating odor

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>4 - Health</b> <b>3 - Fire</b> <b>1 - Reactivity</b> <b>DOT#:</b> UN 2249 <b>ERG Guide #:</b> 131 <b>Hazard Class:</b> 6.1 (Poison)	FLAMMABLE LIQUID Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. Water spray may cause foam or frothing. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Hydrochloric Acid</i> . CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool. Vapors may travel to a source of ignition and flash back. Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source. <b>Bis(Chloromethyl) Ether</b> may form an ignitable vapor/air mixture in closed tanks or containers.	<b>Bis(Chloromethyl) Ether</b> reacts with WATER or MOIST AIR to form <i>Formaldehyde</i> and <i>Hydrogen Chloride gas</i> . <b>Bis(Chloromethyl) Ether</b> is not compatible with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) and OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).

## SPILL/LEAKS

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand or earth.

 Keep **Bis(Chloromethyl) Ether** out of confined spaces, such as sewers, because of the possibility of an explosion.

Use only non-sparking tools and equipment, especially when opening and closing containers of

**Bis(Chloromethyl) Ether**.

DO NOT wash into sewer.

**Bis(Chloromethyl) Ether** is a marine pollutant.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Irritating odor
<b>Flash Point:</b>	66°F (19°C)
<b>Vapor Density:</b>	4 (air = 1)
<b>Vapor Pressure:</b>	30 mm Hg at 72°F (22°C)
<b>Relative Density:</b>	1.3 (water = 1)
<b>Water Solubility:</b>	Decomposes
<b>Boiling Point:</b>	219°F (104°C)
<b>Freezing Point:</b>	-43°F (-42°C)

## EXPOSURE LIMITS

**OSHA:** Refer to 29 CFR 1910.1003

**NIOSH:** Lowest feasible concentration

**ACGIH:** 0.001 ppm (8-hr TWA)

The Protective Action Criteria values are:

PAC-1 = 0.006 ppm PAC-2 = 0.044 ppm PAC-3 = 0.18 ppm

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Silver Shield®/4H® and Barrier® (>8-hr breakthrough for <i>Ethers, aliphatic</i> )
<b>Coveralls:</b>	Tychem® BR, Responder® and TK; and Trelchem® HPS and VPS (>8-hr breakthrough for <i>Ethers, aliphatic</i> )
<b>Respirator:</b>	SCBA

## HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns
<b>Acute:</b>	Nose, throat and lung irritation with coughing and severe shortness of breath (pulmonary edema)
<b>Chronic:</b>	Cancer (lung) in humans

## FIRST AID AND DECONTAMINATION

<b>Remove</b>	the person from exposure.
<b>Flush</b>	eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention immediately.
<b>Quickly</b>	remove contaminated clothing and wash contaminated skin with large amounts of soap and water.
<b>Begin</b>	artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b>	to a medical facility.
<b>Medical</b>	observation is recommended as symptoms may be delayed.



Common Name: **BIS(2-ETHYLHEXYL) PHTHALATE**

Synonyms: Di(2-Ethylhexyl) Phthalate; Dioctyl Phthalate; DOP

CAS No: 117-81-7

 Molecular Formula: C<sub>24</sub>H<sub>38</sub>O<sub>4</sub>

RTK Substance No: 0238

Description: Colorless to light colored, thick liquid with a slight odor

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b> DOT#: None ERG Guide #: None Hazard Class: None	COMBUSTIBLE LIQUID. Use dry chemical, CO <sub>2</sub> , water spray, alcohol-resistant foam or other foam as extinguishing agents. Water or foam may cause frothing. POISONOUS GASES ARE PRODUCED IN FIRE. Use water spray to keep fire-exposed containers cool.	<b>Bis(2-Ethylhexyl) Phthalate</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); and STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE).

**SPILL/LEAKS**
**Isolation Distance:**

Small Spills: 60 meters (200 feet)

Large Spills: 330 meters (1,100 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.

Bioaccumulation of this chemical may occur in seafood.

**PHYSICAL PROPERTIES**

<b>Flash Point:</b>	420°F (215°C)
<b>LEL:</b>	0.3% at 474°F (245°C)
<b>Auto Ignition Temp:</b>	662°F (350°C)
<b>Vapor Density:</b>	16 (air = 1)
<b>Vapor Pressure:</b>	<1 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	0.99 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	725°F (385°C)
<b>Melting Point:</b>	-58°F (-50°C)
<b>Molecular Weight:</b>	391

**EXPOSURE LIMITS**

<b>OSHA:</b>	5 mg/m <sup>3</sup> , 8-hr TWA
<b>NIOSH:</b>	5 mg/m <sup>3</sup> , 10-hr TWA; 10 mg/m <sup>3</sup> , STEL
<b>ACGIH:</b>	5 mg/m <sup>3</sup> , 8-hr TWA
<b>IDLH LEVEL:</b>	5,000 mg/m <sup>3</sup>

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Neoprene and Laminate Film
<b>Coveralls:</b>	DuPont Tychem® BR, LV, TK, CSM and Responder® (>8-hr breakthrough)
<b>Respirator:</b>	>5 mg/m <sup>3</sup> - Supplied air

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose and throat irritation
<b>Chronic:</b>	Cancer (liver) in animals

**FIRST AID AND DECONTAMINATION**

<b>Remove</b>	the person from exposure.
<b>Flush</b>	eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
<b>Quickly</b>	remove contaminated clothing. Wash contaminated skin with large amounts of soap and water.
<b>Begin</b>	artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b>	to a medical facility.

Common Name: **BISPHENOL A**

Synonyms: Diphenylolpropane; 4,4'-Isopropylidenediphenyl

CAS No: 80-05-7

 Molecular Formula: C<sub>15</sub>H<sub>16</sub>O<sub>2</sub>

RTK Substance No: 2388

 Description: White to light brown flake or powder with a medicine or *Phenol*-like odor

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b> DOT#: None ERG Guide #: None Hazard Class: None	<i>Finely divided Bisphenol A</i> is a significant dust explosion hazard. <b>Bisphenol A</b> may burn, but does not readily ignite. Use dry chemical, CO <sub>2</sub> or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE. Use water spray to keep fire-exposed containers cool. Static electricity can cause a dust explosion hazard.	<b>Bisphenol A</b> reacts violently with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE). <b>Bisphenol A</b> is not compatible with STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); ACID CHLORIDES; and ACID ANHYRIDES.

**SPILL/LEAKS**
**Isolation Distance:**

Spills: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

 Wash contaminated area with 60 to 70% *Ethanol* followed by soap and water.

DO NOT wash into sewer.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	<i>Phenol</i> -like odor
<b>Flash Point:</b>	175° to 415°F (79° to 213°C)
<b>Auto Ignition Temp:</b>	1,112°F (600°C)
<b>Vapor Pressure:</b>	0.2 mm Hg at 338°F (170°C)
<b>Specific Gravity:</b>	1.2 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	428°F (220°C)
<b>Melting Point:</b>	302° to 311°F (150° to 155°C)
<b>Molecular Weight:</b>	228.3

**EXPOSURE LIMITS**

The Protective Action Criteria values are:

 PAC-1 = 15 mg/m<sup>3</sup>

 PAC-2 = 100 mg/m<sup>3</sup>

 PAC-3 = 500 mg/m<sup>3</sup>
**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Butyl and Viton (>8-hr breakthrough for <i>Hydroxylic compounds</i> )
<b>Coveralls:</b>	Tyvek®
<b>Respirator:</b>	<15 mg/m <sup>3</sup> - Full facepiece APR with High efficiency filter >15 mg/m <sup>3</sup> - Supplied air or SCBA

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose and throat irritation with coughing and wheezing. Headache, nausea and vomiting

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **BORATE COMPOUNDS, INORGANIC**

Synonyms: None

CAS No: None

Molecular Formula: Varies

RTK Substance No: 0241

Description: White to gray powders

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> <b>DOT#: None</b> <b>ERG Guide #: None</b> <b>Hazard Class: None</b>	<b>Borate Compounds, Inorganic</b> are not combustible, but may be STRONG OXIDIZERS that enhance the combustion of other substances. Extinguish fire using an agent suitable for type of surrounding fire. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Boron Oxides</i> . <b>Borate Compounds, Inorganic</b> may ignite combustibles (wood, paper and oil).	<b>Borate Compounds, Inorganic</b> are not compatible with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC).

### SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Collect powdered material in the most convenient and safe manner and place into sealed containers for disposal.

**Borate Compounds, Inorganic** may be dangerous to aquatic life in high concentrations.

### PHYSICAL PROPERTIES

<b>Flash Point:</b>	Noncombustible
<b>Vapor Pressure:</b>	<0 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.4 to 2.3 (water = 1)
<b>Water Solubility:</b>	Slightly soluble to Soluble
<b>Boiling Point:</b>	Varies
<b>Melting Point:</b>	Varies
<b>Molecular Weight:</b>	Varies

### EXPOSURE LIMITS

**NIOSH:** 1 mg/m<sup>3</sup>, 10-hr TWA (*Anhydrous and Pentahydrate*)  
 5 mg/m<sup>3</sup>, 10-hr TWA (*Decahydrate*)

**ACGIH:** 2 mg/m<sup>3</sup>, 8-hr TWA; 6 mg/m<sup>3</sup>, STEL (*inhalable fraction*)

The Protective Action Criteria values for *Sodium Borate* are:

- PAC-1 = 1.5 mg/m<sup>3</sup>
- PAC-2 = 12.5 mg/m<sup>3</sup>
- PAC-3 = 60 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

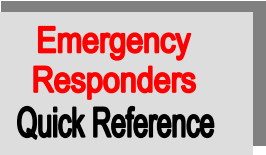
<b>Gloves:</b>	Nitrile and Natural Rubber
<b>Coveralls:</b>	Tyvek®
<b>Respirator:</b>	>1 mg/m <sup>3</sup> - Full facepiece APR with High efficiency filter >10 mg/m <sup>3</sup> - SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, wheezing and shortness of breath Headache, dizziness, tremors, and lightheadedness

### FIRST AID AND DECONTAMINATION

<b>Remove</b> the person from exposure.
<b>Flush</b> eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
<b>Quickly</b> remove contaminated clothing and wash contaminated skin with large amounts of soap and water.
<b>Begin</b> artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b> promptly to a medical facility.



Common Name: **BORON OXIDE**

Synonyms: Boric Anhydride; Diboron Trioxide

CAS No: 1303-86-2

Molecular Formula: B<sub>2</sub>O<sub>3</sub>

RTK Substance No: 0243

Description: Odorless, colorless or white lump, crystal or granular solid

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>0 - Fire</b> <b>1 - Reactivity</b> DOT#: None ERG Guide #: None Hazard Class: None	Extinguish fire using an agent suitable for type of surrounding fire. <b>Boron Oxide</b> itself does not burn. POISONOUS GASES ARE PRODUCED IN FIRE. Use water spray to keep fire-exposed containers cool.	<b>Boron Oxide</b> reacts with WATER and MOISTURE to form <i>Boric Acid</i> . <b>Boron Oxide</b> is not compatible with CALCIUM OXIDE; CALCIUM CHLORIDE; and BROMINE PENTAFLUORIDE. <b>Boron Oxide</b> is corrosive to METALS in the presence of <i>Moist Air and Oxygen</i> .

### SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Collect powdered material in the most convenient and safe manner and place into sealed containers for disposal.

DO NOT wash into sewer.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Noncombustible
<b>Vapor Pressure:</b>	0 mm Hg at 68°F (20°C) (approximate)
<b>Specific Gravity:</b>	2.46 (water = 1)
<b>Water Solubility:</b>	Slightly soluble
<b>Boiling Point:</b>	3,380°F (1,860°C)
<b>Melting Point:</b>	842°F (450°C)
<b>Ionization Potential:</b>	13.5 eV
<b>Molecular Weight:</b>	69.64

### EXPOSURE LIMITS

**OSHA:** 15 mg/m<sup>3</sup>, 8-hr TWA

**NIOSH:** 10 mg/m<sup>3</sup>, 10-hr TWA

**ACGIH:** 10 mg/m<sup>3</sup>, 8-hr TWA

**IDLH:** 2,000 mg/m<sup>3</sup>

The Protective Action Criteria values are:

PAC-1 = 30 mg/m<sup>3</sup>      PAC-3 = 500 mg/m<sup>3</sup>

PAC-2 = 300 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Nitrile and Natural Rubber
<b>Coveralls:</b>	Tyvek®
<b>Respirator:</b>	>10 mg/m <sup>3</sup> - Full facepiece APR with High efficiency filters >30 mg/m <sup>3</sup> - SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose and throat irritation with coughing and wheezing Headache, dizziness, nausea and vomiting

### FIRST AID AND DECONTAMINATION

<b>Remove</b>	the person from exposure.
<b>Flush</b>	eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
<b>Quickly</b>	remove contaminated clothing and wash contaminated skin with large amounts of water.
<b>Begin</b>	artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b>	promptly to a medical facility.

Common Name: **BORON TRIBROMIDE**

Synonyms: Tribromoborane; Boron Bromide

CAS No: 10294-33-4

 Molecular Formula: BBr<sub>3</sub>

RTK Substance No: 0244

Description: Colorless, fuming liquid with a strong odor

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>0 - Fire</b> <b>2-W - Reactivity</b>  DOT ID #: UN 2692 ERG Guide #: 157 Hazard Class: 8  (Corrosive)	Use dry chemical or CO <sub>2</sub> . DO NOT USE WATER. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Hydrogen Bromide</i> and <i>Boron Oxide</i> . Use water to cool intact containers only.	<b>Boron Tribromide</b> reacts violently and explosively with WATER or STEAM, and decomposes on contact with ALCOHOLS, producing <i>Hydrogen Bromide gas</i> . Mixtures of <b>Boron Tribromide</b> and POTASSIUM or SODIUM can explode on impact. <b>Boron Tribromide</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); ETHERS; PHOSPHORUS; STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); AMMONIA; and ALKALI METALS. Protect from SHOCK, HEAT and LIGHT.

## SPILL/LEAKS

**Isolation Distance:** 50 to 100 meters  
(160 to 330 feet)

Absorb spill with inert material.  
Do not use water.

Before entering a confined space where **Boron Tribromide** may be present, check to make sure that an explosive concentration does not exist.

Use the explosive limits for *Hydrogen gas*  
(LEL: 4%, UEL: 75%)

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Strong Odor
<b>Flash Point:</b>	Not Combustible
<b>Relative Vapor Density:</b>	8.6 (air = 1)
<b>Relative Density:</b>	2.7 (water =1)
<b>Vapor Pressure:</b>	40 mm Hg at 57°F (14°C)
<b>Water Solubility:</b>	Reacts/Decomposes
<b>Boiling Point:</b>	196°F (91°C)
<b>Ionization Potential:</b>	9.7 eV
<b>Melting Point:</b>	-51°F (-46°C)

## EXPOSURE LIMITS

<b>OSHA:</b>	N/A
<b>NIOSH:</b>	1 ppm Ceiling
<b>ACGIH:</b>	1 ppm Ceiling

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	No information
<b>Coverall:</b>	DuPont Tychem® BR, LV, Responder®, TK, Reflector®, and ChemFab Challenger® 5200
<b>Boot:</b>	No information
<b>Respirator:</b>	>1 ppm fullface APR with Acid gas cartridges >10 ppm Supplied Air

## HEALTH EFFECTS

<b>Eyes:</b>	Irritation, burns
<b>Skin:</b>	Irritation, burns
<b>Acute:</b>	Cough, shortness of breath, Pulmonary edema
<b>Chronic:</b>	Bronchitis, cough, shortness of breath May affect the nervous system

## FIRST AID AND DECONTAMINATION

<b>Remove</b> the person from exposure.
<b>Flush</b> eyes with large amounts of water for at least 30 minutes.
<b>Remove</b> contact lenses if worn.
<b>Remove</b> contaminated clothing. Wash contaminated skin with soap and water.
<b>Begin</b> artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b> to a medical facility.
<b>Observation</b> is recommended as symptoms may be delayed.

Common Name: **BORON TRIFLUORIDE**

Synonyms: Borane, Trifluoro-; Boron Fluoride; Trifluoroborane

CAS No: 7637-07-2

 Molecular Formula: BF<sub>3</sub>

RTK Substance No: 0246

Description: Colorless gas with a strong odor that forms dense, white fumes in moist air

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>4 - Health</b> <b>0 - Fire</b> <b>1 - Reactivity</b> DOT#: UN 1008 ERG Guide #: 125 Hazard Class: 2.3 (Poisonous gas)	CORROSIVE Extinguish fire using an agent suitable for type of surrounding fire. <b>Boron Trifluoride</b> itself does not burn. Stop flow of gas and use water spray to disperse vapors. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Hydrogen Fluoride</i> and <i>Boric Acid</i> . CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool. <b>Boron Trifluoride</b> may be shipped or stored in complexes with flammable solvents (such as <i>Ethyl Ether</i> ). These complexes may be a fire risk.	<b>Boron Trifluoride</b> reacts with WATER to form toxic <i>Hydrogen Fluoride</i> gas. <b>Boron Trifluoride</b> reacts violently with ALKALI METALS (such as LITHIUM, SODIUM and POTASSIUM); ALKYL NITRATES (such as AMYL NITRATE, BUTYL NITRATE and NITROCELLULOSE); CALCIUM OXIDE; and LIME (CALCIUM HYDROXIDE). <b>Boron Trifluoride</b> attacks many METALS in the presence of WATER.

## SPILL/LEAKS

## Isolation Distance:

Small spill: 30 meters (100 feet)

Large spill: 150 meters (500 feet)

Fire: 1,600 meters (1 mile)

Stop flow of gas. If source of leak is a cylinder and the leak cannot be stopped in place, remove the leaking cylinder to a safe place in the open air, and repair leak or allow cylinder to empty.

**Boron Trifluoride** may be hazardous to the environment, especially to aquatic organisms.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	1.6 ppm
<b>Flash Point:</b>	Nonflammable
<b>Vapor Density:</b>	2.4 (air = 1)
<b>Vapor Pressure:</b>	760 mm Hg at -149°F (-100.6°C)
<b>Specific Gravity:</b>	2.9 (water = 1)
<b>Water Solubility:</b>	Soluble/Reacts
<b>Boiling Point:</b>	-148°F (-100°C)
<b>Freezing Point:</b>	-197°F (-127°C)
<b>Critical Temp:</b>	10°F (-12.2°C)
<b>Ionization Potential:</b>	15.5
<b>Molecular Weight:</b>	67.8

## EXPOSURE LIMITS

**OSHA:** 1 ppm, Ceiling

**NIOSH:** 1 ppm, Ceiling

**ACGIH:** 1 ppm, Ceiling

**IDLH:** 25 ppm

The Protective Action Criteria values are:

PAC-1 = 1 ppm PAC-2 = 1 ppm PAC-3 = 1 ppm

## PROTECTIVE EQUIPMENT

**Gloves:** Insulated Viton/Butyl (>8-hr breakthrough)

**Coveralls:** Tychem® BR, CSM and TK (>8-hr breakthrough)

**Respirator:** >1 ppm - SCBA

## HEALTH EFFECTS

**Eyes:** Irritation and burns

**Skin:** Irritation and burns, contact with liquid causes frostbite (skin absorbable)

**Inhalation:** Nose, throat and lung irritation, with coughing, and severe shortness of breath (pulmonary edema)

## FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses. Seek medical attention.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water. Seek medical attention.

**In** case of contact with *liquid Boron Trifluoride*, immerse affected part in warm water. Seek medical attention.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

**Medical** observation is recommended as symptoms may be delayed.



Common Name: **BROMACIL**

Synonyms: 5-Bromo-3-sec-Butyl-6-Methyluracil; HyvarX

CAS No: 314-40-9

 Molecular Formula: C<sub>9</sub>H<sub>13</sub>BrN<sub>2</sub>O<sub>2</sub>

RTK Substance No: 0251

Description: White, crystalline solid which may be in a solution

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>1 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> DOT#: N/A ERG Guide #: N/A Hazard Class: N/A	Extinguish fire using an agent suitable for type of surrounding fire. <b>Bromacil</b> itself does not burn.  <b>Bromacil</b> may be dissolved in a flammable carrier.  POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Hydrogen Bromide</i> and <i>Nitrogen Oxides</i> .	Contact with AMINES; STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); and OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) will cause <b>Bromacil</b> to decompose.

### SPILL/LEAKS

**Isolation Distance:** No information

Dampen dry spill with water to prevent dust.

For liquid solutions, absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.

Toxic to aquatic organisms and wildlife.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Noncombustible
<b>Vapor Density:</b>	1.55 (air = 1)
<b>Vapor Pressure:</b>	0.0008 mm Hg at 212°F (100°C)
<b>Water Solubility:</b>	Soluble
<b>Melting Point:</b>	317°F (158°C)
<b>Specific Gravity:</b>	1.55

### EXPOSURE LIMITS

<b>OSHA:</b>	N/A
<b>NIOSH:</b>	10 mg/m <sup>3</sup> (10-hr TWA)
<b>ACGIH:</b>	10 mg/m <sup>3</sup> (8-hr TWA)
<b>IDLH LEVEL:</b>	No Information

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Rubber
<b>Coveralls:</b>	DuPont Tyvek® (pesticide dust)
<b>Boots:</b>	Rubber
<b>Respirator:</b>	>10 mg/m <sup>3</sup> - APR with High efficiency filters >100 mg/m <sup>3</sup> - Supplied air

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Acute:</b>	Nose and throat irritation, coughing and wheezing
<b>Chronic:</b>	Lung irritation with coughing, wheezing and shortness of breath

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Remove** contaminated clothing and wash contaminated skin with water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** to a medical facility.

Common Name: **BROMINE**

Synonyms: None

CAS No: 7726-95-6

Molecular Formula: Br<sub>2</sub>

RTK Substance No: 0252

Description: Dark, reddish-brown, corrosive, fuming liquid or vapor

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>3 - Health</b></p> <p><b>0 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p><b>DOT#:</b> UN 1744</p> <p><b>ERG Guide #:</b> 154</p> <p><b>Hazard Class:</b> 8 (Corrosive)</p>	<p><b>Bromine</b> is not combustible but it is a <b>STRONG OXIDIZER</b> which will enhance the burning of other materials.</p> <p>Extinguish fire using an agent suitable for type of surrounding fire.</p> <p><b>POISONOUS GASES ARE PRODUCED IN FIRE</b></p> <p>Use water spray to keep fire-exposed containers cool.</p>	<p><b>Bromine</b> will react violently with <b>ALUMINUM</b> and <b>AQUEOUS AMMONIA</b>.</p> <p><b>Bromine</b> is not compatible with <b>REDUCING AGENTS</b> (such as <b>LITHIUM, SODIUM, and their HYDRIDES</b>); <b>MERCURY</b>; <b>PHOSPHORUS</b>; <b>TITANIUM</b>; <b>POTASSIUM</b>; <b>SODIUM</b>; <b>HALOCARBONS</b>; <b>METAL CARBIDES</b>; <b>METAL SALTS</b>; <b>AMINES</b>; and <b>OXIDIZING AGENTS</b> (such as <b>PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE</b>).</p> <p>Contact with <b>COMBUSTIBLE</b> and <b>ORGANIC MATERIALS</b> (such as <b>FUELS, WOOD and OILS</b>) may cause a fire.</p> <p><b>Bromine</b> will attack <b>METALS</b> (such as <b>IRON, STEEL, STAINLESS STEEL and COPPER</b>).</p>

## SPILL/LEAKS

**Isolation Distance:**

Small Spills: 60 meters (200 feet)

Large Spills: 330 meters (1,100 feet)

Cover with dry lime, sand or soda ash, and place in covered containers for disposal.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	0.051 - 3.5 ppm
<b>Flash Point:</b>	Not Combustible
<b>Vapor Density:</b>	5.5 (air = 1)
<b>Vapor Pressure:</b>	175 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	3.12 (water = 1)
<b>Water Solubility:</b>	Very slightly soluble
<b>Boiling Point:</b>	138°F (58.8°C)
<b>Melting Point:</b>	19.4°F (-7.25°C)
<b>Ionization Potential:</b>	10.55 eV
<b>Molecular Weight:</b>	159.8

## EXPOSURE LIMITS

<b>OSHA:</b>	0.1 ppm, 8-hr TWA
<b>NIOSH:</b>	0.1 ppm, 10-hr TWA; 0.3 ppm STEL
<b>ACGIH:</b>	0.1 ppm, 8-hr TWA; 0.2 ppm STEL
<b>IDLH LEVEL:</b>	3 ppm
<b>PAC LEVELS:</b>	PAC-1 = 0.033 ppm; PAC-2 = 0.24 ppm; PAC-3 = 8.5 ppm

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Neoprene and Nitrile (>8-hr breakthrough for <i>Bromine water</i> )
<b>Coveralls:</b>	DuPont Tychem® TK (40 min. breakthrough sat. vapor; >8-hr breakthrough @ 10 g/m <sup>2</sup> )
<b>Boots:</b>	Neoprene
<b>Respirator:</b>	> 0.1 ppm - full facepiece APR with OV/AG cartridges > 1 ppm - Pressure demand supplied-air > 3 ppm - Pressure demand SCBA

## HEALTH EFFECTS

<b>Eyes:</b>	Irritation, burns
<b>Skin:</b>	Irritation, burns, discoloration and slowly healing ulcers
<b>Acute:</b>	Irritation of nose, throat and lungs with coughing and shortness of breath
<b>Chronic:</b>	Coughing, phlegm and shortness of breath, headache, dizziness

## FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention immediately.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention immediately.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** to a medical facility.

**Medical** observation is recommended as symptoms may be delayed.

Common Name: **BROMINE PENTAFLUORIDE**

Synonyms: None

CAS No: 7789-30-2

 Molecular Formula: BrF<sub>5</sub>

RTK Substance No: 0254

Description: A colorless to pale yellow liquid which becomes a gas at temperatures above 104°F (40°C)

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>4 - Health</b> <b>0 - Fire</b> <b>3-W - Reactivity</b> DOT#: UN 1745 ERG Guide #: 144 Hazard Class: 5.1 (Oxidizer)	<b>Bromine Pentafluoride</b> is not combustible but it is a STRONG OXIDIZER which enhances the combustion of other substances. Use dry chemical, CO <sub>2</sub> , or dry sand as extinguishing agents. DO NOT USE WATER or FOAM as <b>Bromine Pentafluoride</b> reacts violently with WATER. POISONOUS GASES ARE PRODUCED IN FIRE including <i>Hydrogen Bromide</i> and <i>Hydrogen Fluoride</i> . CONTAINERS MAY EXPLODE IN FIRE Use water spray to keep fire-exposed containers cool.	<b>Bromine Pentafluoride</b> reacts violently or explosively with WATER; STEAM; ORGANIC COMPOUNDS (such as FUELS); and HYDROGEN CONTAINING MATERIALS (such as AMMONIA and ACETIC ACID). <b>Bromine Pentafluoride</b> reacts with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) and ACID FUMES releasing highly toxic <i>Hydrogen Bromide</i> and <i>Hydrogen Fluoride</i> gas. <b>Bromine Pentafluoride</b> is not compatible with HALOGENS; SALTS; METALS; METAL OXIDES; SELENIUM; SULFUR; and GLASS. Reacts with all chemicals EXCEPT OXYGEN, NITROGEN and RARE GASES (such as HELIUM and ARGON).

**SPILL/LEAKS**
**Isolation Distance:**

 Small Spills: 30 meters (100 feet)  
 Large Spills: 215 meters (700 feet)

Cover spilled material with dry sand, dry earth, vermiculite or similar inert material and deposit in sealed containers.

DO NOT GET WATER ON SPILLED MATERIAL.

DO NOT ABSORB IN COMBUSTIBLE ABSORBANTS.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	Pungent
<b>Flash Point:</b>	Noncombustible
<b>Relative Vapor Density:</b>	6.05 (air = 1)
<b>Vapor Pressure:</b>	328 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	2.46 (water = 1)
<b>Water Solubility:</b>	Decomposes/Reacts
<b>Boiling Point:</b>	106°F (41°C)
<b>Molecular Weight:</b>	174.9

**EXPOSURE LIMITS**

<b>OSHA:</b>	None
<b>NIOSH:</b>	0.1 ppm, 10-hr TWA
<b>ACGIH:</b>	0.1 ppm, 8-hr TWA
<b>IDLH LEVEL:</b>	No information

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	No information
<b>Coveralls:</b>	DuPont Tychem® Responder®, CSM, and TK for toxic and corrosive vapors and gases
<b>Boots:</b>	No information
<b>Respirator:</b>	>0.1 ppm - Supplied air

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation, burns, watery eyes
<b>Skin:</b>	Irritation, burns, discoloration and slow healing ulcers
<b>Acute:</b>	Irritation of the nose, throat and lungs with coughing and shortness of breath
<b>Chronic:</b>	Coughing, phlegm and shortness of breath, headache and dizziness

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention immediately.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention immediately.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** to a medical facility.

**Medical** observation is recommended as symptoms may be delayed.

Common Name: **BROMOBENZENE**

Synonyms: Phenyl Bromide

CAS No: 108-86-1

 Molecular Formula: C<sub>6</sub>H<sub>5</sub>Br

RTK Substance No: 0258

Description: Clear, colorless liquid with a pleasant (aromatic) odor

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>1 - Health</b> <b>2 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 2514 ERG Guide #: 130 Hazard Class: 3 (Flammable)	COMBUSTIBLE LIQUID Use dry chemical, CO <sub>2</sub> , water spray or alcohol-resistant foam as extinguishing agents. Use water spray to reduce vapors. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Hydrogen Bromide</i> . CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool. Vapors may travel to a source of ignition and flash back. Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.	<b>Bromobenzene</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); ALKALINE EARTH METALS (such as BERYLLIUM, MAGNESIUM and CALCIUM); METALLIC SALTS; BROMOBUTANE; and SODIUM.

**SPILL/LEAKS**
**Isolation Distance:**

Spills: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers for disposal.

DO NOT wash into sewer.

 Use only non-sparking tools and equipment, especially when opening and closing containers of **Bromobenzene**.

**Bromobenzene** is toxic to aquatic organisms.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	Pleasant (aromatic)
<b>Flash Point:</b>	118° to 124°F (48° to 51°C)
<b>LEL:</b>	0.5%
<b>UEL:</b>	3%
<b>Auto Ignition Temp:</b>	1,049°F (565°C)
<b>Vapor Density:</b>	5.4 (air = 1)
<b>Vapor Pressure:</b>	5 mm Hg at 82°F (28°C)
<b>Specific Gravity:</b>	1.5 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	313°F (156°C)
<b>Melting Point:</b>	-24°F (-31°C)
<b>Ionization Potential:</b>	9 ± 0.02 eV
<b>Molecular Weight:</b>	157

**EXPOSURE LIMITS**

The Protective Action Criteria values are:

PAC-1 = 2.5 ppm

PAC-2 = 20 ppm

PAC-3 = 350 ppm

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Polyvinyl Alcohol and Viton (>8-hr breakthrough for <i>Halogen compounds, Aromatics</i> )
<b>Coveralls:</b>	Tychem® BR, LV, Responder®, and TK; Zytron® 500; ONESuit®TEC; and Trelchem® HPS and VPS (>8-hr breakthrough for <i>Halogen compounds, Aromatics</i> ).
<b>Respirator:</b>	>2.5 ppm - Supplied air or SCBA

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose and throat irritation with coughing and wheezing Headache, dizziness, lightheadedness, and passing out

**FIRST AID AND DECONTAMINATION**

<b>Remove</b> the person from exposure.
<b>Flush</b> eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
<b>Remove</b> contaminated clothing and wash contaminated skin with soap and water.
<b>Begin</b> artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b> promptly to a medical facility.

Common Name: **BROMOFORM**

Synonyms: Methyl Tribromide; Tribromomethane

CAS No: 75-25-2

Molecular Formula: CHBr<sub>3</sub>

RTK Substance No: 0262

Description: Colorless liquid with a sweet, *Chloroform*-like odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 2515 ERG Guide #: 159 Hazard Class: 6.1 (Poison)	Extinguish fire using an agent suitable for type of surrounding fire. <b>Bromoform</b> itself does not burn. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Hydrogen Bromide</i> . Use water spray to keep fire-exposed containers cool.	Mixtures of <b>Bromoform</b> with POTASSIUM, LITHIUM, MAGNESIUM or SODIUM are shock sensitive and can explode on impact. <b>Bromoform</b> reacts violently with ACETONE; OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); and POWDERED METALS (such as ALUMINUM and ZINC). <b>Bromoform</b> is corrosive to most METALS and attacks some PLASTICS, RUBBER and COATINGS. Protect from AIR, LIGHT and excess HEAT as <b>Bromoform</b> will decompose.

### SPILL/LEAKS

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers for disposal.

DO NOT wash into sewer.

**Bromoform** is hazardous to the environment, especially to marine life.

### EXPOSURE LIMITS

**OSHA:** 0.5 ppm, 8-hr TWA

**NIOSH:** 0.5 ppm, 10-hr TWA

**ACGIH:** 0.5 ppm, 8-hr TWA

**IDLH:** 850 ppm

The Protective Action Criteria values are:

PAC-1 = 1.5 ppm; PAC-2 = 6.8 ppm

PAC-3 = 41 ppm

### HEALTH EFFECTS

**Eyes:** Irritation and burns

**Skin:** Irritation and burns

**Inhalation:** Nose, throat and lungs Irritation with coughing, wheezing and shortness of breath

Headache, dizziness, tremors, convulsions, and passing out

**Chronic:** Cancer (large intestines) in animals

### PHYSICAL PROPERTIES

**Odor Threshold:** 0.19 to 15 ppm

**Flash Point:** Noncombustible

**Vapor Density:** 8.7 (air = 1)

**Vapor Pressure:** 5 mm Hg at 68°F (20°C)

**Specific Gravity:** 2.8 (water = 1)

**Water Solubility:** Slightly soluble

**Boiling Point:** 301°F (149°C)

**Melting Point:** 48°F (8.7°C)

**Ionization Potential:** 10.48 eV

**Molecular Weight:** 252.75

### PROTECTIVE EQUIPMENT

**Gloves:** Viton (>8-hr breakthrough)

**Coveralls:** Tychem® SL, BR, Responder® and TK (>8-hr breakthrough for *Methyl Bromide*)

**Respirator:** >0.5 ppm - full facepiece APR with *Organic Vapor cartridges*

>25 ppm - Pressure demand supplied-air

>500 ppm - Pressure demand SCBA

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **1-BROMOPROPANE**

Synonyms: Propyl Bromide

CAS No: 106-94-5

 Molecular Formula: C<sub>3</sub>H<sub>7</sub>Br

RTK Substance No: 4198

Description: Clear, colorless, liquid with a sweet odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>2 - Health</b></p> <p><b>3 - Fire</b></p> <p><b>1 - Reactivity</b></p> <p><b>DOT#:</b> UN 2344</p> <p><b>ERG Guide #:</b> 129</p> <p><b>Hazard Class:</b> 3 (Flammable)</p>	<p><b>1-Bromopropane</b> is a FLAMMABLE LIQUID. Use dry chemical, CO<sub>2</sub>, water spray or alcohol-resistant foam as extinguishing agents.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Hydrogen Bromide</i>.</p> <p>CONTAINERS MAY EXPLODE IN FIRE.</p> <p>Use water spray to keep fire-exposed containers cool.</p> <p>Vapors may travel to a source of ignition and flash back.</p> <p>Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.</p> <p>Flow or agitation may generate electrostatic charges.</p>	<p><b>1-Bromopropane</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE).</p> <p><b>1-Bromopropane</b> may accumulate static electricity when being filled into properly grounded containers.</p> <p>Grounding and bonding may not be sufficient to remove static electricity.</p>

SPILL/LEAKS
<p><b>Isolation Distance:</b> Small Spill: 60 meters (200 feet) Large Spill: 270 meters (900 feet) Fire: 80 meters (1/2 mile)</p> <p>Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.</p> <p>Keep <b>1-Bromopropane</b> out of confined spaces, such as sewers, because of the possibility of an explosion.</p> <p>DO NOT wash into sewer.</p> <p><b>1-Bromopropane</b> may bioaccumulate.</p>

PHYSICAL PROPERTIES
<p><b>Odor Threshold:</b> Sweet odor</p> <p><b>Flash Point:</b> 72°F (21°C)</p> <p><b>LEL:</b> 4.6%</p> <p><b>UEL:</b> 7.8%</p> <p><b>Auto Ignition Temp:</b> 914°F (490°C)</p> <p><b>Vapor Density:</b> 4.3 (air = 1)</p> <p><b>Vapor Pressure:</b> 143 mm Hg at 77°F (25°C)</p> <p><b>Specific Gravity:</b> 1.35 (water = 1)</p> <p><b>Water Solubility:</b> Slightly soluble</p> <p><b>Boiling Point:</b> 160°F (71°C)</p> <p><b>Melting Point:</b> -166°F (-110°C)</p> <p><b>Molecular Weight:</b> 123</p>

EXPOSURE LIMITS
<p><b>ACGIH:</b> 10 ppm, 8-hr TWA</p> <p>The Protective Action Criteria values are: PAC-1 = 0.3 ppm PAC-2 = 120 ppm PAC-3 = 700 ppm</p>

PROTECTIVE EQUIPMENT
<p><b>Gloves:</b> Silver Shield®/4H® and Viton</p> <p><b>Coveralls:</b> DuPont Tychem® LV, Responder® and TK; Kappler® Zytron® 500; and Saint-Gobain ONESuit® TEC for <i>Aliphatic Halogen compounds</i></p> <p><b>Respirator:</b> &gt;10 ppm - Supplied air &gt;30 ppm - SCBA</p>

HEALTH EFFECTS
<p><b>Eyes:</b> Irritation</p> <p><b>Skin:</b> Irritation, drying and cracking with redness</p> <p><b>Inhalation:</b> Nose, throat and lung irritation with coughing, wheezing and shortness of breath</p> <p>Headache, dizziness and lightheadedness</p>

FIRST AID AND DECONTAMINATION
<p><b>Remove</b> the person from exposure.</p> <p><b>Flush</b> eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.</p> <p><b>Remove</b> contaminated clothing and wash contaminated skin with soap and water.</p> <p><b>Begin</b> artificial respiration if breathing has stopped and CPR if necessary.</p> <p><b>Transfer</b> to a medical facility.</p>



Common Name: **2-BROMOPROPANE**

Synonyms: Isopropyl Bromide; sec-Propyl Bromide

CAS No: 75-26-3

 Molecular Formula: C<sub>3</sub>H<sub>7</sub>Br

RTK Substance No: 0267

Description: Colorless liquid

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>3 - Fire</b> <b>1 - Reactivity</b> DOT#: UN 2344 ERG Guide #: 129 Hazard Class: 3 (Flammable)	<b>2-Bromopropane</b> is a FLAMMABLE LIQUID. Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Hydrogen Bromide</i> . CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool. Vapors may travel to a source of ignition and flash back. Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.	<b>2-Bromopropane</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE). Explosive compounds may form after prolonged contact with AZIDES.

## SPILL/LEAKS

**Isolation Distance:**

Small Spill: 60 meters (200 feet)

Large Spill: 270 meters (900 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.

 Keep **2-Bromopropane** out of confined spaces, such as sewers, because of the possibility of an explosion. DO NOT wash into sewer.

May bioaccumulate.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Unknown
<b>Flash Point:</b>	<57°F (14°C)
<b>Vapor Density:</b>	4.3 (air = 1)
<b>Vapor Pressure:</b>	216 mm Hg at 77°F (25°C)
<b>Specific Gravity:</b>	1.3 (water = 1)
<b>Water Solubility:</b>	Slightly soluble
<b>Boiling Point:</b>	138°F (59°C)
<b>Melting Point:</b>	-128°F (-89°C)
<b>Molecular Weight:</b>	123

## EXPOSURE LIMITS

<b>OSHA:</b>	None
<b>NIOSH:</b>	None
<b>ACGIH:</b>	10 ppm, 8-hr TWA (as <i>1-Bromopropane</i> )
<b>IDLH:</b>	None

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Silver Shield®/4H® and Viton
<b>Coveralls:</b>	DuPont Tychem® LV, Responder® and TK; Kappler® Zytron® 500; and Saint-Gobain ONESuit® TEC (>8-hr breakthrough for <i>Aliphatic Halogen compounds</i> )
<b>Respirator:</b>	>10 ppm - Supplied air

## HEALTH EFFECTS

<b>Eyes:</b>	Irritation with redness
<b>Skin:</b>	Irritation with redness
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, wheezing and shortness of breath.

## FIRST AID AND DECONTAMINATION

<b>Remove</b>	the person from exposure.
<b>Flush</b>	eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
<b>Remove</b>	contaminated clothing and wash contaminated skin with soap and water.
<b>Begin</b>	artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b>	to a medical facility.

**Common Name: BRUCINE**

Synonyms: 10,11-Dimethoxystrychnine; (-)Brucine Dihydrate  
 CAS Number: 357-57-3  
 Molecular Formula: C<sub>23</sub>H<sub>26</sub>N<sub>2</sub>O<sub>4</sub>  
 RTK Number: 0270  
 Description: White, odorless, crystalline (sand-like) solid with a very bitter taste

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>Health:</b> 4 <b>Fire:</b> 1 <b>Reactivity:</b> 1 <b>DOT #:</b> UN 1570 <b>ERG #:</b> 152 <b>DOT:</b> 6.1 <b>Hazard:</b> (poison)	Use dry chemical, CO <sub>2</sub> , water spray or foam extinguishers. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> .	<b>Brucine</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).

**SPILLS/LEAKS**

**Isolation Distances:**  
**Liquid Spill:** 50 meters (150 feet)  
**Solid Spill:** 25 meters (75 feet)  
**Fire:** 800 meters (1/2 mile)

Evacuate personnel.  
 Secure and control entrance to the area.  
 If it is safe to do so, remove potential ignition sources.  
 Collect *powdered* material in the most convenient and safe manner and deposit in sealed containers.  
 Do not allow this substance to enter waterways, including sewers, as it is very toxic to aquatic life with long-lasting effects.  
 Ventilate area after clean-up is complete.

**PHYSICAL PROPERTIES**

**Melting Point:** 178 °C (352 °F)  
**Molecular Weight:** 394.51  
**Boiling Point:** 470 °C (878 °F)  
**Water Solubility:** Slightly soluble  
**Specific Gravity:** >1 at 20 °C (68 ° F)

**EXPOSURE LIMITS**

There are no occupational exposure limits to this substance.

**PAC:** PAC-1 = 0.29 mg/m<sup>3</sup>  
 PAC-2 = 3.2 mg/m<sup>3</sup>  
 PAC-3 = 36 mg/m<sup>3</sup>

**PROTECTIVE EQUIPMENT**

**Gloves:** Butyl or Nitrile  
**Coverall:** Tychem® QC or Tychem® SL  
**Respirator:** Self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode

**ACUTE HEALTH EFFECTS**

**Eyes:** Irritation  
**Skin:** Irritation  
**Inhalation:** Irritation, headache, nausea, vomiting, ringing in the ear, disturbed vision, restlessness, excitement, twitching, convulsions, paralysis, death

**FIRST AID AND DECONTAMINATION**

Immediately flush with large amounts of water for at least 15 minutes.  
 Remove contaminated clothing. Wash contaminated skin with soap and water.  
 Shampoo hair immediately if contaminated.  
 Remove the person from exposure.  
 Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.  
 Transfer promptly to a medical facility.

**Chemical Name: 1,3-BUTADIENE**
**Synonyms:** Biethylene; Divinyl; Vinylethylene

**CAS No:** 106-99-0

**Molecular Formula:** CH<sub>2</sub>CHCHCH<sub>2</sub>
**RTK Substance No:** 0272

**Description:** Colorless gas, liquefied or compressed gas below 31°F (-1°C), with a gasoline-like odor.

**DOT/NFPA DATA**

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>4 - Fire</b> <b>2 - Reactivity</b>  <b>DOT ID #:</b> UN 1010 <b>ERG Guide #:</b> 116 P <b>Hazard Class:</b> 2.1 (Flammable gas)	Stop flow of gas. Gas/Air mixtures are explosive. Cylinders may explode in fire. May autopolymerize. Vapors may travel to a source of ignition and flash back. Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.	<b>1,3-Butadiene</b> reacts with PHENOL; CROTONALDEHYDE; CHLORINE DIOXIDE; HALOGENS; OXYGEN; NITROGEN OXIDES; ALUMINUM TETRAHYDROBORATE; RUST; OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); and STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC).  <b>1,3-Butadiene</b> forms shock-sensitive compounds with COPPER and COPPER ALLOYS.

**SPILL/LEAKS**
**Isolation Distance:**

Small Spills: 30 meters (100 feet)

Large Spills: 60 meters (200 feet)

Move cylinder to a safe place and allow to vent unless flow of gas can be stopped.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	1 to 1.6 ppm
<b>Flash Point:</b>	-105°F (-76°C)
<b>LEL:</b>	2%
<b>UEL:</b>	11.5%
<b>Vapor Density:</b>	1.9 (air = 1)
<b>Vapor Pressure:</b>	1,824 mm Hg at 68°F (20°C)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	24°F (-4.4°C)
<b>Ionization Potential:</b>	9.07 eV

**EXPOSURE LIMITS**

<b>OSHA:</b>	1 ppm 8-hr TWA, 5 ppm STEL
<b>NIOSH:</b>	Lowest feasible concentration
<b>ACGIH:</b>	2 ppm, 8-hr TWA
<b>IDLH LEVEL:</b>	2,000 ppm
<b>PAC LEVEL:</b>	PAC-1 = 670 ppm; PAC-2 = 5,300 ppm; PAC-3 = 22,000 ppm

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Butyl, Viton®
<b>Coverall:</b>	DuPont Tychem® CPF2, SL, CPF3, CPF4, TK, and Responder®, Kappler Zytron® 300 and 500
<b>Boot:</b>	Butyl
<b>Respirator:</b>	≤ 5 ppm APR with Organic Vapor cartridge ≤ 50 ppm full facepiece APR with Organic Vapor cartridge ≤ 1000 ppm Supplied Air

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation, frostbite
<b>Acute:</b>	Coughing, wheezing, headache, dizziness, and passing out
<b>Chronic:</b>	Cancer (lymph and blood) in humans May damage the male and female reproductive systems in animals

**FIRST AID AND DECONTAMINATION**

Remove the person from exposure.
Flush eyes with large amounts of water for at least 15 minutes.
Remove contact lenses if worn.
Immerse affected part in warm water.
Transfer to a medical facility.

Common Name: **BUTANE**

Synonyms: n-Butane; Butyl Hydride; Diethyl

CAS No: 106-97-8

 Molecular Formula: C<sub>4</sub>H<sub>10</sub>

RTK Substance No: 0273

 Description: Colorless gas with a *Natural gas* odor

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>1 - Health</b> <b>4 - Fire</b> <b>0 - Reactivity</b>  DOT#: UN 1011 ERG Guide #: 115 Hazard Class: 2.1 (Flammable gas)	FLAMMABLE GAS Stop flow of gas or let fire burn itself out. POISONOUS GASES ARE PRODUCED IN FIRE CONTAINERS MAY EXPLODE IN FIRE. Use water spray to disperse gas, keep fire-exposed cylinders cool, and protect individuals attempting to stop leak. Vapors may travel to a source of ignition and flash back. Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.	<b>Butane</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); and mixtures of NICKEL CARBONYL and OXYGEN.

**SPILL/LEAKS**
**Isolation Distance:**

Small Spills: 30 meters (100 feet)

Large Spills: 60 meters (200 feet)

Use water spray to keep cylinders or tanks cool.

 Keep **Butane** out of confined spaces, such as  
 sewers, because of the possibility of an explosion.

 Before entering a confined space where **Butane** is  
 present, check to make sure sufficient *Oxygen*  
 (19.5%) exists.

Will not affect aquatic environments.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	50,000 ppm
<b>Flash Point:</b>	-76° to -117° F (-60° to -83° C)
<b>LEL:</b>	1.6%
<b>UEL:</b>	8.4%
<b>Vapor Density:</b>	2.1 (air = 1)
<b>Vapor Pressure:</b>	760 mm Hg at 77°F (25°C)
<b>Specific Gravity:</b>	0.6 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	31°F (-0.5°C)
<b>Ionization Potential:</b>	10.63 eV
<b>Molecular Weight:</b>	58.1

**EXPOSURE LIMITS**

<b>OSHA:</b>	None
<b>NIOSH:</b>	800 ppm, 10-hr TWA
<b>ACGIH:</b>	1,000 ppm, 8-hr TWA (as <i>Aliphatic hydrocarbon gases</i> )

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Insulated Neoprene or Rubber
<b>Coveralls:</b>	Clothes designed to prevent freezing of body tissues
<b>Respirator:</b>	>800 ppm - Supplied air

**HEALTH EFFECTS**

<b>Eyes:</b>	Contact with liquid causes frostbite
<b>Skin:</b>	Contact with liquid causes frostbite
<b>Inhalation:</b>	Headache, lightheadedness, drowsiness and passing out

**FIRST AID AND DECONTAMINATION**

<b>Remove</b> the person from exposure.
<b>Flush</b> eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention immediately.
<b>Immerse</b> affected part in warm water. Seek medical attention.
<b>Transfer</b> to a medical facility.

Common Name: **2-BUTOXY ETHANOL**

Synonyms: Butyl Cellosolve; Ethylene Glycol Monobutyl Ether; EGBE

CAS No: 111-76-2

 Molecular Formula: C<sub>6</sub>H<sub>14</sub>O<sub>2</sub>

RTK Substance No: 0275

Description: Colorless liquid with a mild odor

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>2 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 2369 ERG Guide #: 152 Hazard Class: 6.1 (Poison)	COMBUSTIBLE LIQUID Use dry chemical, CO <sub>2</sub> , water spray or alcohol-resistant foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool.	<b>2-Butoxy Ethanol</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE).  <b>2-Butoxy Ethanol</b> forms <i>Peroxides</i> on exposure to AIR and LIGHT.

**SPILL/LEAKS**
**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit into sealed containers.

DO NOT wash into sewer.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	0.1 ppm
<b>Flash Point:</b>	140° to 160°F (60° to 71°C)
<b>LEL:</b>	1.1%
<b>UEL:</b>	10%
<b>Auto Ignition Temp:</b>	472°F (244°C)
<b>Vapor Density:</b>	4.1 (air = 1)
<b>Vapor Pressure:</b>	0.8 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	0.9 (water = 1)
<b>Water Solubility:</b>	Miscible
<b>Boiling Point:</b>	340°F (171°C)
<b>Melting Point:</b>	-94°F (-70°C)
<b>Ionization Potential:</b>	10 eV
<b>Molecular Weight:</b>	118.2

**EXPOSURE LIMITS**
**OSHA:** 50 ppm, 8-hr TWA

**NIOSH:** 5 ppm, 10-hr TWA

**ACGIH:** 20 ppm, 8-hr TWA

**IDLH:** 700 ppm

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Butyl, Nitrile, Neoprene, Silver Shield®/4H® and Viton (>8-hr breakthrough)
<b>Coveralls:</b>	DuPont Tychem® SL and Responder®; Kappler® Zytron® 500; and Saint-Gobain ONESuit® TEC (>8-hr breakthrough for <i>Glycol Ethers</i> )
<b>Respirator:</b>	>5 ppm - Full facepiece APR with Organic vapor filter >50 ppm - Supplied air

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation with possible eye damage
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose and throat irritation with coughing and wheezing Nausea, vomiting, headache, dizziness, confusion and passing out
<b>Chronic:</b>	Cancer (liver) in animals

**FIRST AID AND DECONTAMINATION**

<b>Remove</b>	the person from exposure.
<b>Flush</b>	eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.
<b>Quickly</b>	remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention.
<b>Begin</b>	artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b>	promptly to a medical facility.

Common Name: **BUTOXYL**

Synonyms: 3-Methoxybutyl Acetate; Methyl-1,3-Butylene Glycol Acetate

CAS No: 4435-53-4

Molecular Formula: C<sub>7</sub>H<sub>14</sub>O<sub>3</sub>

RTK Substance No: 0276

Description: Clear, colorless liquid with a slight, irritating odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>1 - Health</b></p> <p><b>2 - Fire</b></p> <p><b>1 - Reactivity</b></p> <p><b>DOT#:</b> UN 2708</p> <p><b>ERG Guide #:</b> 127</p> <p><b>Hazard Class:</b> 3 (Flammable)</p>	<p>COMBUSTIBLE</p> <p>Use dry chemical, CO<sub>2</sub>, water spray or alcohol-resistant foam as extinguishing agents.</p> <p>Use water in flooding quantities as fog, as solid streams of water may be ineffective.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE.</p> <p>CONTAINERS MAY EXPLODE IN FIRE.</p> <p>Use water spray to keep fire-exposed containers cool.</p> <p>Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.</p> <p>Flow or agitation may generate electrostatic charges.</p>	<p><b>Butoxyl</b> may form explosive <i>Peroxides</i> with prolonged storage or contact with AIR, LIGHT or when stored above room temperature.</p> <p><b>Butoxyl</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); ALUMINUM; LEAD; and CHROMIUM TRIOXIDE.</p>

### SPILL/LEAKS

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids with fly ash, cement powder or commercial sorbents and place in sealed containers for disposal.

DO NOT wash into sewer.

**Butoxyl** may accumulate static electricity.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Slightly irritating odor
<b>Flash Point:</b>	145° to 171°F (63° to 77°C)
<b>LEL:</b>	0.8 to 2.3%
<b>UEL:</b>	4.7 to 15%
<b>Auto Ignition Temp:</b>	770°F (410°C)
<b>Vapor Density:</b>	5 (air = 1)
<b>Specific Gravity:</b>	0.96 (water = 1)
<b>Water Solubility:</b>	Slightly soluble
<b>Boiling Point:</b>	275° to 343°F (135° to 173°C)
<b>Freezing Point:</b>	-112°F (-80°C)
<b>Molecular Weight:</b>	146.21

### EXPOSURE LIMITS

No occupational exposure limits have been established for **Butoxyl**.

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl, Silver Shield®/4H® and Barrier® (>8-hr breakthrough for <i>Esters Carboxylic, Acetates</i> )
<b>Coveralls:</b>	Tychem® BR, Responder® and TK; Trelchem® HPS and VPS (>8-hr breakthrough for <i>Esters Carboxylic, Acetates</i> )
<b>Respirator:</b>	SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose and throat irritation with coughing and wheezing Headache, dizziness and lightheadedness

### FIRST AID AND DECONTAMINATION

<b>Remove</b>	the person from exposure.
<b>Flush</b>	eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
<b>Remove</b>	contaminated clothing and wash contaminated skin with soap and water.
<b>Begin</b>	artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b>	promptly to a medical facility.



Common Name: **n-BUTYL ACETATE**

Synonyms: 1-Acetoxybutane; Butyl Ethanoate; Acetic Acid, Butyl Ester

CAS No: 123-86-4

Molecular Formula: C<sub>6</sub>H<sub>12</sub>O<sub>2</sub>

RTK Substance No: 1329

Description: Clear, colorless liquid with a fruity odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>2 - Health</b></p> <p><b>3 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p><b>DOT#:</b> UN 1123</p> <p><b>ERG Guide #:</b> 129</p> <p><b>Hazard Class:</b> 3 (Flammable)</p>	<p><b>FLAMMABLE LIQUID</b></p> <p>Use dry chemical, CO<sub>2</sub>, water spray or alcohol-resistant foam as extinguishing agents.</p> <p><b>POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE.</b></p> <p>Use water spray to keep fire-exposed containers cool and to dilute and disperse vapors.</p> <p>Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.</p>	<p><b>n-Butyl Acetate</b> may react with <b>OXIDIZING AGENTS</b> (such as <b>PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE</b>); <b>STRONG BASES</b> (such as <b>SODIUM HYDROXIDE and POTASSIUM HYDROXIDE</b>); <b>STRONG ACIDS</b> (such as <b>HYDROCHLORIC, SULFURIC and NITRIC</b>); and <b>POTASSIUM tert-BUTYLATE</b> to cause fires and explosions.</p> <p><b>n-Butyl Acetate</b> may attack many <b>PLASTICS and RUBBER</b>.</p>

### SPILL/LEAKS

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in dry sand, earth, or a similar material and place into sealed containers for disposal.

Use only non-sparking tools and equipment, especially when opening and closing containers of **n-Butyl Acetate**.

Keep **n-Butyl Acetate** out of confined spaces, such as sewers, because of the possibility of an explosion.

DO NOT wash into sewer.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	0.63 to 7.4 ppm
<b>Flash Point:</b>	72°F (22°C)
<b>LEL:</b>	1.2%
<b>UEL:</b>	7.6%
<b>Auto Ignition Temp:</b>	760°F (404°C)
<b>Vapor Density:</b>	4 (air = 1)
<b>Vapor Pressure:</b>	10 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	0.88 (water = 1)
<b>Water Solubility:</b>	Slightly soluble
<b>Boiling Point:</b>	260°F (127°C)
<b>Melting Point:</b>	-107°F (-77°C)
<b>Ionization Potential:</b>	10 eV
<b>Molecular Weight:</b>	116

### EXPOSURE LIMITS

**OSHA:** 150 ppm, 8-hr TWA

**NIOSH:** 150 ppm, 10-hr TWA; 200 ppm, STEL

**ACGIH:** 150 ppm, 8-hr TWA; 200 ppm, STEL

**IDLH:** 1,700 ppm

The Protective Action Criteria values are:

PAC-1 = 5 ppm    PAC-2 = 200 ppm

PAC-3 = 3,000 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Silver Shield®/4H® and Barrier® (>8-hr breakthrough)
<b>Coveralls:</b>	Tychem® BR, Responder®, and TK (>8-hr breakthrough)
<b>Respirator:</b>	At levels >10% of the LEL use turn out gear or flash protection >150 ppm - full facepiece APR with <i>Organic vapor cartridge</i> >1,500 ppm - SCBA

### HEALTH EFFECTS

**Eyes:** Irritation and burns

**Skin:** Irritation and burns

**Inhalation:** Nose, throat and lung irritation with coughing, wheezing and shortness of breath

Headache, dizziness, confusion, lightheadedness, and passing out

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **BUTYL ACRYLATE**

Synonyms: Acrylic Acid Butyl Ester

CAS No: 141-32-2

Molecular Formula: C<sub>7</sub>H<sub>12</sub>O<sub>2</sub>

RTK Substance No: 0278

Description: Clear, colorless liquid with a fruity, strong odor

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>3 - Health</b></p> <p><b>3 - Fire</b></p> <p><b>2 - Reactivity</b></p> <p><b>DOT#:</b> UN 2348</p> <p><b>ERG Guide #:</b> 130P</p> <p><b>Hazard Class:</b> 3 (Flammable)</p>	<p>Use dry chemical, CO<sub>2</sub>, water spray or foam as extinguishing agents.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE.</p> <p>CONTAINERS MAY EXPLODE IN FIRE.</p> <p>Use water spray to keep fire-exposed containers cool.</p> <p>Vapors may travel to a source of ignition and flash back.</p> <p>Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.</p>	<p><b>Butyl Acrylate</b> is REACTIVE and can easily polymerize with HEAT, LIGHT, or by catalytic reaction with METALS.</p> <p><b>Butyl Acrylate</b> reacts violently with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) to cause fires and explosions.</p> <p><b>Butyl Acrylate</b> is not compatible with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); AMINES; and HYDROGEN COMPOUNDS.</p>

### SPILL/LEAKS

**Isolation Distance:**

Small Spill - 60 meters (200 feet)

Large Spill - 270 meters (900 feet)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.

Toxic to aquatic organisms.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	0.035 ppm
<b>Flash Point:</b>	97.7°F (36.5°C)
<b>LEL:</b>	1.1%
<b>UEL:</b>	9.9%
<b>Relative Density:</b>	0.9 (water = 1)
<b>Vapor Density:</b>	4.42 (air = 1)
<b>Vapor Pressure:</b>	4 mm Hg at 68°F (20°C)
<b>Water Solubility:</b>	Slightly soluble
<b>Boiling Point:</b>	293° to 300°F (145° to 149°C)
<b>Molecular Weight:</b>	128.2

### EXPOSURE LIMITS

<b>OSHA:</b>	None
<b>NIOSH:</b>	10 ppm, 10-hr TWA
<b>ACGIH:</b>	2 ppm, 8-hr TWA
<b>IDLH LEVEL:</b>	No information
<b>PAC LEVELS:</b>	PAC-1 = 8.3 ppm; PAC-2 = 130 ppm; PAC-3 = 480 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	4-H®/Silver Shield® (>8-hr breakthrough)
<b>Coveralls:</b>	DuPont Tychem® Responder and TK (>8-hr breakthrough)
<b>Boots:</b>	No information
<b>Respirator:</b>	>2 ppm - full facepiece APR with Organic Vapor cartridges >100 ppm – Pressure demand supplied-air

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns
<b>Acute:</b>	Irritation of nose, throat and lungs with coughing, wheezing, and/or shortness of breath
<b>Chronic:</b>	Headache, dizziness and vomiting Skin allergy with itching, redness and rash

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** to a medical facility.

Common Name: **n-BUTYL ALCOHOL**

Synonyms: 1-Butanol, Propyl Carbinol

CAS No: 71-36-3

Molecular Formula: C<sub>4</sub>H<sub>10</sub>O

RTK Substance No: 1330

Description: Colorless liquid with a strong, sweet alcohol odor

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<p><b>2 - Health</b></p> <p><b>3 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p>DOT#: UN 1120</p> <p>ERG Guide #: 129</p> <p>Hazard Class: 3 (Flammable)</p>	<p><b>n-Butyl Alcohol</b> is a FLAMMABLE LIQUID. Use dry chemical, CO<sub>2</sub>, alcohol-resistant foam or other foaming agent as extinguishing agents, as water may not be effective in fighting fires.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE.</p> <p>CONTAINERS MAY EXPLODE IN FIRE.</p> <p>Use water spray to keep fire-exposed containers cool.</p> <p>Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.</p>	<p><b>n-Butyl Alcohol</b> will react with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); ALKALI METALS (such as LITHIUM, SODIUM and POTASSIUM); and ALKALINE EARTH METALS (such as BERYLLIUM, MAGNESIUM and CALCIUM) to form flammable and explosive <i>Hydrogen gas</i>.</p> <p><b>n-Butyl Alcohol</b> is not compatible with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES); ALIPHATIC AMINES; ISOCYANATES; ACETALDEHYDE; and ETHYLENE OXIDE.</p>

**SPILL/LEAKS**

**Isolation Distance:**

Spill: 50 to 100 meters (160 to 330 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.

Use only non-sparking tools and equipment, especially when opening and closing containers.

Keep **n-Butyl Alcohol** out of confined spaces, such as sewers, because of the possibility of an explosion.

**n-Butyl Alcohol** is readily biodegradable.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	1 to 15 ppm
<b>Flash Point:</b>	98°F (37°C)
<b>LEL:</b>	1.4%
<b>UEL:</b>	11.2%
<b>Ignition Temp:</b>	650°F (343°C)
<b>Vapor Density:</b>	2.6 (air = 1)
<b>Vapor Pressure:</b>	6 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	0.81 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	243°F (117°C)
<b>Ionization Potential:</b>	10.04 eV
<b>Molecular Weight:</b>	74.1

**EXPOSURE LIMITS**

**OSHA:** 100 ppm, 8-hr TWA

**NIOSH:** 50 ppm, Ceiling

**ACGIH:** 20 ppm, Ceiling

**IDLH LEVEL:** 1,400 ppm

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Butyl, Nitrile, Neoprene and Viton (>8-hr breakthrough)
<b>Coveralls:</b>	DuPont Tychem® CPF 2, SL, CPF 3, BR, LV, Responder® and TK; Kappler Zytron® 300; Saint-Gobain ONESuit®/TEC or equivalent (>8-hr breakthrough)
<b>Respirator:</b>	>20 ppm - full-facepiece APR with Organic Vapor cartridges >200 ppm - Supplied air

**HEALTH EFFECTS**

**Eyes:** Irritation, burns, tearing, eye damage

**Skin:** Irritation, burns, redness, drying and cracking of the skin

**Inhalation:** Nose, throat and lung irritation with coughing, wheezing and/or shortness of breath

Headache, dizziness, lightheadedness and passing out

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** to a medical facility.

Common Name: **sec-BUTYL ALCOHOL**

Synonyms: Methyl Ethyl Carbinol; Butylene Hydrate; 1-Methyl Propanol

CAS No: 78-92-2

Molecular Formula: C<sub>4</sub>H<sub>10</sub>O

RTK Substance No: 1645

Description: Colorless liquid with a strong, pleasant odor

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<p><b>2 - Health</b></p> <p><b>3 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p><b>DOT#:</b> UN 1120</p> <p><b>ERG Guide #:</b> 129</p> <p><b>Hazard Class:</b> 3 (Flammable)</p>	<p><b>sec-Butyl Alcohol</b> is a <b>FLAMMABLE LIQUID</b>. Use dry chemical, CO<sub>2</sub>, alcohol-resistant foam or other foaming agent as extinguishing agents, as water may not be effective in fighting fires.</p> <p><b>POISONOUS GASES ARE PRODUCED IN FIRE.</b></p> <p><b>CONTAINERS MAY EXPLODE IN FIRE.</b></p> <p>Use water spray to keep fire-exposed containers cool.</p> <p>Vapors may travel to a source of ignition and flash back.</p> <p>Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.</p>	<p><b>sec-Butyl Alcohol</b> can form explosive <i>Peroxides</i>.</p> <p><b>sec-Butyl Alcohol</b> reacts with <b>CHROMIUM TRIOXIDE</b> and other <b>OXIDIZING AGENTS</b> (such as <b>PERCHLORATES</b>, <b>PEROXIDES</b>, <b>PERMANGANATES</b>, <b>CHLORATES</b>, <b>NITRATES</b>, <b>CHLORINE</b>, <b>BROMINE</b> and <b>FLUORINE</b>); <b>ALKALINE EARTH METALS</b> (such as <b>BERYLLIUM</b>, <b>MAGNESIUM</b> and <b>CALCIUM</b>); and <b>ALKALI METALS</b> (such as <b>LITHIUM</b>, <b>SODIUM</b> and <b>POTASSIUM</b>) to form flammable and explosive <i>Hydrogen gas</i>.</p> <p><b>sec-Butyl Alcohol</b> is not compatible with <b>STRONG ACIDS</b> (such as <b>HYDROCHLORIC</b>, <b>SULFURIC</b> and <b>NITRIC</b>); <b>STRONG BASES</b> (such as <b>SODIUM HYDROXIDE</b> and <b>POTASSIUM HYDROXIDE</b>); <b>AMINES</b>; <b>ISOCYANATES</b>; <b>PERCHLORIC ACID</b>; and <b>ALUMINUM</b> (when heated).</p>

**SPILL/LEAKS**

**Isolation Distance:**

Small Spills: 60 meters (200 feet)

Large Spills: 270 meters (900 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.

Before entering a confined space where **sec-Butyl Alcohol** may be present, check to make sure that an explosive concentration does not exist.

DO NOT wash into sewer.

**PHYSICAL PROPERTIES**

**Odor Threshold:** 3.2 ppm

**Flash Point:** 75°F (24°C)

**LEL:** 1.7%

**UEL:** 9.8%

**Vapor Density:** 2.6 (air = 1)

**Vapor Pressure:** 12 mm Hg at 68°F (20°C)

**Specific Gravity:** 0.8 (water = 1)

**Water Solubility:** Soluble

**Boiling Point:** 201°F (94°C)

**Ionization Potential:** 10.1 eV

**Molecular Weight:** 74.1

**EXPOSURE LIMITS**

**OSHA:** 150 ppm, 8-hr TWA

**NIOSH:** 100 ppm, 10-hr TWA  
150 ppm, 15 min STEL

**ACGIH:** 100 ppm, 8-hr TWA

**IDLH LEVEL:** 2,000 ppm

**PROTECTIVE EQUIPMENT**

**Gloves:** Butyl, Nitrile, Neoprene, Silver Shield®/4H® and Viton (>8-hr breakthrough)

**Coveralls:** DuPont Tychem® CPF 4, Responder® and TK; Kappler Zytron® 300; and Saint-Gobain ONESuit®/TEC or equivalent (>8-hr breakthrough)

**Respirator:** >100 ppm - full facepiece APR with Organic vapor cartridges  
>1,000 ppm - Supplied air

**HEALTH EFFECTS**

**Eyes:** Irritation and burns

**Skin:** Irritation, burns, drying and cracking of the skin

**Inhalation:** Nose and throat irritation  
Headache, dizziness, lightheadedness and passing out

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing. Wash contaminated skin with large amounts of water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** to a medical facility.

Common Name: **tert-BUTYL ALCOHOL**

Synonyms: t-Butanol; Trimethyl Carbinol

CAS No: 75-65-0

Molecular Formula: C<sub>4</sub>H<sub>10</sub>O

RTK Substance No: 1787

Description: Colorless liquid or crystalline solid with a mothball-like odor

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<p><b>2 - Health</b></p> <p><b>3 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p><b>DOT#:</b> UN 1120</p> <p><b>ERG Guide #:</b> 129</p> <p><b>Hazard Class:</b> 3 (Flammable liquids)</p>	<p><b>tert-Butyl Alcohol</b> is a FLAMMABLE LIQUID or SOLID.</p> <p>Use dry chemical, CO<sub>2</sub>, alcohol-resistant foam or other foaming agent as extinguishing agents, as water may not be effective in fighting fires.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Isobutylene</i>.</p> <p>CONTAINERS MAY EXPLODE IN FIRE.</p> <p>Use water spray to keep fire-exposed containers cool.</p> <p>Vapors may travel to a source of ignition and flash back.</p> <p>Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.</p>	<p><b>tert-Butyl Alcohol</b> reacts violently with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); ALKALI METALS (such as LITHIUM, SODIUM and POTASSIUM) and ALKALINE EARTH METALS (such as BERYLLIUM, MAGNESIUM and CALCIUM) to produce flammable and explosive <i>Hydrogen gas</i>.</p> <p><b>tert-Butyl Alcohol</b> is not compatible with STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); ALIPHATIC AMINES; ISOCYANATES; ACETALDEHYDE; and some ZINC, CHROMIUM and ALUMINUM COMPOUNDS.</p> <p><b>tert-Butyl Alcohol</b> will decompose on contact with STRONG MINERAL ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) to produce flammable <i>Isobutylene gas</i>.</p>

**SPILL/LEAKS**

**Isolation Distance:**

Small Spill: 60 meters (200 feet)

Large Spill: 270 meters (900 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.

Keep **tert-Butyl Alcohol** out of confined spaces, such as sewers, because of the possibility of an explosion.

Bioconcentrations in aquatic life are low.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	47 ppm
<b>Flash Point:</b>	52°F (11°C)
<b>LEL:</b>	2.4%
<b>UEL:</b>	8.0%
<b>Vapor Density:</b>	2.55 (air = 1)
<b>Vapor Pressure:</b>	40 mm Hg at 77°F (25°C)
<b>Specific Gravity:</b>	0.78 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	180°F (82.4°C)
<b>Melting Point:</b>	78°F (25.7°C)
<b>Ionization Potential:</b>	9.7 eV
<b>Molecular Weight:</b>	74.1

**EXPOSURE LIMITS**

<b>OSHA:</b>	100 ppm, 8-hr TWA
<b>NIOSH:</b>	100 ppm, 10-hr TWA; 150 ppm, STEL
<b>ACGIH:</b>	100 ppm, 8-hr TWA
<b>IDLH LEVEL:</b>	1,600 ppm

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Butyl, Nitrile, Neoprene, Silver Shield® and Viton
<b>Coveralls:</b>	DuPont Tychem® CSM, Responder® and TK; Kappler Zytron® 300; and Saint-Gobain ONESuit®/TEC for <i>toxic liquids</i>
<b>Respirator:</b>	>100 ppm - Full facepiece APR with Organic vapor filter >1,000 ppm - Supplied air

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation, drying, cracking and redness
<b>Inhalation:</b>	Nose and throat irritation with coughing and wheezing and shortness of breath Headache, dizziness, confusion and passing out

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** to a medical facility.



Common Name: **BUTYLAMINE**

Synonyms: 1-Butanamine; n-Butylamine

CAS No: 109-73-9

 Molecular Formula: C<sub>4</sub>H<sub>11</sub>N

RTK Substance No: 0280

Description: Clear, colorless liquid with an Ammonia or fish-like odor.

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>3 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 1125 ERG Guide #: 132 Hazard Class: 3 (Flammable liquids)	FLAMMABLE LIQUID Use dry chemical, CO <sub>2</sub> , water spray, or alcohol-resistant foam. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> . CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool. Vapors may travel to a source of ignition and flash back. Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.	Contact with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and PERCHLORYL FLUORIDE may cause fires and explosions. <b>Butylamine</b> is not compatible with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); COPPER; COPPER ALLOYS; ALUMINUM; ZINC; ISOCYANATES; ACROLEIN; PHENOLS; KETONES; ETHERS; GLYCOLS; ORGANIC HALOGENS; EPICHLOROHYDRIN; and ALCOHOLS.

**SPILL/LEAKS**
**Isolation Distance:** 800 meters or ½ mile

 Absorb liquid in sand or other inert absorbent.  
 DO NOT let this chemical enter the environment.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	0.12 ppm
<b>Flash Point:</b>	10°F (-12.2°C)
<b>LEL:</b>	1.7%
<b>UEL:</b>	9.8%
<b>Vapor Density:</b>	2.5 (air = 1)
<b>Vapor Pressure:</b>	82 mm Hg at 68°F (20°C)
<b>Water Solubility:</b>	Miscible
<b>Boiling Point:</b>	172°F (78°C)
<b>Ionization Potential:</b>	8.71 eV

**EXPOSURE LIMITS**

<b>OSHA:</b>	5 ppm, Ceiling
<b>NIOSH:</b>	5 ppm, Ceiling
<b>ACGIH:</b>	5 ppm, Ceiling
<b>IDLH LEVEL:</b>	300 ppm

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Butyl Rubber
<b>Coveralls:</b>	DuPont Tychem® CPF3, BR, LV, Responder® and TK
<b>Boots:</b>	No information
<b>Respirator:</b>	>5 ppm APR with cartridge specific for <b>Butylamine</b> >50 ppm Supplied Air >300 ppm SCBA

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation, burns and blisters
<b>Acute:</b>	Nose, throat and lung irritation with coughing, and shortness of breath (pulmonary edema)
<b>Chronic:</b>	Bronchitis with coughing, phlegm and/or shortness of breath

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention immediately.

**Quickly** remove contaminated clothing. Wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** to a medical facility.

**Medical** observation is recommended as symptoms may be delayed.



Common Name: **tert-BUTYL CHROMATE**

Synonyms: t-Butyl Chromate; Bis(tert-butyl) Chromate

CAS No: 1189-85-1

Molecular Formula: C<sub>8</sub>H<sub>18</sub>CrO<sub>4</sub>

RTK Substance No: 1788

Description: Clear, colorless liquid

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>4 - Health</b></p> <p><b>1 - Fire</b></p> <p><b>1 - Reactivity</b></p> <p><b>DOT#:</b> UN 3082</p> <p><b>ERG Guide #:</b> 171</p> <p><b>Hazard Class:</b> 9 (Environmentally Hazardous Material)</p>	<p><b>tert-Butyl Chromate</b> may burn, but does not readily ignite.</p> <p>Use dry chemical, CO<sub>2</sub>, water spray, alcohol-resistant foam or other foam as extinguishing agents.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Chromium Oxide fumes</i>.</p> <p>Use water spray to keep fire-exposed containers cool.</p> <p><b>tert-Butyl Chromate</b> may ignite combustibles (wood, paper and oil).</p>	<p><b>tert-Butyl Chromate</b> is a STRONG OXIDIZER and will react violently with REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES) and COMBUSTIBLES.</p> <p><i>Water solutions of tert-Butyl Chromate</i> react violently with STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE).</p> <p><b>tert-Butyl Chromate</b> is incompatible with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); ALCOHOLS; and HYDRAZINE.</p>

### SPILL/LEAKS

**Isolation Distance:**

Small Spill: 60 meters (200 feet)

Large Spill: 270 meters (900 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.

DO NOT wash into sewer.

May be harmful to aquatic life.

### PHYSICAL PROPERTIES

**Odor Threshold:** None

**Flash Point:** May burn

**Vapor Density:** 7.9 (air = 1)

**Water Solubility:** Insoluble

**Melting Point:** 41°F (5°C)

**Freezing Point:** 23°F (-5°C)

**Molecular Weight:** 230.3

### EXPOSURE LIMITS

**OSHA:** 0.1 mg/m<sup>3</sup>, Ceiling

**NIOSH:** 0.001 mg/m<sup>3</sup>, 10-hr TWA

**ACGIH:** 0.1 mg/m<sup>3</sup>, Ceiling

**IDLH:** 15 mg/m<sup>3</sup>

(All of the above are for *hexavalent Chromium*)

### PROTECTIVE EQUIPMENT

**Gloves:** Silver Shield®/4H®

**Coveralls:** DuPont Tychem® CSM, Responder®, and TK (for *known carcinogens*)

**Respirator:** >0.001 mg/m<sup>3</sup> - Supplied air

### HEALTH EFFECTS

**Eyes:** Irritation and burns

**Skin:** Irritation and burns

**Inhalation:** Nose and throat irritation with coughing and wheezing

Headache, nausea and vomiting

**Chronic:** *Hexavalent Chromium* or *Chromium VI compounds* cause lung cancer in humans

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention immediately.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **1,2-BUTYLENE OXIDE**

Synonyms: 1,2-Epoxybutane; Ethyloxirane

CAS No: 106-88-7

Molecular Formula: C<sub>4</sub>H<sub>8</sub>O

RTK Substance No: 0287

Description: Clear, colorless liquid with a sweet, disagreeable odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>3 - Health</b></p> <p><b>3 - Fire</b></p> <p><b>2W - Reactivity</b></p> <p><b>DOT#:</b> UN 3022P</p> <p><b>ERG Guide #:</b> 127</p> <p><b>Hazard Class:</b> 3 (Flammable)</p>	<p>FLAMMABLE AND REACTIVE</p> <p>Use dry chemical, CO<sub>2</sub>, or alcohol-resistant foam as extinguishing agents.</p> <p>Water may not be effective in fighting fires and <b>1,2-Butylene Oxide</b> may react violently with WATER to give off heat.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE.</p> <p>Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.</p> <p>Flow or agitation may generate electrostatic charges.</p> <p><b>1,2-Butylene Oxide</b> may form an ignitable vapor/air mixture in closed tanks or containers.</p>	<p><b>1,2-Butylene Oxide</b> may polymerize on contact with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); CHARCOAL; TIN CHLORIDES; ALUMINUM CHLORIDE; and IRON CHLORIDE, to cause fires and explosions.</p> <p><b>1,2-Butylene Oxide</b> reacts with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).</p> <p><b>1,2-Butylene Oxide</b> may react violently with WATER to release heat.</p> <p>Protect from LIGHT and COMBUSTIBLES.</p>

### SPILL/LEAKS

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in dry sand, earth, or a noncombustible material and place into sealed containers for disposal. Use only non-sparking tools and equipment.

Metal containers involving the transfer of **1,2-Butylene Oxide** should be grounded and bonded.

Keep **1,2-Butylene Oxide** out of confined spaces, such as sewers, because of the possibility of an explosion.

DO NOT wash into sewer.

### PHYSICAL PROPERTIES

<b>Flash Point:</b>	-7°F (-22°C)
<b>LEL:</b>	1.5%
<b>UEL:</b>	19%
<b>Auto Ignition Temp:</b>	822°F (439°C)
<b>Vapor Density:</b>	2.2 (air = 1)
<b>Vapor Pressure:</b>	180 mm Hg at 77°F (25°C)
<b>Specific Gravity:</b>	0.826 (water = 1)
<b>Water Solubility:</b>	Soluble/Reactive
<b>Boiling Point:</b>	145°F (63°C)
<b>Freezing Point:</b>	<-58°F (<-50°C)
<b>Molecular Weight:</b>	72

### EXPOSURE LIMITS

**AIHA:** 2 ppm, 8-hr TWA

The Protective Action Criteria values are:

PAC-1 = 72 ppm    PAC-2 = 140 ppm

PAC-3 = 330 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl (<1-hr breakthrough)
<b>Coveralls:</b>	Tychem® CSM (>4-hr breakthrough)
<b>Respirator:</b>	>2 ppm - full facepiece APR with <i>Organic vapor filters</i> >20 ppm - SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing and severe shortness of breath (pulmonary edema)  Headache, dizziness, lightheadedness, and passing out
<b>Chronic:</b>	Cancer (nose) in animals

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

**Medical** observation is recommended as symptoms may be delayed.

Common Name: **BUTYL PROPIONATE**

Synonyms: Butyl Propanoate

CAS No: 590-01-2

 Molecular Formula: C<sub>7</sub>H<sub>14</sub>O<sub>2</sub>

RTK Substance No: 0295

Description: Colorless liquid with a fruity odor

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>3 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 1914 ERG Guide #: 130 Hazard Class: 3 (Flammable)	FLAMMABLE LIQUID Use dry chemical, CO <sub>2</sub> , water spray or alcohol-resistant foam as extinguishing agents. Solid streams of water may be ineffective. POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool. Vapors may travel to a source of ignition and flash back. Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.	<b>Butyl Propionate</b> will react with ALKALI METALS (such as LITHIUM, SODIUM and POTASSIUM) to produce flammable and explosive <i>Hydrogen gas</i> . <b>Butyl Propionate</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE). <b>Butyl Propionate</b> will react with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) to release heat.

## SPILL/LEAKS

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers for disposal.

 Keep **Butyl Propionate** out of confined spaces, such as sewers, because of the possibility of an explosion.

DO NOT wash into sewer.

## PHYSICAL PROPERTIES

<b>Flash Point:</b>	90°F (32°C)
<b>Auto Ignition Temp:</b>	799°F (426°C)
<b>Vapor Density:</b>	4.5 (air = 1)
<b>Vapor Pressure:</b>	2.8 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	0.9 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	295°F (146°C)
<b>Melting Point:</b>	-128°F (-90°C)
<b>Molecular Weight:</b>	130.2

## EXPOSURE LIMITS

The Protective Action Criteria values are:

PAC-1 = 94 ppm

PAC-2 = 94 ppm

PAC-3 = 94 ppm

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Nitrile and Barrier® (>8-hr breakthrough for <i>Esters, aliphatic</i> )
<b>Coveralls:</b>	Tychem® BR, LV, Responder®, and TK (>8-hr breakthrough for <i>Esters, aliphatic</i> )
<b>Respirator:</b>	>94 ppm - Supplied air

## HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose and throat irritation

## FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Remove** contaminated clothing and wash contaminated skin with soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **BUTYRIC ACID**

Synonyms: Ethylacetic Acid; 1-Propanecarboxylic Acid

CAS No: 107-92-6

Molecular Formula: C<sub>4</sub>H<sub>8</sub>O<sub>2</sub>

RTK Substance No: 0300

Description: Colorless, oily liquid with a strong characteristic odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>3 - Health</b></p> <p><b>2 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p><b>DOT#:</b> UN 2820</p> <p><b>ERG Guide #:</b> 153</p> <p><b>Hazard Class:</b> 8 (Corrosive)</p>	<p><b>Butyric Acid</b> is a COMBUSTIBLE LIQUID. Use dry chemical, CO<sub>2</sub>, water spray or alcohol-resistant foam as extinguishing agents.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE.</p> <p>Use water spray to keep fire-exposed containers cool. Vapors may travel to a source of ignition and flash back.</p>	<p><b>Butyric Acid</b> reacts with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); REDUCING AGENTS; and CHROMIUM TRIOXIDES.</p> <p>Contact with ALUMINUM and other METALS may release flammable and explosive <i>Hydrogen gas</i>.</p>

### SPILL/LEAKS

**Isolation Distance:**

Small Spills: 60 meters (200 feet)

Large Spills: 330 meters (1,100 feet)

Cover with dry lime, sand or soda ash, and place in covered containers for disposal.

DO NOT let this chemical enter the environment.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Strong odor
<b>Flash Point:</b>	161°F (72°C)
<b>LEL:</b>	2%
<b>UEL:</b>	10%
<b>Relative Vapor Density:</b>	3 (air = 1)
<b>Vapor Pressure:</b>	0.43 mm Hg at 68°F (20°C)
<b>Relative Density:</b>	0.96 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	327°F (164°C)
<b>Melting Point:</b>	17°F (-8°C)

### EXPOSURE LIMITS

No occupational exposure limits have been established.

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Viton® or Butyl (>8-hr breakthrough)
<b>Coveralls:</b>	DuPont Tychem® Responder® and CSM (>8-hr breakthrough)
<b>Boots:</b>	Butyl
<b>Respirator:</b>	Supplied air

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns
<b>Acute:</b>	Irritation of nose, throat and lungs with coughing, wheezing, and/or shortness of breath
<b>Chronic:</b>	Cough, phlegm and shortness of breath

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention immediately.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water. Seek medical attention immediately.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** to a medical facility.

Common Name: **CACODYLIC ACID**

Synonyms: Hydroxydimethylarsine Oxide

CAS No: 75-60-5

 Molecular Formula: C<sub>2</sub>H<sub>7</sub>AsO<sub>2</sub>

RTK Substance No: 0304

Description: Colorless to white, odorless, crystalline solid

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>4 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 1572 ERG Guide #: 151 Hazard Class: 6.1 (Poison)	Extinguish fire using an agent suitable for type of surrounding fire. <b>Cacodylic Acid</b> itself does not burn. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Arsenic Oxides</i> . Use water spray to keep fire-exposed containers cool.	<b>Cacodylic Acid</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); CHEMICALLY ACTIVE METALS (such as POTASSIUM, MAGNESIUM and ZINC); and SODIUM BOROHYDRIDE.

## SPILL/LEAKS

**Isolation Distance:**

 Spill: 25 meters (75 feet)  
 Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and deposit in sealed containers. DO NOT wash into sewer. Harmful to aquatic life.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Nonflammable
<b>Specific Gravity:</b>	>1.2 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	392°F (200°C)
<b>Melting Point:</b>	383° to 392°F (195° to 200°C)
<b>Molecular Weight:</b>	138
<b>pH:</b>	Acidic

## EXPOSURE LIMITS

<b>OSHA:</b>	0.5 mg/m <sup>3</sup> , 8-hr TWA (as <i>Arsenic</i> )
<b>NIOSH:</b>	None
<b>ACGIH:</b>	None
<b>IDLH:</b>	None

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Nitrile and Natural Rubber
<b>Coveralls:</b>	DuPont Tyvek®
<b>Respirator:</b>	<0.5 mg/m <sup>3</sup> - Full facepiece APR with High efficiency filter >0.5 mg/m <sup>3</sup> - Supplied air

## HEALTH EFFECTS

<b>Eyes:</b>	Irritation, burns, red and watery eyes
<b>Skin:</b>	Irritation, burns, itching, rash and loss of pigment
<b>Inhalation:</b>	Nose and throat irritation with coughing, wheezing, and hoarseness Weakness, nausea, vomiting, headache and muscle cramps
<b>Chronic:</b>	<i>Arsenic</i> and <i>Arsenic compounds</i> cause bladder, lung, and skin cancer in humans.

## FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.  
**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** promptly to a medical facility.

Common Name: **CADMIUM**

Synonyms: None

CAS No: 7440-43-9

Molecular Formula: Cd

RTK Substance No: 0305

Description: Soft, blue-white solid, gray-black metal, or gray or white powder

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>4 - Health</b> <b>3 - Fire</b> <b>1 - Reactivity</b> DOT#: UN 2570 ERG Guide #: 154 Hazard Class: 6.1 (Poison)	Use dry chemicals appropriate for extinguishing metal fires. DO NOT USE water, foam, CO <sub>2</sub> or Halons. POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE Use water spray to keep fire-exposed containers cool. <b>Cadmium powder</b> may ignite combustibles (wood, paper and oil).	<b>Cadmium</b> reacts with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) to form flammable and explosive <i>Hydrogen gas</i> .  <b>Cadmium dust or powder</b> reacts with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); HYDROGEN AZIDE; AMMONIUM NITRATE; AMMONIA; POTASSIUM; ZINC; SULFUR; SELENIUM; and TELLURIUM to cause fires and explosions.

**SPILL/LEAKS**
**Isolation Distance:** 25 meters (75 feet)

 Moisten *powdered* spilled material first or use a HEPA-filter vacuum for clean-up.

Collect solid material in the most convenient and safe manner and deposit in sealed containers.

DO NOT wash into sewer.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	None
<b>Flash Point:</b>	Non-combustible solid, flammable powder/dust
<b>Vapor Pressure:</b>	0 mm at Hg 68°F (20°C)
<b>Specific Gravity:</b>	8.65
<b>Water Solubility:</b>	Insoluble
<b>Melting Point:</b>	610°F (321°C)
<b>Boiling Point:</b>	1,409°F (765°C)
<b>Molecular Weight:</b>	112.4

**EXPOSURE LIMITS**

<b>OSHA:</b>	0.005 mg/m <sup>3</sup> , 8-hr TWA
<b>NIOSH:</b>	Lowest feasible concentration
<b>ACGIH:</b>	0.01 mg/m <sup>3</sup> , 8-hr TWA (total particulates)
	0.002 mg/m <sup>3</sup> , 8-hr TWA (respirable fraction)
<b>IDLH LEVEL:</b>	9 mg/m <sup>3</sup> (dust or fume)

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Nitrile or Neoprene
<b>Coveralls:</b>	DuPont Tyvek®
<b>Respirator:</b>	>0.005 mg/m <sup>3</sup> - APR with High efficiency filters >5 mg/m <sup>3</sup> - Supplied air

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Lung irritation with coughing and/or shortness of breath Nausea, vomiting, Headache, fever and chills, aches and chest tightness
<b>Chronic:</b>	Carcinogen (lung and prostate) in humans Teratogen in humans

**FIRST AID AND DECONTAMINATION**

<b>Remove</b>	the person from exposure.
<b>Flush</b>	eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
<b>Remove</b>	contaminated clothing and wash contaminated skin with soap and water.
<b>Begin</b>	artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b>	to a medical facility.
<b>Medical</b>	observation is recommended as symptoms may be delayed.



Common Name: **CADMIUM ACETATE**

Synonyms: Bis(Acetoxy)Cadmium; Cadmium Diacetate

CAS No: 543-90-8

 Molecular Formula:  $C_4H_6CdO_4$ 

RTK Substance No: 0306

Description: White to colorless, crystalline material

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>4 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 2570 ERG Guide #: 154 Hazard Class: 6.1 (Poison)	Extinguish fire using an agent suitable for type of surrounding fire. <b>Cadmium Acetate</b> itself does not burn. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Cadmium Oxide</i> . Use water spray to keep fire-exposed containers cool. <b>Cadmium Acetate</b> may ignite combustibles (wood, paper and oil).	<b>Cadmium Acetate</b> is not compatible with SULFUR; OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); SELENIUM; TELLURIUM; or STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); and POTASSIUM.

**SPILL/LEAKS**
**Isolation Distance:**

Small Spills: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up.

Collect powdered material in the most convenient and safe manner and deposit in sealed containers.

DO NOT wash into sewer.

**Cadmium Acetate** is a marine pollutant.

**PHYSICAL PROPERTIES**
**Odor Threshold:** Slightly vinegar odor

**Flash Point:** Nonflammable

**Specific Gravity:** 2.34 (water =1)

**Water Solubility:** Soluble

**Boiling Point:** Decomposes

**Freezing Point:** 493°F (256°C)

**Molecular Weight:** 230.5

**EXPOSURE LIMITS**
**OSHA:** 0.005 mg/m<sup>3</sup>, 8-hr TWA

**NIOSH:** Lowest feasible concentration

**ACGIH:** 0.01 mg/m<sup>3</sup>, 8-hr TWA (total particulate)  
 0.002 mg/m<sup>3</sup>, 8-hr TWA (respirable fraction)

**IDLH:** 9 mg/m<sup>3</sup>  
 (All of the above are for *Cadmium*)

**PROTECTIVE EQUIPMENT**
**Gloves:** Nitrile and Neoprene

**Coveralls:** DuPont Tyvek®

**Respirator:** >0.005 mg/m<sup>3</sup> - APR with High efficiency filters  
 >0.05 mg/m<sup>3</sup> - Supplied air

**HEALTH EFFECTS**
**Eyes:** Irritation

**Skin:** Irritation

**Inhalation:** Nose, throat and lung irritation with coughing and shortness of breath  
 Nausea, vomiting, headache, fever and chills, aches, and chest tightness

**Chronic:** *Cadmium* and *Cadmium compounds* cause lung and prostate cancer in humans

**FIRST AID AND DECONTAMINATION**
**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Remove** contaminated clothing and wash contaminated skin with water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** to a medical facility.

**Medical** observation is recommended as symptoms may be delayed.

Common Name: **CADMIUM BROMIDE**

Synonyms: Cadmium Dibromide

CAS No: 7789-42-6

 Molecular Formula: CdBr<sub>2</sub>

RTK Substance No: 0307

Description: White to yellowish, odorless, crystalline solid which changes to a powder on exposure to dry air

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>4 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 2570 ERG Guide #: 154 Hazard Class: 6.1 (Poison)	Extinguish fire using an agent suitable for type of surrounding fire. <b>Cadmium Bromide</b> itself does not burn. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Cadmium Oxide</i> and <i>Hydrogen Bromide</i> . Use water spray to keep fire-exposed containers cool. <b>Cadmium Bromide</b> may ignite combustibles (wood, paper and oil).	A mixture of <b>Cadmium Bromide</b> and POTASSIUM may explode on impact. <b>Cadmium Bromide</b> reacts with SULFIDES, and will form <i>Acids</i> in WATER. <b>Cadmium Bromide</b> is not compatible with SULFURIC ACID; ALKALI; AMMONIA; AMINES; AMIDES; EPICHLOROHYDRIN; ISOCYANATES; NITROMETHANE; and VINYL ACETATE.

## SPILL/LEAKS

## Isolation Distance:

Spills: 25 meters (75 yards)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up.

Collect powdered material in the most convenient and safe manner and deposit in sealed containers.

DO NOT wash into sewer.

Toxic to aquatic organisms. Hazardous to the environment and persists in the environment.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Nonflammable; dust may be explosive
<b>Specific Gravity:</b>	5.2 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	1,585°F (863°C) (decomposes)
<b>Freezing Point:</b>	1,053°F (567°C)
<b>Molecular Weight:</b>	272.22

## EXPOSURE LIMITS

<b>OSHA:</b>	0.005 mg/m <sup>3</sup> , 8-hr TWA
<b>NIOSH:</b>	Lowest feasible concentration
<b>ACGIH:</b>	0.01 mg/m <sup>3</sup> , 8-hr TWA (total particulate) 0.002 mg/m <sup>3</sup> , 8-hr TWA (respirable fraction)
<b>IDLH:</b>	9 mg/m <sup>3</sup> (All of the above are for <i>Cadmium</i> )

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Nitrile and Neoprene
<b>Coveralls:</b>	DuPont Tyvek®
<b>Respirator:</b>	>0.005 mg/m <sup>3</sup> - APR with High efficiency filters >0.05 mg/m <sup>3</sup> - Supplied air

## HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing and shortness of breath Nausea, vomiting, headache, fever and chills, aches, and chest tightness
<b>Chronic:</b>	<i>Cadmium</i> and <i>Cadmium compounds</i> cause lung and prostate cancer in humans

## FIRST AID AND DECONTAMINATION

<b>Remove</b>	the person from exposure.
<b>Flush</b>	eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
<b>Remove</b>	contaminated clothing and wash contaminated skin with water.
<b>Begin</b>	artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b>	to a medical facility.
<b>Medical</b>	observation is recommended as symptoms may be delayed.

Common Name: **CADMIUM CARBONATE**

Synonyms: Cadmium Monocarbonate; Otavite; Calcit

CAS No: 513-78-0

Molecular Formula: CdCO<sub>3</sub>

RTK Substance No: 4090

Description: White, odorless crystal or powder

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<p><b>4 - Health</b></p> <p><b>0 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p><b>DOT#:</b> UN 2570</p> <p><b>ERG Guide #:</b> 154</p> <p><b>Hazard Class:</b> 6.1 (Poison)</p>	<p>Extinguish fire using an agent suitable for type of surrounding fire. <b>Cadmium Carbonate</b> itself does not burn.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Cadmium Oxide</i>.</p> <p>Use water spray to keep fire-exposed containers cool.</p> <p><b>Cadmium Carbonate</b> may ignite combustibles (wood, paper and oil).</p>	<p><b>Cadmium Carbonate</b> reacts violently with POTASSIUM.</p> <p><b>Cadmium Carbonate</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).</p> <p><i>Cadmium dust</i> may be a fire or explosion hazard when exposed to HEAT; FLAME; SULFUR; SELENIUM; TELLURIUM; AMMONIA; and METALS (such as ZINC and MAGNESIUM).</p>

**SPILL/LEAKS**

**Isolation Distance:**

Small Spills: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up.

Collect powdered material in the most convenient and safe manner and deposit in sealed containers. DO NOT wash into sewer.

May be harmful to the environment.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Nonflammable; dust may explode
<b>Specific Gravity:</b>	4.26 (water =1)
<b>Water Solubility:</b>	Insoluble
<b>Melting Point:</b>	Decomposes
<b>Molecular Weight:</b>	172.4

**EXPOSURE LIMITS**

<b>OSHA:</b>	0.005 mg/m <sup>3</sup> , 8-hr TWA
<b>NIOSH:</b>	Lowest feasible concentration
<b>ACGIH:</b>	0.01 mg/m <sup>3</sup> , 8-hr TWA (total particulate)
<b>IDLH:</b>	0.002 mg/m <sup>3</sup> , 8-hr TWA (respirable fraction)
	9 mg/m <sup>3</sup> (dust or fume)
<b>PAC LEVELS:</b>	(All of the above are for <i>Cadmium</i> )
	PAC-1 = 0.15 mg/m <sup>3</sup> ; PAC-2 = 1.2 mg/m <sup>3</sup> ; PAC-3 = 7.2 mg/m <sup>3</sup>

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Nitrile and Neoprene
<b>Coveralls:</b>	DuPont Tyvek®
<b>Respirator:</b>	>0.005 mg/m <sup>3</sup> - APR with High efficiency filters >0.05 mg/m <sup>3</sup> - Supplied air

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing and/or shortness of breath Nausea, vomiting, headache, fever and chills, aches, and chest tightness
<b>Chronic:</b>	<i>Cadmium</i> and <i>Cadmium compounds</i> cause lung and prostate cancer in humans

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes.

Remove contact lenses if worn.

**Remove** contaminated clothing and wash contaminated skin with soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** to a medical facility.

**Medical** observation is recommended as symptoms may be delayed.

Common Name: **CADMIUM CHLORIDE**

Synonyms: Cadmium Dichloride; Caddy

CAS No: 10108-64-2

Molecular Formula: CdCl<sub>2</sub>

RTK Substance No: 0308

Description: An odorless, colorless, crystalline powder

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>4 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> <b>DOT#:</b> UN 2570 <b>ERG Guide #:</b> 154 <b>Hazard Class:</b> 6.1 (Poison)	Extinguish fire using an agent suitable for type of surrounding fire. <b>Cadmium Chloride</b> itself does not burn. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Cadmium Oxide</i> . Use water spray to keep fire-exposed containers cool. <b>Cadmium Chloride</b> may ignite combustibles (wood, paper and oil).	<b>Cadmium Chloride</b> reacts violently with BROMIDE TRIFLUORIDE and POTASSIUM. <b>Cadmium Chloride</b> reacts with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); SELENIUM; TELLURIUM; SULFUR; and ZINC. Contact with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) and ACID FUMES forms toxic <i>Chlorine gas</i> .

### SPILL/LEAKS

**Isolation Distance:**

Small Spills: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up.

Collect powdered material in the most convenient and safe manner and deposit in sealed containers.

DO NOT wash into sewer.

Toxic to aquatic organisms and persists in the environment.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Vapor Pressure:</b>	10 mm Hg at 1,211°F (656°C)
<b>Vapor Density:</b>	6.3 (air = 1)
<b>Specific Gravity:</b>	3.3 (water =1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	1,760°F (960°C)
<b>Melting Point:</b>	1,054°F (568°C)
<b>pH:</b>	3.5 to 5
<b>Molecular Weight:</b>	1,833

### EXPOSURE LIMITS

**OSHA:** 0.005 mg/m<sup>3</sup>, 8-hr TWA

**NIOSH:** Lowest feasible concentration

**ACGIH:** 0.01 mg/m<sup>3</sup>, 8-hr TWA (total particulate)  
 0.002 mg/m<sup>3</sup>, 8-hr TWA (respirable fraction)

**IDLH:** 9 mg/m<sup>3</sup>  
 (All of the above are for *Cadmium*)

The Protective Action Criteria values are:

PAC-1 = 0.16 mg/m<sup>3</sup>   PAC-2 = 1.2 mg/m<sup>3</sup>  
 PAC-3 = 7.6 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Nitrile and Neoprene
<b>Coveralls:</b>	DuPont Tyvek®
<b>Respirator:</b>	>0.005 mg/m <sup>3</sup> - APR with High efficiency filters >0.05 mg/m <sup>3</sup> - Supplied air

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing and/or shortness of breath  Nausea, vomiting, headache, fever and chills, aches, and chest tightness
<b>Chronic:</b>	<i>Cadmium</i> and <i>Cadmium compounds</i> cause lung and prostate cancer in humans

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.  
**Remove** contaminated clothing and wash contaminated skin with water.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** to a medical facility.  
**Medical** observation is recommended as symptoms may be delayed.

Common Name: **CADMIUM HYDROXIDE**

Synonyms: Cadmium Hydrate

CAS No: 21041-95-2

Molecular Formula: CdH<sub>2</sub>O<sub>2</sub>

RTK Substance No: 4089

Description: White powder

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<p><b>4 - Health</b></p> <p><b>0 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p>DOT#: UN 2570</p> <p>ERG Guide #: 154</p> <p>Hazard Class: 6.1 (Poison)</p>	<p>Extinguish fire using an agent suitable for type of surrounding fire. <b>Cadmium Hydroxide</b> itself does not burn.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Cadmium Oxide</i>.</p> <p>Use water spray to keep fire-exposed containers cool.</p> <p><b>Cadmium Hydroxide</b> may ignite combustibles (wood, paper and oil).</p>	<p><i>Cadmium dust</i> may be a fire or explosion hazard when exposed to HEAT; FLAME; SULFUR; OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE; SELENIUM, TELLURIUM, AMMONIA; and METALS (such as ZINC, POTASSIUM and MAGNESIUM).</p>

**SPILL/LEAKS**

**Isolation Distance:**

Small Spills: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up.

Collect powdered material in the most convenient and safe manner and deposit in sealed containers.

DO NOT wash into sewer.

Severe marine pollutant.

**PHYSICAL PROPERTIES**

**Odor Threshold:** No information

**Flash Point:** Nonflammable

**Specific Gravity:** 4.8 (water =1)

**Water Solubility:** Insoluble

**Boiling Point:** No information

**Freezing Point:** No information

**Molecular Weight:** 146.4

**EXPOSURE LIMITS**

**OSHA:** 0.005 mg/m<sup>3</sup>, 8-hr TWA

**NIOSH:** Lowest feasible concentration

**ACGIH:** 0.01 mg/m<sup>3</sup>, 8-hr TWA (total particulate)  
0.002 mg/m<sup>3</sup>, 8-hr TWA (respirable fraction)

**IDLH:** 9 mg/m<sup>3</sup> (dust or fume)  
(All of the above are for *Cadmium*)

**PAC LEVELS:** PAC-1 = 0.13 mg/m<sup>3</sup>; PAC-2 = 0.99 mg/m<sup>3</sup>;  
PAC-3 = 6.1 mg/m<sup>3</sup>

**PROTECTIVE EQUIPMENT**

**Gloves:** Nitrile and Neoprene

**Coveralls:** DuPont Tyvek®

**Respirator:** >0.005 mg/m<sup>3</sup> - APR with High efficiency filters  
>0.05 mg/m<sup>3</sup> - Supplied air

**HEALTH EFFECTS**

**Eyes:** Irritation

**Skin:** Irritation

**Inhalation:** Nose, throat and lung irritation with coughing and/or shortness of breath  
Nausea, vomiting, headache, fever and chills, aches, and chest tightness

**Chronic:** Carcinogen - *Cadmium* and *Cadmium compounds* cause lung and prostate cancer in humans.

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes.  
**Remove** contact lenses if worn.

**Remove** contaminated clothing and wash contaminated skin with soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** to a medical facility.

**Medical** observation is recommended as symptoms may be delayed.

Common Name: **CADMIUM NITRATE**

Synonyms: Cadmium Dinitrate

CAS No: 10325-94-7

Molecular Formula:  $Cd(NO_3)_2$

RTK Substance No: 4088

Description: White, odorless crystal that absorbs moisture from the air

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<p><b>4 - Health</b></p> <p><b>0 - Fire</b></p> <p><b>1 - Reactivity</b></p> <p>DOT#: UN 2570</p> <p>ERG Guide #: 154</p> <p>Hazard Class: 6.1 (Poison)</p>	<p>Extinguish fire using an agent suitable for type of surrounding fire.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Cadmium Oxide</i> and <i>Nitrogen Oxides</i>.</p> <p>Use water spray to keep fire-exposed containers cool.</p> <p><b>Cadmium Nitrate</b> may ignite combustibles (wood, paper and oil).</p>	<p><b>Cadmium Nitrate</b> is highly reactive with COMBUSTIBLES; ORGANIC MATERIALS; and REDUCING AGENTS.</p> <p><b>Cadmium Nitrate</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); SELENIUM; TELLURIUM; HYDROGEN AZIDE; and HYDRIDES.</p>

**SPILL/LEAKS**

**Isolation Distance:**

Small Spills: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up.

Collect powdered material in the most convenient and safe manner and deposit in sealed containers. DO NOT wash into sewer.

**Cadmium Nitrate** may bioaccumulate and is toxic to aquatic life.

**PHYSICAL PROPERTIES**

**Odor Threshold:** Odorless

**Flash Point:** Nonflammable

**Water Solubility:** Soluble

**Boiling Point:** 270°F (132°C)

**Melting Point:** 140°F (59.5°C)

**Molecular Weight:** 236.4

**EXPOSURE LIMITS**

**OSHA:** 0.005 mg/m<sup>3</sup>, 8-hr TWA

**NIOSH:** Lowest feasible concentration

**ACGIH:** 0.01 mg/m<sup>3</sup>, 8-hr TWA (total particulate)  
0.002 mg/m<sup>3</sup>, 8-hr TWA (respirable fraction)

**IDLH:** 9 mg/m<sup>3</sup> (dust or fume)  
(All of the above are for *Cadmium*)

**PAC LEVELS:** PAC-1 = 0.21 mg/m<sup>3</sup>; PAC-2 = 1.6 mg/m<sup>3</sup>;  
PAC-3 = 9.9 mg/m<sup>3</sup>

**PROTECTIVE EQUIPMENT**

**Gloves:** Nitrile and Neoprene

**Coveralls:** DuPont Tyvek®

**Respirator:** >0.005 mg/m<sup>3</sup> - APR with High efficiency filters  
>0.05 mg/m<sup>3</sup> - Supplied air

**HEALTH EFFECTS**

**Eyes:** Irritation

**Skin:** Irritation

**Inhalation:** Nose, throat and lung irritation with coughing and/or shortness of breath  
Nausea, vomiting, headache, fever and chills, aches, and chest tightness

**Chronic:** *Cadmium* and *Cadmium compounds* cause lung and prostate cancer in humans

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes.  
**Remove** contact lenses if worn.

**Remove** contaminated clothing and wash contaminated skin with soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** to a medical facility.

**Medical** observation is recommended as symptoms may be delayed.



Common Name: **CADMIUM OXIDE**

Synonyms: Cadmium Monoxide

CAS No: 1306-19-0

Molecular Formula: CdO

RTK Substance No: 2200

Description: Odorless, white powder or a red or brown crystal

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>4 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 2570 ERG Guide #: 154 Hazard Class: 6.1 (Poison)	Extinguish fire using an agent suitable for type of surrounding fire. <b>Cadmium Oxide</b> itself does not burn. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Cadmium</i> . Use water spray to keep fire-exposed containers cool. <b>Cadmium Oxide</b> may ignite combustibles (wood, paper and oil).	<b>Cadmium Oxide</b> reacts violently with MAGNESIUM, ALUMINUM, and AMMONIUM PERCHLORATE, when heated, to cause fires and explosions. <b>Cadmium Oxide</b> explodes or ignites on contact with HYDRAZINIUM NITRATE; HYDROGEN PEROXIDE; HYDROGEN SULFIDES; and LITHIUM. <b>Cadmium Oxide</b> is not compatible with PHOSPHORUS; SULFUR; SULFUR OXIDES; SELENIUM; and ZINC. Contact with ACIDS releases flammable and explosive <i>Hydrogen gas</i> .

## SPILL/LEAKS

**Isolation Distance:**

Spills: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up.

Collect powdered material in the most convenient and safe manner and deposit in sealed containers.

DO NOT wash into sewer.

Bioaccumulation may occur in plants and seafood.

Severe marine pollutant.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Nonflammable
<b>Vapor Pressure:</b>	1 mm Hg at 1,832°F (1,000°C)
<b>Specific Gravity:</b>	8.15 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	2,838°F (1,559°C)
<b>Melting Point:</b>	1,652° to 1,832°F (900° to 1,000°C)
<b>Molecular Weight:</b>	128.4

## EXPOSURE LIMITS

<b>OSHA:</b>	0.005 mg/m <sup>3</sup> , 8-hr TWA
<b>NIOSH:</b>	Lowest feasible concentration
<b>ACGIH:</b>	0.01 mg/m <sup>3</sup> , 8-hr TWA (total particulate) 0.002 mg/m <sup>3</sup> , 8-hr TWA (respirable fraction)
<b>IDLH:</b>	9 mg/m <sup>3</sup> (dust or fume) (All of the above are for <i>Cadmium</i> )
<b>PAC LEVELS:</b>	PAC-1 = 0.11 mg/m <sup>3</sup> ; PAC-2 = 0.87 mg/m <sup>3</sup> ; PAC-3 = 5.4 mg/m <sup>3</sup>

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Neoprene or Nitrile
<b>Coveralls:</b>	DuPont Tyvek®
<b>Respirator:</b>	>0.005 mg/m <sup>3</sup> - APR with High efficiency filters >0.05 mg/m <sup>3</sup> - Supplied air

## HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing and shortness of breath Nausea, vomiting, headache, fever and chills, aches and chest tightness
<b>Chronic:</b>	<i>Cadmium</i> and <i>Cadmium compounds</i> cause lung and prostate cancer in humans

## FIRST AID AND DECONTAMINATION

<b>Remove</b> the person from exposure.
<b>Flush</b> eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
<b>Remove</b> contaminated clothing and wash contaminated skin with soap and water.
<b>Begin</b> artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b> to a medical facility.
<b>Medical</b> observation is recommended as symptoms may be delayed.

Common Name: **CADMIUM STEARATE**

Synonyms: Alaixol 11; Cadmium Distearate

CAS No: 2223-93-0

Molecular Formula:  $C_{26}H_{72}CdO_4$

RTK Substance No: 2201

Description: White powder with a slight fatty odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>4 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b>  DOT#: UN 2570 ERG Guide #: 154 Hazard Class: 6.1 (Poison)	Extinguish fire using an agent suitable for type of surrounding fire. <b>Cadmium Stearate</b> itself does not burn.  POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Cadmium Oxide</i> .  Use water spray to keep fire-exposed containers cool.  <b>Cadmium Stearate</b> may ignite combustibles (wood, paper and oil).	<i>Cadmium dust</i> may be a fire or explosion hazard when exposed to HEAT; FLAME; SULFUR; OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); SELENIUM, TELLURIUM, AMMONIA; and METALS (such as ZINC, POTASIUUM and MAGNESIUM).

### SPILL/LEAKS

**Isolation Distance:**

Small Spills: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up.

Collect powdered material in the most convenient and safe manner and deposit in sealed containers.

DO NOT wash into sewer.

May be harmful to the environment.

### PHYSICAL PROPERTIES

**Odor Threshold:** Fatty odor

**Flash Point:** Nonflammable

**Specific Gravity:** 1.21 (water =1)

**Water Solubility:** Insoluble

**Boiling Point:** 1,413°F (767°C)

**Freezing Point:** 22.3°F (106°C)

**Molecular Weight:** 681.5

### EXPOSURE LIMITS

**OSHA:** 0.005 mg/m<sup>3</sup>, 8-hr TWA

**NIOSH:** Lowest feasible concentration

**ACGIH:** 0.01 mg/m<sup>3</sup>, 8-hr TWA (total particulate)  
0.002 mg/m<sup>3</sup>, 8-hr TWA (respirable fraction)

**IDLH:** 9 mg/m<sup>3</sup> (dust or fume)  
(All of the above are for *Cadmium*)

**PAC LEVELS:** PAC-1 = 0.61 mg/m<sup>3</sup>; PAC-2 = 4.6 mg/m<sup>3</sup>;  
PAC-3 = 28 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

**Gloves:** Nitrile and Neoprene

**Coveralls:** DuPont Tyvek®

**Respirator:** >0.005 mg/m<sup>3</sup> - APR with High efficiency filters  
>0.05 mg/m<sup>3</sup> - Supplied air

### HEALTH EFFECTS

**Eyes:** Irritation

**Skin:** Irritation

**Inhalation:** Nose, throat and lung irritation with coughing and/or shortness of breath  
  
Nausea, vomiting, headache, fever and chills, aches, and chest tightness

**Chronic:** *Cadmium* and *Cadmium compounds* cause lung and prostate cancer in humans

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes.  
Remove contact lenses if worn.

**Remove** contaminated clothing and wash contaminated skin with soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** to a medical facility.

**Medical** observation is recommended as symptoms may be delayed.

Common Name: **CADMIUM SULFATE**

Synonyms: Cadmium Monosulfate

CAS No: 10124-36-4

Molecular Formula: CdSO<sub>4</sub>

RTK Substance No: 3073

Description: White or colorless, odorless, crystalline solid

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>4 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 2570 ERG Guide #: 154 Hazard Class: 6.1 (Poison)	Extinguish fire using an agent suitable for type of surrounding fire. <b>Cadmium Sulfate</b> itself does not burn. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Cadmium Oxide</i> and <i>Sulfur Oxides</i> . Use water spray to keep fire-exposed containers cool. <b>Cadmium Sulfate</b> may ignite combustibles (wood, paper and oil).	<b>Cadmium Sulfate</b> reacts violently with finely divided ALUMINUM; MAGNESIUM; CARBON DUST; and POTASSIUM. <b>Cadmium Sulfate</b> is not compatible with SULFUR; OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); TELLURIUM; SELENIUM; and ZINC.

**SPILL/LEAKS**

**Isolation Distance:**

Spills: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA filter vacuum for clean up.

Collect powdered material in the most convenient and safe manner and deposit in sealed containers.

DO NOT wash into sewer.

May be toxic to aquatic organisms

Hazardous and persists in the environment.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Nonflammable
<b>Vapor Density:</b>	3.08 (air = 1)
<b>Vapor Pressure:</b>	1 mm Hg at 741°F (394°C)
<b>Specific Gravity:</b>	4.69
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	Decomposes
<b>Melting Point:</b>	1,832°F (1,000°C)
<b>Molecular Weight:</b>	208.5

**EXPOSURE LIMITS**

<b>OSHA:</b>	0.005 mg/m <sup>3</sup> , 8-hr TWA
<b>NIOSH:</b>	Lowest feasible concentration
<b>ACGIH:</b>	0.01 mg/m <sup>3</sup> , 8-hr TWA (total particulate) 0.002 mg/m <sup>3</sup> , 8-hr TWA (respirable fraction)
<b>IDLH:</b>	9 mg/m <sup>3</sup> (All of the above are for <i>Cadmium</i> )
<b>PAC LEVELS:</b>	PAC-1 = 0.19 mg/m <sup>3</sup> ; PAC-2 = 1.4 mg/m <sup>3</sup> ; PAC-3 = 8.7 mg/m <sup>3</sup>

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Nitrile and Neoprene
<b>Coveralls:</b>	DuPont Tyvek®
<b>Respirator:</b>	>0.005 mg/m <sup>3</sup> - APR with High efficiency filters >0.05 mg/m <sup>3</sup> - Supplied air

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing and shortness of breath Nausea, vomiting, headache, fever and chills, aches, and chest tightness
<b>Chronic:</b>	<i>Cadmium</i> and <i>Cadmium compounds</i> cause lung and prostate cancer in humans

**FIRST AID AND DECONTAMINATION**

- Remove** the person from exposure.
- Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
- Remove** contaminated clothing and wash contaminated skin with water.
- Begin** artificial respiration if breathing has stopped and CPR if necessary.
- Transfer** to a medical facility.
- Medical** observation is recommended as symptoms may be delayed.

Common Name: **CADMIUM SULFIDE**

Synonyms: Cadmium Monosulfide; Cadmium Yellow; Orange Cadmium

CAS No: 1306-23-6

Molecular Formula: CdS

RTK Substance No: 3081

Description: Odorless, lemon yellow to orange crystal or yellow to brown powder

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>4 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b>  DOT#: UN 2570 ERG Guide #: 154 Hazard Class: 6.1 (Poison)	Use dry chemical, water spray or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Cadmium Oxide</i> and <i>Sulfur Oxides</i> . Use water spray to keep fire-exposed containers cool.	<b>Cadmium Sulfide</b> reacts with WATER; MOISTURE: STEAM or STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) to produce toxic and flammable <i>Hydrogen Sulfide gas</i> . <b>Cadmium Sulfide</b> reacts violently or explosively with IODINE MONOCHLORIDE and OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).

**SPILL/LEAKS**

**Isolation Distance:**

Small Spills: 25 meters (75 feet)

Collect powdered material in the most convenient and safe manner and deposit in sealed containers.

Hazardous to the environment and persists in the environment.

Marine pollutant.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Nonflammable
<b>Specific Gravity:</b>	4.5 to 4.8 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Melting Point:</b>	1,796°F (980°C)
<b>Molecular Weight:</b>	145

**EXPOSURE LIMITS**

<b>OSHA:</b>	0.005 mg/m <sup>3</sup> , 8-hr TWA
<b>NIOSH:</b>	Lowest feasible concentration
<b>ACGIH:</b>	0.01 mg/m <sup>3</sup> , 8-hr TWA (total particulate) 0.002 mg/m <sup>3</sup> , 8-hr TWA (respirable fraction)
<b>IDLH:</b>	9 mg/m <sup>3</sup> (All of the above are for <i>Cadmium</i> )
<b>PAC LEVELS:</b>	PAC-1 = 0.13 mg/m <sup>3</sup> ; PAC-2 = 0.98 mg/m <sup>3</sup> ; PAC-3 = 6 mg/m <sup>3</sup>

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Nitrile and Neoprene
<b>Coveralls:</b>	DuPont Tyvek®
<b>Respirator:</b>	>0.005 mg/m <sup>3</sup> - APR with High efficiency filters >0.05 mg/m <sup>3</sup> - Supplied air

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing and/or shortness of breath Nausea, vomiting, headache, fever and chills, aches, and chest tightness
<b>Chronic:</b>	<i>Cadmium</i> and <i>Cadmium compounds</i> cause lung and prostate cancer in humans

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes.  
Remove contact lenses if worn.

**Remove** contaminated clothing and wash contaminated skin with soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** to a medical facility.

**Medical** observation is recommended as symptoms may be delayed.

Common Name: **CALCIUM**

Synonyms: Atomic Calcium; Elemental Calcium

CAS No: 7440-70-2

Molecular Formula: Ca

RTK Substance No: 0309

Description: Odorless, soft, silvery-white, metallic solid

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>3 - Health</b></p> <p><b>1* - Fire</b></p> <p><b>2-W - Reactivity</b></p> <p><b>DOT#:</b> UN 1401</p> <p><b>ERG Guide #:</b> 138</p> <p><b>Hazard Class:</b> 4.3 (Water Reactive)</p>	<p><b>*Calcium</b> in bulk form is not flammable, but <i>finely divided Calcium</i> is <b>FLAMMABLE</b> and <b>REACTIVE</b> with AIR, MOIST AIR and WATER.</p> <p>Use dry chemical, soda ash, lime, or sand as extinguishing agents. <b>DO NOT USE WATER, CO<sub>2</sub> OR FOAM.</b></p> <p><b>POISONOUS GASES ARE PRODUCED IN FIRE.</b></p> <p><b>CONTAINERS MAY EXPLODE IN FIRE.</b></p> <p>Use water spray to keep fire-exposed containers cool. <b>DO NOT GET WATER INSIDE CONTAINERS.</b></p> <p><i>Finely divided Calcium</i> may form an ignitable vapor/air mixture in closed tanks or containers.</p>	<p><b>Calcium</b> can react violently with WATER, STEAM, MOISTURE and STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) to form flammable and explosive <i>Hydrogen gas</i>.</p> <p><i>Finely divided Calcium</i> can ignite in AIR or in the presence of HALOGENS (such as CHLORINE and FLUORINE).</p> <p>Contact with STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES); and CARBONATES (such as LIME and SODA ASH) may result in explosions.</p> <p><b>Calcium</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES); METALS (such as LEAD and MERCURY); METAL OXIDES; METAL SALTS; DINITROGEN TETRAOXIDE; SILICON; and AMMONIA.</p>

### SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Cover with dry sand, earth, or a similar material and place into dry, sealed containers for disposal.

**DO NOT** wash into sewer.

**Calcium** is dangerous to aquatic life at high concentrations.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Flammable (when <i>finely divided</i> )
<b>Auto Ignition Temp:</b>	1,454 ± 18°F (790 ± -8°C)
<b>Vapor Pressure:</b>	10 mm Hg at 1,801°F (983°C)
<b>Specific Gravity:</b>	1.54 (water = 1)
<b>Water Solubility:</b>	Reacts
<b>Boiling Point:</b>	2,703°F (1,484°C)
<b>Melting Point:</b>	1,548°F (842°C)
<b>Molecular Weight:</b>	40.1

### EXPOSURE LIMITS

No occupational exposure limits have been established for **Calcium**.

The Protective Action Criteria values are:

PAC-1 = 30 mg/m<sup>3</sup>    PAC-2 = 50 mg/m<sup>3</sup>

PAC-3 = 250 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Nitrile and Natural Rubber
<b>Coveralls:</b>	Tyvek®
<b>Respirator:</b>	Full facepiece APR with P95 filters >30 mg/m <sup>3</sup> - SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns
<b>Inhalation:</b>	Nose and throat irritation with coughing and wheezing

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention immediately.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **CALCIUM ARSENATE**

Synonyms: Cucumber dust; Tricalcium Orthoarsenate

CAS No: 7778-44-1

 Molecular Formula:  $\text{Ca}_3\text{As}_2\text{H}_6\text{O}_8$ 

RTK Substance No: 0310

Description: Colorless to white, odorless powder

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>4 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 1573 ERG Guide #: 151 Hazard Class: 6.1 (Poison)	Extinguish fire using an agent suitable for type of surrounding fire. <b>Calcium Arsenate</b> itself does not burn. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Arsenic Oxides</i> . Use water spray to keep fire-exposed containers cool.	<b>Calcium Arsenate</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE). HYDROGEN gas and STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) can react with <i>inorganic Arsenic</i> to form highly toxic <i>Arsine gas</i> . <i>Water solutions of Calcium Arsenate</i> in contact with ACTIVE METALS (such as IRON, ALUMINUM and ZINC) may release highly toxic <i>Arsenic fumes</i> and <i>Arsine gas</i> .

## SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and deposit in sealed containers.

DO NOT wash into sewer.

Hazardous to the environment, especially to water organisms.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Nonflammable
<b>Vapor Pressure:</b>	0 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	3.62 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	Decomposes
<b>Melting Point:</b>	2,651°F (1,455°C)
<b>Molecular Weight:</b>	398.1

## EXPOSURE LIMITS

**OSHA:** 0.01 mg/m<sup>3</sup>, 8-hr TWA

**NIOSH:** 0.002 mg/m<sup>3</sup>, 15-min Ceiling

**ACGIH:** 0.01 mg/m<sup>3</sup>, 8-hr TWA

**IDLH:** 5 mg/m<sup>3</sup>  
 (All of the above are for *inorganic Arsenic*)

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Nitrile and Natural Rubber
<b>Coveralls:</b>	DuPont Tyvek®
<b>Respirator:</b>	<0.1 mg/m <sup>3</sup> - Full facepiece APR with High efficiency filter <0.5 mg/m <sup>3</sup> - Supplied air

## HEALTH EFFECTS

<b>Eyes:</b>	Irritation, burns, red and watery eyes
<b>Skin:</b>	Irritation, burns, itching, rash and loss of pigment
<b>Inhalation:</b>	Nose and throat irritation with coughing, wheezing, and hoarseness Weakness, nausea, vomiting, headache and muscle cramps
<b>Chronic:</b>	<i>Arsenic compounds</i> cause skin, lung and liver cancer in humans

## FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention immediately.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.



Common Name: **CALCIUM CARBIDE**

Synonyms: Acetylenogen; Calcium Acetylide

CAS No: 75-20-7

Molecular Formula: CaC<sub>2</sub>

RTK Substance No: 0312

Description: Grayish-black lump or crystalline powder with a garlic-like odor

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>3 - Fire</b> <b>2-W - Reactivity</b> <b>DOT#:</b> UN 1402 <b>ERG Guide #:</b> 138 <b>Hazard Class:</b> 4.3 (Water Reactive/ Dangerous When Wet)	FLAMMABLE AND WATER REACTIVE When <b>Calcium Carbide</b> is exposed to WATER or MOISTURE it forms flammable <i>Acetylene gas</i> . Use approved Class D extinguishers or smother with dry sand, dry clay or dry ground limestone. DO NOT USE WATER, CO <sub>2</sub> or FOAM as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Calcium Oxides</i> . CONTAINERS MAY EXPLODE IN FIRE. Use water spray only to keep fire-exposed containers cool.	<b>Calcium Carbide</b> reacts with WATER and MOISTURE to produce flammable <i>Acetylene gas</i> and <i>Lime</i> . The heat of the reaction may ignite the <i>Acetylene</i> . <b>Calcium Carbide</b> reacts with COPPER, SILVER, MERCURY and BRASS to form explosive compounds such as METAL ACETYLIDES. <b>Calcium Carbide</b> is not compatible with METHANOL; OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); ACID FUMES; STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); and METAL SALTS and METAL OXIDES (such as IRON CHLORIDE and IRON OXIDE).

**SPILL/LEAKS**

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Cover with dry lime, sand or soda ash and place into sealed containers for disposal.

Use only non-sparking tools and equipment, especially when opening and closing containers of **Calcium Carbide**.

DO NOT USE WATER OR WET METHOD.

Keep **Calcium Carbide** out of confined spaces, such as sewers, because of the possibility of an explosion.

DO NOT wash into sewer.

**Calcium Carbide** is harmful to aquatic life at low concentrations.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	Garlic-like odor
<b>Flash Point:</b>	Flammable solid
<b>LEL:</b>	2.5% (for <i>Acetylene gas</i> )
<b>UEL:</b>	82% (for <i>Acetylene gas</i> )
<b>Auto Ignition Temp:</b>	617°F (325°C)
<b>Specific Gravity:</b>	2.22 (water = 1)
<b>Water Solubility:</b>	Reacts
<b>Melting Point:</b>	4,172°F (2,300°C)
<b>Molecular Weight:</b>	64.1

**EXPOSURE LIMITS**

No occupational exposure limits have been established for **Calcium Carbide**.

The Protective Action Criteria values are: PAC-1 = 120 mg/m<sup>3</sup>  
 PAC-2 = 1,300 mg/m<sup>3</sup> PAC-3 = 7,900 mg/m<sup>3</sup>

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Nitrile and Natural Rubber
<b>Coveralls:</b>	DuPont Tyvek®
<b>Respirator:</b>	>30 mg/m <sup>3</sup> - SCBA Use SCBA at any level if <i>Acetylene gas</i> may be present

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation, rash and burning feeling
<b>Inhalation:</b>	Mouth, nose, throat and lung irritation with coughing and severe shortness of breath (pulmonary edema)

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.  
**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** promptly to a medical facility. Medical observation is recommended as symptoms may be delayed.

Common Name: **CALCIUM CARBONATE**

Synonyms: Calcium Salt of Carbonic Acid, Chalk, Limestone

CAS No: 1317-65-3

Molecular Formula: CaCO<sub>3</sub>

RTK Substance No: 4001

Description: White to tan odorless powder or colorless crystals

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>1 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b>	<b>Calcium Carbonate</b> is non-combustible, but when heated, decomposes to emit an acrid smoke and irritating vapors. Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents.	<b>Calcium Carbonate</b> ignites on contact with FLUORINE. <b>Calcium Carbonate</b> when heated with mixture of magnesium and hydrogen causes violent explosion. <b>Calcium Carbonate</b> is not compatible with ACIDS, ALUMINUM, AMMONIUM SALTS, FLUORINE and MAGNESIUM and HYDROGEN.

### SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Use damp methods to control dust. Test for trace levels of radioactivity after clean-up.

Collect powdered material in the most convenient and safe manner and place into sealed containers for disposal.

DO NOT wash into sewer.

### PHYSICAL PROPERTIES

<b>Vapor Pressure:</b>	0 mm Hg
<b>Specific Gravity:</b>	2.7% - 2.9%
<b>Water Solubility:</b>	0.001%
<b>Boiling Point:</b>	Decomposes
<b>Melting Point:</b>	1,517°F – 2,442°F (Decomposes)
<b>Molecular Weight:</b>	100.1

### EXPOSURE LIMITS

**OSHA:** 15 mg/m<sup>3</sup> (total particulate)  
 5 mg/m<sup>3</sup> (respirable fraction) averaged over an 8-hour workshift

**NIOSH:** 10 mg/m<sup>3</sup> (total particulate)  
 5 mg/m<sup>3</sup> (respirable fraction) averaged over a 10-hour workshift

The Protective Action Criteria values are:

PAC-1 = 45 mg/m<sup>3</sup>

PAC-2 = 500 mg/m<sup>3</sup>

PAC-3 = 3,000 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Nitrile
<b>Coveralls:</b>	DuPont Tyvek®
<b>Respirator:</b>	> 5 mg/m <sup>3</sup> - N95 or higher >45 mg/m <sup>3</sup> – Supplied Air

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Cough, sneezing, rhinorrhea (discharge of nasal mucus)

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.  
**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** promptly to a medical facility.



Common Name: **CALCIUM CHROMATE**

Synonyms: C.I. Pigment Yellow 33; Calcium Chrome Yellow  
 CAS No: 13765-19-0  
 Molecular Formula: CaCrO  
 RTK Substance No: 0315  
 Description: Odorless yellow, crystalline powder

HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>4 - Health</b>  <b>0 - Fire</b>  <b>0 - Reactivity</b>                      DOT#: UN 3077                      ERG Guide #: 171                      Hazard Class: 9                      (Environmentally Hazardous Material)</p>	<p>Extinguish fire using an agent suitable for type of surrounding fire. <b>Calcium Chromate</b> itself does not burn.  <b>Calcium Chromate</b> is not combustible but it is a STRONG OXIDIZER which enhances the combustion of other substances.                      POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Chromium fumes</i>.                      Use water spray to keep fire-exposed containers cool.  <b>Calcium Chromate</b> may ignite combustibles (wood, paper and oil).</p>	<p><b>Calcium Chromate</b> reacts explosively with HYDRAZINE.  <b>Calcium Chromate</b> is not compatible with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); ORGANIC MATTER; ALUMINUM; SULFUR; BORON; and ETHANOL.                      Store in tightly closed containers in a cool, well-ventilated area away from PLASTICS and COMBUSTIBLES.</p>

SPILL/LEAKS

**Isolation Distance:**  
 Spill: 25 meters (75 feet)  
 Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and deposit into sealed containers.  
 DO NOT wash into sewer.

PHYSICAL PROPERTIES

**Odor Threshold:** Odorless  
**Flash Point:** Nonflammable  
**Vapor Density:** 2.89 (air = 1)  
**Vapor Pressure:** <1 mm Hg at 68°F (20°C)  
**Specific Gravity:** 2.9 (water = 1)  
**Water Solubility:** Slightly soluble  
**Melting Point:** 392°F (200°C) (dihydrate)  
**Molecular Weight:** 156.1

EXPOSURE LIMITS

**OSHA:** 0.1 mg/m<sup>3</sup>, Ceiling (as *Chromates*)  
**NIOSH:** 0.001 mg/m<sup>3</sup>, 10-hr TWA (as *Chromates*)  
**ACGIH:** 0.001 mg/m<sup>3</sup>, 8-hr TWA  
**IDLH:** 15 mg/m<sup>3</sup> (as *Chromates*)

PROTECTIVE EQUIPMENT

**Gloves:** Butyl, Nitrile, Silver Shield®/4H® and Viton  
**Coveralls:** Tyvek®  
**Respirator:** >0.001 mg/m<sup>3</sup> - APR with High efficiency filter  
 >0.01 mg/m<sup>3</sup> - Supplied air

HEALTH EFFECTS

**Eyes:** Irritation and burns  
**Skin:** Irritation and burns, itching and ulcers  
**Inhalation:** Nose and throat irritation with coughing and wheezing  
**Chronic:** *Hexavalent Chromium* or *Chromium VI compounds* cause lung cancer in humans

FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention.  
**Quickly** remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** promptly to a medical facility.

Common Name: **CALCIUM NITRATE**

Synonyms: Calcium Saltpeter; Lime Nitrate; Nitrocalcite

CAS No: 10124-37-5

Molecular Formula:  $\text{Ca}(\text{NO}_3)_2$

RTK Substance No: 0324

Description: White to gray, odorless, crystalline or granular solid

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>0 - Fire</b> <b>3 - Reactivity</b> DOT#: UN 1454 ERG Guide #: 140 Hazard Class: 5.1 (Oxidizer)	<p><b>Calcium Nitrate</b> is not combustible, but it is a <b>STRONG OXIDIZER</b> that enhances the combustion of other substances.</p> <p>Use water in flooding quantities or extinguish fire using an agent suitable for type of surrounding fire.</p> <p><b>POISONOUS GASES ARE PRODUCED IN FIRE</b>, including <i>Nitrogen Oxides</i>.</p> <p>Use water spray to keep fire-exposed containers cool.</p> <p><b>Calcium Nitrate</b> may ignite combustibles (wood, paper and oil).</p>	<p>Mixtures of <b>Calcium Nitrate</b> with <b>ALKYL ESTERS</b>; <b>PHOSPHORUS</b>; <b>TIN CHLORIDE</b>; and <b>REDUCING AGENTS</b> (such as <b>LITHIUM</b>, <b>SODIUM</b>, <b>ALUMINUM</b> and their <b>HYDRIDES</b>) may result in fires and explosions.</p> <p><b>Calcium Nitrate</b> reacts with <b>WATER</b> to release heat.</p> <p><b>Calcium Nitrate</b> is not compatible with <b>STRONG ACIDS</b> (such as <b>HYDROCHLORIC</b>, <b>SULFURIC</b> and <b>NITRIC</b>); <b>METAL SALTS</b>; and <b>COMBUSTIBLES</b>.</p>

**SPILL/LEAKS**

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Collect powdered material in the most convenient and safe manner and place into sealed containers for disposal.

DO NOT wash into sewer.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Nonflammable
<b>Specific Gravity:</b>	2.5 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Melting Point:</b>	1,042°F (561°C)
<b>Molecular Weight:</b>	164.1

**EXPOSURE LIMITS**

The Protective Action Criteria values are:

PAC-1 = 0.91 mg/m<sup>3</sup>

PAC-2 = 10 mg/m<sup>3</sup>

PAC-3 = 60 mg/m<sup>3</sup>

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Nitrile and Natural Rubber
<b>Coveralls:</b>	DuPont Tyvek®
<b>Respirator:</b>	>0.91 mg/m <sup>3</sup> - SCBA

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, wheezing and shortness of breath
	Headache, dizziness, nausea and vomiting

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **CALCIUM SILICIDE**

Synonyms: Calcium Disilicide; Calcium Silicon

CAS No: 12013-56-8

Molecular Formula:  $\text{CaSi}_2$

RTK Substance No: 0332

Description: Gray to black or brown, powder or chip with a repulsive odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>1 - Health</b> <b>3 - Fire</b> <b>2-W - Reactivity</b> <b>DOT#:</b> UN 1405 <b>ERG Guide #:</b> 138 <b>Hazard Class:</b> 4.3 (Water Reactive)	FLAMMABLE AND REACTIVE WATER REACTIVE Use sand, soda ash, lime or dry chemicals appropriate for extinguishing metal fires. <b>DO NOT USE WATER</b> or <b>FOAM</b> . POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Silicon Oxides</i> and <i>Hydrogen</i> . CONTAINERS MAY EXPLODE IN FIRE. DO NOT get water into containers.	<b>Calcium Silicide</b> reacts violently and/or explosively with WATER, STEAM, MOIST AIR, and FLUORINE. <b>Calcium Silicide</b> reacts with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) to form self-igniting and toxic <i>Silane gas</i> . <b>Calcium Silicide</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); BORON; and IODINE.

### SPILL/LEAKS

**Isolation Distance:**

**Spill:** 25 meters (75 feet)

**Fire:** 800 meters (1/2 mile)

Cover with dry lime, sand or soda ash and place into sealed containers for disposal.

**DO NOT USE WATER OR WET METHOD.**

Keep **Calcium Silicide** out of confined spaces, such as sewers, because of the possibility of an explosion.

### PHYSICAL PROPERTIES

**Odor Threshold:** Repulsive odor

**Flash Point:** Flammable

**Auto Ignition Temp:** 1,472°F (800°C)

**Specific Gravity:** 2.5 (water = 1)

**Water Solubility:** Decomposes in hot water

**Melting Point:** 1,292° to 1,715°F (700° to 935°C)

**Molecular Weight:** 96.25

### EXPOSURE LIMITS

No occupational exposure limits have been established for **Calcium Silicide**.

### PROTECTIVE EQUIPMENT

**Gloves:** Nitrile and Polyvinyl Chloride

**Coveralls:** Tyvek®

**Respirator:** SCBA

### HEALTH EFFECTS

**Eyes:** Irritation

**Skin:** Irritation

**Inhalation:** Nose, throat and lung irritation

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Remove** contaminated clothing and wash contaminated skin with soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **CAPROLACTAM**

Synonyms: 1,6-Hexolactam; 2-Oxohexamethyleneimine

CAS No: 105-60-2

 Molecular Formula: C<sub>6</sub>H<sub>11</sub>NO

RTK Substance No: 0337

Description: White flake or crystalline solid with an unpleasant odor, or when molten a colorless or milky-white liquid

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b> DOT#: NA 3082 ERG Guide #: 171 Hazard Class: 9 (Miscellaneous Hazardous Material)	<b>Caprolactam</b> may burn, but does not readily ignite. Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> and <i>Ammonia</i> . Use water spray to keep fire-exposed containers cool.	<b>Caprolactam</b> may react violently with a mixture of ACETIC ACID and DINITROEN TRIOXIDE. <b>Caprolactam</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); CHLORINATED HYDROCARBONS (such as METHYLENE CHLORIDE and TRICHLOROETHYLENE); and ALKALI METALS (such as LITHIUM, SODIUM and POTASSIUM).

## SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

 Absorb *molten Caprolactam* with fly ash, cement powder or commercial sorbent and place into sealed containers for disposal.

 Moisten spilled *solid* material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

DO NOT wash into sewer.

**Caprolactam** may be hazardous to the environment, especially to aquatic organisms.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	0.064 ppm
<b>Flash Point:</b>	257°F (125°C)
<b>LEL:</b>	1.4%
<b>UEL:</b>	8%
<b>Auto Ignition Temp:</b>	707°F (375°C)
<b>Vapor Density:</b>	3.9 (air = 1)
<b>Vapor Pressure:</b>	0.001 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.02 (water = 1)
<b>Water Solubility:</b>	Highly soluble and hygroscopic
<b>Boiling Point:</b>	513°F (267°C)
<b>Melting Point:</b>	156°F (69°C)
<b>Critical Temperature:</b>	944.4°F (507°C)
<b>Molecular Weight:</b>	113.16

## EXPOSURE LIMITS

**NIOSH:** 1 mg/m<sup>3</sup> (*solid*), 10-hr TWA; 3 mg/m<sup>3</sup> STEL

**NIOSH:** 0.22 ppm (*vapor*), 10-hr TWA; 0.66 ppm STEL

**ACGIH:** 5 mg/m<sup>3</sup>, 8-hr TWA

The Protective Action Criteria values are:

 PAC-1 = 3 mg/m<sup>3</sup> PAC-2 = 20 mg/m<sup>3</sup>

 PAC-3 = 20 mg/m<sup>3</sup>

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Neoprene
<b>Coveralls:</b>	Tyvek®
	>1 mg/m <sup>3</sup> <i>solid</i> or >0.22 ppm <i>vapor</i> - full facepiece APR with <i>Organic vapor</i> cartridges and <i>N95</i> prefilters
<b>Respirator:</b>	>3 mg/m <sup>3</sup> <i>solid</i> or >0.66 ppm <i>vapor</i> - SCBA

## HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns
<b>Inhalation:</b>	Nose, throat and lungs irritation with coughing, wheezing and shortness of breath Headache and convulsions (seizures)

## FIRST AID AND DECONTAMINATION

<b>Remove</b>	the person from exposure.
<b>Flush</b>	eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
<b>Quickly</b>	remove contaminated clothing and wash contaminated skin with large amounts of water.
<b>Begin</b>	artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b>	promptly to a medical facility.



Common Name: **CAPTAFOL**

Synonyms: None

CAS No: 2425-06-1

Molecular Formula: C<sub>10</sub>H<sub>9</sub>Cl<sub>4</sub>NO<sub>2</sub>S

RTK Substance No: 0338

Description: Colorless to pale yellow or tan, crystalline solid or powder with a strong odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> DOT#: None ERG Guide #: None Hazard Class: None	<b>Captafol</b> does not burn, however, it is often dissolved in a liquid carrier which may be flammable or combustible. Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Sulfur Oxides, Nitrogen Oxides, Hydrogen Chloride and Phosgene.</i>	<b>Captafol</b> reacts violently with STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE). <b>Captafol</b> is not compatible with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); ACID VAPORS; ACID CHLORIDES; ACID ANHYDRIDES; and OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).

### SPILL/LEAKS

**Isolation Distance:**

Spill (solid): 25 meters (75 feet)

Spill (liquid): 75 meters (150 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

Absorb liquids in dry sand, earth, or a noncombustible material and place into sealed containers for disposal.

DO NOT wash into sewer.

**Captafol** is very toxic to aquatic organisms.

### PHYSICAL PROPERTIES

**Flash Point:** Noncombustible (solid)

**Vapor Density:** 1.2 (air = 1)

**Vapor Pressure:** 8.3 x 10<sup>-9</sup> at 68 °F (20 °C)

**Boiling Point:** Decomposes

**Melting Point:** 321 °F (162 °C) (Decomposes)

**Molecular Weight:** 349.06

### EXPOSURE LIMITS

**NIOSH:** 0.1 mg/m<sup>3</sup>, 10-hr TWA

**ACGIH:** 0.1 mg/m<sup>3</sup>, 8-hr TWA

### PROTECTIVE EQUIPMENT

**Gloves:** Nitrile and Neoprene

**Coveralls:** Tyvek®

**Respirator:** >0.1 mg/m<sup>3</sup> - Pressure demand supplied-air

### HEALTH EFFECTS

**Eyes:** Irritation

**Skin:** Irritation, rash, dryness and redness.

**Inhalation:** Nose and throat irritation with coughing and wheezing

**Chronic:** Cancer (kidney, liver, small intestine) in animals

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **CAPTAN**

Synonyms: Captane; Orthocide; Vanicide

CAS No: 133-06-2

 Molecular Formula: C<sub>9</sub>H<sub>8</sub>Cl<sub>3</sub>NO<sub>2</sub>S

RTK Substance No: 0339

Description: White, odorless, crystalline solid when pure or cream to yellow powder with a strong odor (technical grade)

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>0 - Fire</b> <b>1 - Reactivity</b> DOT#: UN 3077 ERG Guide #: 171 Hazard Class: 9 (miscellaneous/ hazardous material)	<i>Pure Captan</i> does not burn, however it is often dissolved in a liquid carrier which may be flammable or combustible. Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Sulfur Oxides, Nitrogen Oxides, Hydrogen Chloride</i> and <i>Phosgene</i> . Use water spray to keep fire-exposed containers cool.	<b>Captan</b> is not compatible with STRONG ALKALIES (such as LIME); TETRAETHYL PYROPHOSPHATE; OIL SPRAYS; and PARATHION. <b>Captan</b> may react with WATER to form <i>Hydrogen Chloride</i> gas. <b>Captan</b> is corrosive to METALS in the presence of MOISTURE.

## SPILL/LEAKS

## Isolation Distance:

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up.

Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.

May be hazardous to aquatic and soil organisms.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless (when pure)
<b>Vapor Pressure:</b>	0 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.74 (water = 1)
<b>Water Solubility:</b>	Very slightly soluble
<b>Boiling Point:</b>	Decomposes
<b>Melting Point:</b>	352°F (178°C)
<b>Molecular Weight:</b>	300.6

## EXPOSURE LIMITS

 NIOSH: 5 mg/m<sup>3</sup>, 10-hr TWA

 ACGIH: 5 mg/m<sup>3</sup>, 8-hr TWA (as the inhalable fraction)

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Rubber or Nitrile
<b>Coveralls:</b>	DuPont Tyvek® or equivalent
<b>Respirator:</b>	>5 mg/m <sup>3</sup> - Full facepiece APR with Organic vapor cartridge and High efficiency pre-filters >50 mg/m <sup>3</sup> - Supplied air

## HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation, skin rash and itching
<b>Inhalation:</b>	Nose and throat irritation Headache, dizziness, nausea and vomiting

## FIRST AID AND DECONTAMINATION

<b>Remove</b>	the person from exposure.
<b>Flush</b>	eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
<b>Remove</b>	contaminated clothing and wash contaminated skin with large amounts of soap and water.
<b>Transfer</b>	to a medical facility.

Common Name: **CARBON BLACK**

Synonyms: C.I. Pigment Black 7; Channel Black; Lamp Black, Furnace Black

CAS No: 1333-86-4

Molecular Formula: Mixture

RTK Substance No: 0342

Description: Black, odorless, finely divided powder

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b>  DOT#: UN 1361 ERG Guide #: 133 Hazard Class: 4.2 (Spontaneously combustible)	<b>Carbon Black</b> is a COMBUSTIBLE SOLID, which may contain <i>flammable Hydrocarbons</i> . Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE. Use water spray to keep fire-exposed containers cool.	Finely dispersed particles may form explosive mixtures in air.  <b>Carbon Black</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).

### SPILL/LEAKS

**Isolation Distance:**

Small Spills: 25 meters (75 feet)

Large Spills: 100 meters (330 feet)

Moisten spilled powder first or use a HEPA-filter vacuum for clean-up.

For solid **Carbon Black**, collect in the most convenient and safe manner and deposit in sealed containers.

Keep **Carbon Black powder** or *dust* out of confined spaces, such as sewers, because of the possibility of an explosion.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	No information
<b>Vapor Pressure:</b>	0 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.8 - 2.1 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	Sublimates approx. 6,605°F (3,652°C)
<b>Melting Point:</b>	Sublimates approx. 6,605°F (3,652°C)
<b>Molecular Weight:</b>	12.01

### EXPOSURE LIMITS

<b>OSHA:</b>	3.5 mg/m <sup>3</sup> , 8-hr TWA
<b>NIOSH:</b>	3.5 mg/m <sup>3</sup> , 10-hr TWA 0.1 mg PAHs/m <sup>3</sup> , 10-hr TWA
<b>ACGIH:</b>	3.0 mg/m <sup>3</sup> , 8-hr TWA
<b>IDLH LEVEL:</b>	1,750 mg/m <sup>3</sup>
<b>PAC LEVELS:</b>	PAC-1 = 9 mg/m <sup>3</sup> ; PAC-2 = 99 mg/m <sup>3</sup> ; PAC-3 = 590 mg/m <sup>3</sup>

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Natural Rubber
<b>Coveralls:</b>	DuPont Tychem® Polycoat, QC, CPF1, SL and CPF2
<b>Boots:</b>	Rubber
<b>Respirator:</b>	>3.0 mg/m <sup>3</sup> - APR with High efficiency filters >30 mg/m <sup>3</sup> - Supplied air

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Irritation of the nose, throat and lungs with coughing and wheezing
<b>Chronic:</b>	Carcinogen (lung) in animals

### FIRST AID AND DECONTAMINATION

<b>Remove</b>	the person from exposure.
<b>Flush</b>	eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
<b>Remove</b>	contaminated clothing and wash contaminated skin with soap and water.
<b>Begin</b>	artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b>	to a medical facility.

Common Name: **CARBON DIOXIDE**

Synonyms: Carbonic Acid; Dry Ice

CAS No: 124-38-9

Molecular Formula: CO<sub>2</sub>

RTK Substance No: 0343

Description: Colorless, odorless gas commonly found as a liquid under pressure or as a solid (dry ice)

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>3 - Health</b></p> <p><b>0 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p><b>DOT#:</b> UN 1013</p> <p><b>ERG Guide #:</b> 120</p> <p><b>Hazard Class:</b> 2.2 (Nonflammable gas)</p>	<p>Extinguish fire using an agent suitable for type of surrounding fire. <b>Carbon Dioxide</b> itself does not burn.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE.</p> <p>CONTAINERS MAY EXPLODE IN FIRE.</p> <p>Use water spray to keep fire-exposed containers cool.</p> <p>Flow or agitation may generate electrostatic charges and may ignite any explosive mixtures present.</p>	<p><i>Dusts</i> of various METALS (such as MAGNESIUM, ZIRCONIUM, TITANIUM and CHROMIUM) can ignite or explode when suspended in <b>Carbon Dioxide</b>.</p> <p><b>Carbon Dioxide</b> reacts with WATER to form <i>Carbonic Acid</i>.</p> <p><b>Carbon Dioxide</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES); METAL CARBIDES; METAL SALTS; and STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE).</p>

### SPILL/LEAKS

**Isolation Distance:**

Spill: 100 meters (330 feet)

Fire: 800 meters (1/2 mile)

Stop flow of gas. If source of leak is a cylinder and the leak cannot be stopped in place, remove the leaking cylinder to a safe place in the open air, and repair leak or allow cylinder to empty.

Gas is heavier than air and may accumulate in low ceiling spaces and confined spaces.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Nonflammable
<b>Vapor Density:</b>	1.52 (air = 1)
<b>Vapor Pressure:</b>	42,940 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.5 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	-109°F (-78.3°C)
<b>Freezing Point:</b>	-70°F (-57°C)
<b>Ionization Potential:</b>	13.77 eV
<b>Molecular Weight:</b>	44

### EXPOSURE LIMITS

**NIOSH:** 5,000 ppm, 10-hr TWA; 30,000 ppm, STEL

**IDLH:** 40,000 ppm

The Protective Action Criteria values are:

PAC-1 = 30,000 ppm

PAC-2 = 40,000 ppm

PAC-3 = 50,000 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Insulated Rubber
<b>Coveralls:</b>	Insulated material
<b>Respirator:</b>	>5,000 ppm - SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns. Contact with liquid or solid ("dry ice") causes frostbite
<b>Skin:</b>	Irritation and burns. Contact with liquid or solid ("dry ice") causes frostbite
<b>Inhalation:</b>	Headache, dizziness, difficulty breathing, tremors, convulsions, coma and death

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water.

**Immerse** affected part in warm water. Seek medical attention.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **CARBON DISULFIDE**

Synonyms: Carbon Bisulfide; Carbon Sulfide; Dithiocarbonic Anhydride

CAS No: 75-15-0

Molecular Formula: CS<sub>2</sub>

RTK Substance No: 0344

Description: Clear, colorless to light yellow liquid with an unpleasant, rotten egg odor (reagent or commercial grade) and a sweet, pleasant odor when pure

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>4 - Fire</b> <b>0 - Reactivity</b> <b>DOT#:</b> UN 1131 <b>ERG Guide #:</b> 131 <b>Hazard Class:</b> 3 (Flammable)	<p><b>Carbon Disulfide</b> is a <b>FLAMMABLE LIQUID</b> and has a very low ignition temperature. Contact with hot steam pipes, ordinary light bulbs, sparks, friction or shock can ignite <b>Carbon Disulfide</b> or its <i>vapors</i>.</p> <p>Blanket fire with water to extinguish and control vapors or use dry chemical or CO<sub>2</sub> as extinguishing agents.</p> <p><b>POISONOUS GASES ARE PRODUCED IN FIRE</b>, including <i>Sulfur Oxides</i>.</p> <p><b>CONTAINERS MAY EXPLODE IN FIRE.</b></p> <p>Use water spray to keep fire-exposed containers cool.</p> <p>Vapors may travel to a source of ignition and flash back.</p> <p>Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.</p> <p>Flow or agitation may generate electrostatic charges.</p> <p><b>Carbon Disulfide</b> may form an ignitable vapor/air mixture.</p>	<p><b>Carbon Disulfide</b> and <b>Carbon Disulfide vapor</b> can be ignited or may explode with <b>HEAT, SHOCK</b> and <b>FRICITION</b> or on contact with <b>HEATED SURFACES</b> (such as <b>STEAM PIPES</b> and <b>LIGHT BULBS</b>).</p> <p><b>Carbon Disulfide</b> may react violently with <b>AZIDES; STRONG ACIDS</b> (such as <b>HYDROCHLORIC, SULFURIC</b> and <b>NITRIC</b>); <b>RUST; NITROGEN OXIDE; AMINES; OXIDIZING AGENTS</b> (such as <b>PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE</b> and <b>FLUORINE</b>); and <b>CHEMICALLY ACTIVE METALS</b> (such as <b>POTASSIUM, SODIUM, MAGNESIUM</b> and <b>ZINC</b>).</p>

### SPILL/LEAKS

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers for disposal.

Metal containers involving the transfer of **Carbon Disulfide** should be grounded and bonded.

Use only non-sparking tools and equipment, especially when opening and closing containers of **Carbon Disulfide**.

Keep **Carbon Disulfide** out of confined spaces, such as sewers, because of the possibility of an explosion.

**Carbon Disulfide** is harmful to aquatic life in very low concentrations.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	0.1 to 0.2 ppm
<b>Flash Point:</b>	-22°F (-30°C)
<b>LEL:</b>	1%
<b>UEL:</b>	50%
<b>Auto Ignition Temp:</b>	212°F (100°C)
<b>Vapor Density:</b>	2.67 (air = 1)
<b>Vapor Pressure:</b>	297 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.26 (water = 1)
<b>Water Solubility:</b>	Very slightly soluble
<b>Boiling Point:</b>	115°F (46°C)
<b>Freezing Point:</b>	-168°F (-111°C)
<b>Ionization Potential:</b>	10.8 eV
<b>Molecular Weight:</b>	76.13

### EXPOSURE LIMITS

**NIOSH:** 1 ppm, 10-hr TWA; 10 ppm, 15-min Ceiling

**ACGIH:** 1 ppm, 8-hr TWA

**IDLH:** 500 ppm

The Protective Action Criteria values are:

PAC-1 = 13 ppm PAC-2 = 160 ppm PAC-3 = 480 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Polyvinyl Alcohol, SilverShield®/4H®, Viton and Barrier® (>8-hr breakthrough)
<b>Coveralls:</b>	Tychem® BR, Responder® and TK; Trelchem® HPS and VPS (>8-hr breakthrough)
<b>Respirator:</b>	>1 ppm - full facepiece APR with <i>Organic vapor cartridges</i> >10 ppm - SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns
<b>Inhalation:</b>	Headache, nausea, vomiting, dizziness, lightheadedness, passing out and even death

### FIRST AID AND DECONTAMINATION

<b>Remove</b> the person from exposure.
<b>Flush</b> eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.
<b>Quickly</b> remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention.
<b>Begin</b> artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b> promptly to a medical facility.

**Common Name: CARBON MONOXIDE**

**Synonyms:** Carbonic Oxide; Exhaust Gas; Flue Gas

**CAS No:** 630-08-0

**Molecular Formula:** CO

**RTK Substance No:** 0345

**Description:** Colorless, odorless gas

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>4 - Fire</b> <b>0 - Reactivity</b>  <b>DOT#:</b> UN 1016 <b>ERG Guide #:</b> 119 <b>Hazard Class:</b> 2.3 (Poisonous Gas)	<b>Carbon Monoxide</b> is a <b>FLAMMABLE GAS</b> . Stop flow of gas and use water spray to disperse vapors. <b>POISONOUS GASES ARE PRODUCED IN FIRE.</b> Use water spray to keep fire-exposed containers cool. Vapors may travel to a source of ignition and flash back. <b>Carbon Monoxide</b> may form an ignitable vapor/air mixture in closed tanks or containers.	<b>Carbon Monoxide</b> is not compatible with <b>OXIDIZING AGENTS</b> (such as <b>PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE</b> and <b>FLUORINE</b> ) and <b>ALKALI METALS</b> (such as <b>LITHIUM, SODIUM</b> and <b>POTASSIUM</b> ).  <i>Liquified, cold Carbon Monoxide</i> may react vigorously with water.

### SPILL/LEAKS

**Isolation Distance:**

Small Spill: 30 meters (100 feet)

Large Spill: 150 meters (500 feet)

Fire: 800 meters (1/2 mile)

Stop flow of gas. If source of leak is a cylinder and the leak cannot be stopped in place, remove the leaking cylinder to a safe place in the open air, and repair leak or allow cylinder to empty.

Keep **Carbon Monoxide** out of confined spaces, such as sewers, because of the possibility of an explosion.

Turn leaking cylinder with leak up to prevent escape of gas in liquid state.

Purge with *inert gas* before attempting repairs.

Use only non-sparking tools and equipment, especially when opening and closing containers of **Carbon Monoxide**.

**Carbon Monoxide** is harmful to aquatic life at very low concentrations.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Flammable gas
<b>LEL:</b>	12%
<b>UEL:</b>	75%
<b>Auto Ignition Temp:</b>	1,125°F (607°C)
<b>Vapor Density:</b>	0.97 (air = 1)
<b>Vapor Pressure:</b>	>750 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	0.79 (water = 1)
<b>Water Solubility:</b>	Very slightly soluble
<b>Boiling Point:</b>	-313°F (-192°C)
<b>Melting Point:</b>	-337°F (-205°C)
<b>Critical Temp:</b>	-282°F (-139°C)
<b>Ionization Potential:</b>	14 eV
<b>Molecular Weight:</b>	28

### EXPOSURE LIMITS

**OSHA:** 50 ppm, 8-hr TWA

**NIOSH:** 35 ppm, 10-hr TWA; 200 ppm, 15-min Ceiling

**ACGIH:** 25 ppm, 8-hr TWA

**IDLH:** 1,200 ppm

The Protective Action Criteria values are:

PAC-1 = 75 ppm   PAC-2 = 83 ppm   PAC-3 = 330 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Insulated work gloves (double glove for spills)
<b>Coveralls:</b>	Tychem® BR, Responder® and TK (330-minute breakthrough) >10% LEL wear flash protection or turnout gear
<b>Respirator:</b>	SCBA

### HEALTH EFFECTS

**Eyes:** No information available

**Skin:** Skin contact with *liquid Carbon Monoxide* can cause frostbite

**Inhalation:** Headache, dizziness, lightheadedness and fatigue, convulsions and loss of consciousness

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**In case of contact with *liquid Carbon Monoxide***, immerse affected part in warm water. Seek medical attention.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

**Medical** observation is recommended as symptoms may be delayed.



Common Name: **CARBON TETRACHLORIDE**

Synonyms: Tetrachlorocarbon; Perchloromethane; Carbon Tet

CAS No: 56-23-5

Molecular Formula: CCl<sub>4</sub>

RTK Substance No: 0347

Description: Colorless liquid with an Ether-like odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b>  DOT#: UN 1846 ERG Guide #: 151 Hazard Class: 6.1 (Poisonous)	Extinguish fire using an agent suitable for type of surrounding fire. <b>Carbon Tetrachloride</b> itself does not burn.  POISONOUS GASES ARE PRODUCED IN FIRE, or when in contact with hot surfaces, including <i>Phosgene</i> and <i>Hydrogen Chloride</i> .  Use water spray to keep fire-exposed containers cool.	<b>Carbon Tetrachloride</b> reacts with CHEMICALLY-ACTIVE METALS (such as SODIUM, POTASSIUM and MAGNESIUM); ZINC; ALUMINUM; POWDERED BERYLLIUM; FLUORINE; DIMETHYLFORMAMIDE; CALCIUM DISILICIDE; CALCIUM HYPOCHLORITE; and mixtures of ETHYLENE and BENZOYL PEROXIDE to cause fires and explosions.  <b>Carbon Tetrachloride</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).

### SPILL/LEAKS

**Isolation Distance:**

Small Spill: 60 meters (200 feet)  
 Large Spill: 270 meters (900 feet)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.  
 DO NOT wash into sewer.

**Carbon Tetrachloride** is harmful to aquatic organisms and is hazardous to the environment and ozone layer.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	>10 ppm
<b>Flash Point:</b>	Non-combustible
<b>Vapor Density:</b>	5.3 (air = 1)
<b>Vapor Pressure:</b>	91 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.59 (water = 1)
<b>Water Solubility:</b>	Very slightly soluble
<b>Boiling Point:</b>	169°F (76°C)
<b>Ionization Potential:</b>	11.47 eV
<b>Molecular Weight:</b>	153.8

### EXPOSURE LIMITS

<b>OSHA:</b>	10 ppm, 8-hr TWA; 25 ppm, 15-min Ceiling; and 200 ppm, as a 5-min maximum Peak in any 4-hr work period
<b>NIOSH:</b>	2 ppm, 60-min STEL
<b>ACGIH:</b>	5 ppm, 8-hr TWA; 10 ppm, 15-min STEL
<b>IDLH:</b>	200 ppm
<b>PAC</b>	PAC-1 = 1.2 ppm; PAC-2 = 13 ppm;
<b>LEVELS:</b>	PAC-3 = 340 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Silver Shield®/4H®, Viton, Viton/Butyl and Nitrile (>8-hr breakthrough)
<b>Coveralls:</b>	DuPont Tychem® BR and LV, Responder® and TK; ONESuit® TEC; and Kappler Zytron® 300, 400 and 500 (>8-hr breakthrough)
<b>Respirator:</b>	>2 ppm - Supplied air

### HEALTH EFFECTS

<b>Eyes:</b>	Severe irritation, burns
<b>Skin:</b>	Severe irritation, burns, rash with blisters
<b>Inhalation:</b>	Headache, nausea, vomiting, diarrhea, dizziness, lightheadedness and passing out
<b>Chronic:</b>	Carcinogen (liver) in animals. Limited evidence that it may damage the developing fetus and male reproductive glands (testes)

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention immediately.  
**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** to a medical facility.

Common Name: **CARBONYL SULFIDE**

Synonyms: Carbon Oxysulfide; Oxycarbon Sulfide

CAS No: 463-58-1

Molecular Formula: COS

RTK Substance No: 0349

Description: Colorless gas with a *Sulfide* (rotten egg) odor

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>4 - Fire</b> <b>1 - Reactivity</b>  <b>DOT#:</b> UN 2204 <b>ERG Guide #:</b> 119 <b>Hazard Class:</b> 2.3 (Toxic gas)	<b>Carbonyl Sulfide</b> is a <b>FLAMMABLE GAS</b> . Stop flow of gas or let burn if leak cannot be stopped. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Hydrogen Sulfide</i> . CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool. Vapors may travel to a source of ignition and flash back. Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.	<b>Carbonyl Sulfide</b> may react with WATER or MOIST AIR to form flammable and toxic gases.  <b>Carbonyl Sulfide</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).

**SPILL/LEAKS**

**Isolation Distance:**

Spill: 100 meters (330 feet)

Fire: 1,600 meters (1 mile)

If **Carbonyl Sulfide** is leaked, take the following steps:

Stop flow of gas. If source of leak is a cylinder and the leak cannot be stopped in place, remove the leaking cylinder to a safe place in the open air, and repair leak or allow cylinder to empty.

Keep **Carbonyl Sulfide** out of confined spaces, such as sewers, because of the possibility of an explosion.

**Carbonyl Sulfide** may bioaccumulate.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	<i>Sulfide</i> odor
<b>Flash Point:</b>	Flammable gas
<b>LEL:</b>	12%
<b>UEL:</b>	29%
<b>Vapor Density:</b>	2.1 (air = 1)
<b>Vapor Pressure:</b>	9,034 mm Hg at 69.8°F (21°C)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	-58°F (-50°C)
<b>Freezing Point:</b>	-218°F (-139°C)
<b>Ionization Potential:</b>	11.19 eV
<b>Molecular Weight:</b>	60.08

**EXPOSURE LIMITS**

The Protective Action Criteria values are:

PAC-1 = 30 ppm

PAC-2 = 55 ppm

PAC-3 = 150 ppm

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Polyvinyl Alcohol, Silver Shield®/4H®, Viton and Barrier® (>8-hr breakthrough for <i>Sulfur compounds, Sulfides</i> and <i>Disulfides</i> )
<b>Coveralls:</b>	Tychem® BR, LV, Responder® and TK; and Trelchem® HPS and VPS (>8-hr breakthrough for <i>Sulfur compounds, Sulfides</i> and <i>Disulfides</i> )
<b>Respirator:</b>	>30 ppm - SCBA

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation with possible eye damage
<b>Skin:</b>	Irritation and redness Contact with the <i>liquefied gas</i> may cause frostbite
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, wheezing and severe shortness of breath (pulmonary edema) Nausea, vomiting, weakness and muscle cramps

**FIRST AID AND DECONTAMINATION**

<b>Remove</b> the person from exposure.
<b>Flush</b> eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.
<b>Quickly</b> remove contaminated clothing and wash contaminated skin with large amounts of water. Seek medical attention.
<b>If</b> exposed to <i>liquefied gas</i> , immerse affected part in warm water.
<b>Begin</b> artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b> promptly to a medical facility.
<b>Medical</b> observation is recommended as symptoms may be delayed.

Common Name: **CESIUM HYDROXIDE**

Synonyms: Cesium Hydrate; Cesium Hydroxide Dimer

CAS No: 21351-79-1

Molecular Formula: (Cs(OH))

RTK Substance No: 0354

Description: Colorless to yellow, crystalline solid, which absorbs moisture from the air and is often in solution. It is a very strong base.

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>0 - Fire</b> <b>1 - Reactivity</b> <b>DOT#:</b> UN 2682 (Solid) UN 2681 (Solution) <b>ERG Guide #:</b> 157 (Solid) 154 (Solution) <b>Hazard Class: 8</b> (Corrosive)	Extinguish fire using an agent suitable for type of surrounding fire. <b>Cesium Hydroxide</b> itself does not burn. POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE. Use water spray only to keep fire-exposed containers cool. DO NOT get water inside containers.	<b>Cesium Hydroxide</b> will react with WATER or MOISTURE to generate enough heat to ignite COMBUSTIBLES. <b>Cesium Hydroxide</b> may react violently with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); and is not compatible with CARBON DIOXIDE and OXYGEN. <b>Cesium Hydroxide</b> attacks many METALS (such as TIN, LEAD, ALUMINUM and ZINC) to form flammable and explosive gases.

**SPILL/LEAKS**

**Isolation Distance:** 25 meters (75 feet) for solids  
 50 meters (150 feet) for liquids

Sweep up solid spills.  
 Absorb liquid spills with vermiculite or dry sand.

**PHYSICAL PROPERTIES**

**Odor Threshold:** No information  
**Flash Point:** Not combustible  
**Specific Gravity:** 3.68 g/cm<sup>3</sup>  
**Vapor Pressure:** 0 mm Hg at 68°F (20°C)  
**Water Solubility:** Soluble/Reactive  
**Melting Point:** 522°F (272°C)

**EXPOSURE LIMITS**

**OSHA:** N/A  
**NIOSH:** 2 mg/m<sup>3</sup>, 10-hr TWA  
**ACGIH:** 2 mg/m<sup>3</sup>, 8-hr TWA  
**IDLH LEVEL:** N/A

**PROTECTIVE EQUIPMENT**

**Gloves:** Butyl Rubber, Nitrile, Neoprene, Natural Rubber or VITON® for *corrosive bases* in *solution*  
**Coveralls:** DuPont Tychem® SP, Polycoat, QC, CPF-1, SL and CPF-2 for *inorganic acids* and *bases*  
**Boots:** Butyl, Neoprene  
**Respirator:** >2 mg/m<sup>3</sup> APR with High Efficiency filters  
 >20 mg/m<sup>3</sup> Supplied Air

**HEALTH EFFECTS**

**Eyes:** Irritation and burns  
**Skin:** Irritation and burns  
**Acute:** Nose, throat and lung irritation with coughing, and shortness of breath (pulmonary edema)  
**Chronic:** Bronchitis with coughing, phlegm and shortness of breath

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention immediately.  
**Quickly** remove contaminated clothing. Wash contaminated skin with large amounts of water. Seek medical attention immediately.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** to a medical facility.  
**Medical** observation is recommended as symptoms may be delayed.

Chemical Name: **CHLORINE**

Synonym: Molecular Chlorine

CAS No: 7782-50-5

Molecular Formula: Cl<sub>2</sub>

RTK Substance No: 0367

Description: Yellow-green gas with strong irritating odor. Can be a liquid under pressure or cold temperatures.

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>4 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> <b>DOT#:</b> UN 1017 <b>ERG Guide #:</b> 124 <b>Hazard Class:</b> 2.3 (Poison Gas)	Nonflammable Gas Cylinders may vent rapidly or explode when heated. Remove gas with fine water spray. DO NOT USE WATER DIRECTLY ON THE SOURCE OF THE LEAK.	Strong Oxidizer Reacts with WATER to form <i>Acid solutions</i> . Forms explosive compounds or reacts explosively with ACETYLENE, ETHER, FLUORINE COMPOUNDS, TURPENTINE, ALCOHOLS, HYDROGEN, FINELY DIVIDED METALS, AMMONIA, STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE), and MANY OTHER CHEMICALS.

**SPILL/LEAKS**

**Isolation Distance:** (All Directions):  
 Small spill - 30 meters (100 feet)  
 Large spill - 240 meters (800 feet)

Ventilate area to disperse gas.  
 Stop flow of gas or place leaking cylinder in a safe place.  
 DO NOT USE WATER DIRECTLY ON THE SOURCE OF LEAK.  
 Toxic to aquatic organisms.

**PHYSICAL PROPERTIES**

**Odor Threshold:** 0.2 to 0.4 ppm  
**Flash Point:** N/A  
**LEL:** N/A  
**UEL:** N/A  
**Vapor Density:** 2.5 (air = 1)  
**Vapor Pressure:** 5,025 mm Hg at 68°F (20°C)  
**Solubility:** Slightly soluble  
**Ionization Potential:** 11.48 eV  
**Freezing Point:** -150°F (-101°C)  
**Boiling Point:** -29°F (-34°C)

**EXPOSURE LIMITS**

**OSHA:** 1 ppm Ceiling  
**NIOSH:** 0.5 ppm 15-minute Ceiling  
**ACGIH:** 0.5 ppm 8-hr, 1 ppm STEL  
**IDLH LEVEL:** 10 ppm  
**ERPG 1** 1 ppm  
**ERPG 2** 3 ppm  
**ERPG 3** 20 ppm

**PROTECTIVE EQUIPMENT**

**Gloves:** Butyl, Neoprene, Viton®  
**Coverall:** DuPont Tychem® CPF3, CPF4, Responder®, TK®, Reflector®, Kappler Zytron® 300 and Zytron® 500  
**Boot:** Neoprene  
**Respirator:** >0.5 ppm CCR with cartridge for Chlorine or Acid Gas  
 >5 ppm Supplied-air respirator  
 >10 ppm SCBA

**HEALTH EFFECTS**

**Eyes:** Irritation, burns and possible eye damage  
**Skin:** Irritation, burns  
 Liquid can cause frostbite  
**Acute:** Nose, throat and lung irritation, coughing (Pulmonary edema)  
 Headache, nausea, vomiting  
**Chronic:** Cancer - Tested (Not Classifiable).  
 Asthma with shortness of breath, wheezing, coughing and/or chest tightness  
 Damage to teeth, skin blisters and hoarseness

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Immediate medical attention is necessary.  
**For** contact with *liquified gas* quickly flush skin with luke warm water.  
**Do** not rub or reheat area.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** to a medical facility.  
**Observation** is recommended as symptoms may be delayed.

Common Name: **alpha-CHLOROACETOPHENONE**

Synonyms: CN; Chemical Mace; Tear Gas

CAS No: 532-27-4

 Molecular Formula: C<sub>8</sub>H<sub>7</sub>ClO

RTK Substance No: 0048

Description: Colorless, white or gray, crystalline solid with an irritating floral odor

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 1697 ERG Guide #: 153 Hazard Class: 6.1 (Poison)	COMBUSTIBLE SOLID Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. Water or foam may cause frothing. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Hydrogen Chloride</i> . Use water spray to keep fire-exposed containers cool.	<b>alpha-Chloroacetophenone</b> in contact with WATER or MOIST AIR may form toxic gases such as <i>Hydrogen Chloride</i> . <b>alpha-Chloroacetophenone</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); ALDEHYDES; NITRIC ACID; and PERCHLORIC ACID.

**SPILL/LEAKS**
**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and deposit into sealed containers.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	0.035 ppm (0.1 to 0.15 mg/m <sup>3</sup> )
<b>Flash Point:</b>	244°F (118°C)
<b>Vapor Density:</b>	5.2 (air = 1)
<b>Vapor Pressure:</b>	0.005 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.3 (water = 1)
<b>Water Solubility:</b>	Very slightly soluble
<b>Boiling Point:</b>	471° to 473°F (244° to 245°C)
<b>Ionization Potential:</b>	9.4
<b>Molecular Weight:</b>	155

**EXPOSURE LIMITS**
**OSHA:** 0.3 mg/m<sup>3</sup>, 8-hr TWA

**NIOSH:** 0.3 mg/m<sup>3</sup>, 10-hr TWA

**ACGIH:** 0.3 mg/m<sup>3</sup>, 8-hr TWA

**IDLH:** 15 mg/m<sup>3</sup>
**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Silver Shield®/4H® (>4-hr breakthrough for <i>Aromatic Ketones</i> )
<b>Coveralls:</b>	DuPont Tychem® Responder® (>8-hr breakthrough)
<b>Respirator:</b>	<3 mg/m <sup>3</sup> -full facepiece APR with Organic vapor filters and N100 prefilter >3 mg/m <sup>3</sup> -Supplied air

**HEALTH EFFECTS**

<b>Eyes:</b>	Severe irritation and burns with redness, blurred vision, pain and tearing
<b>Skin:</b>	Severe Irritation and burns
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing and severe shortness of breath (pulmonary edema)

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention immediately.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

**Medical** observation is recommended as symptoms may be delayed.



Common Name: **CHLORO BENZENE**

Synonyms: Benzene Chloride; Phenyl Chloride

CAS No: 108-90-7

Molecular Formula: C<sub>6</sub>H<sub>5</sub>Cl

RTK Substance No: 0379

Description: Colorless to yellowish liquid with an almond-like odor

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>3 - Fire</b> <b>0 - Reactivity</b> <b>DOT#:</b> UN 1134 <b>ERG Guide #:</b> 130 <b>Hazard Class:</b> 3 (Flammable)	<b>FLAMMABLE LIQUID</b> Use dry chemical, CO <sub>2</sub> or foam as extinguishing agents. Water may not be effective in fighting fires, but may be used to blanket fire. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Hydrogen Chloride</i> and <i>Phosgene</i> . CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool. Flow or agitation may generate electrostatic charges.	<b>Chlorobenzene</b> may react explosively with powdered SODIUM and mixtures of PHOSPHORUS TRIFLUORIDE and SODIUM. <b>Chlorobenzene</b> may react violently with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); ALKALI METALS (such as LITHIUM, ALUMINUM and POTASSIUM); NITRIC ACID; and DIMETHYL SULFOXIDE.

**SPILL/LEAKS**

**Isolation Distance:**  
 Small Spill: 50 meters (150 feet)  
 Large Spill: 300 meters (1,000 feet)  
 Fire: 800 meters (1/2 mile)  
 Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers for disposal.  
 Use only non-sparking tools and equipment, especially when opening and closing containers of **Chlorobenzene**.  
 Keep **Chlorobenzene** out of confined spaces, such as sewers, because of the possibility of an explosion.  
 DO NOT wash into sewer.  
**Chlorobenzene** is harmful to aquatic life in very low concentrations.

**PHYSICAL PROPERTIES**

**Odor Threshold:** Almond-like odor  
**Flash Point:** 82°F (28°C)  
**LEL:** 1.3%  
**UEL:** 9.6%  
**Auto Ignition Temp:** 1,099°F (593°C)  
**Vapor Density:** 3.9 (air = 1)  
**Vapor Pressure:** 8.8 mm Hg at 68°F (20°C)  
**Specific Gravity:** 1.1 (water = 1)  
**Water Solubility:** Very slightly soluble  
**Boiling Point:** 270°F (132°C)  
**Freezing Point:** -50°F (-46°C)  
**Ionization Potential:** 9.1 eV  
**Molecular Weight:** 112.6

**EXPOSURE LIMITS**

**OSHA:** 75 ppm, 8-hr TWA  
**ACGIH:** 10 ppm, 8-hr TWA  
**IDLH:** 1,000 ppm  
 The Protective Action Criteria values are:  
 PAC-1 = 10 ppm  
 PAC-2 = 150 ppm  
 PAC-3 = 400 ppm

**PROTECTIVE EQUIPMENT**

**Gloves:** Polyvinyl Alcohol, Silver Shield®/4H®, Viton and Barrier® (>8-hr breakthrough)  
**Coveralls:** Tychem® CPF 4, BR, LV, Responder®, and TK; and Trelchem® HPS and VPS (>8-hr breakthrough)  
**Respirator:** >10 ppm - Supplied air or SCBA

**HEALTH EFFECTS**

**Eyes:** Irritation  
**Skin:** Irritation, rash and burning feeling  
**Inhalation:** Nose and throat irritation  
 Headache, dizziness, lightheadedness, and passing out

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.  
**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** promptly to a medical facility.



Common Name: **CHLORODIFLUOROETHANE**

Synonyms: Difluoro-1- Chloroethane; Freon 142

CAS No: 75-68-3

 Molecular Formula: C<sub>2</sub>H<sub>3</sub>ClF<sub>2</sub>

RTK Substance No: 0385

 Description: Colorless gas with a slight *Ether*-like odor

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>4 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 2517 ERG Guide #: 115 Hazard Class: 2.1 (Flammable gas)	FLAMMABLE GAS Shut off all ignition sources. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Phosgene, Hydrogen Fluoride, Hydrogen Chloride, Fluorine</i> and <i>Carbonyl Fluoride</i> . CONTAINERS MAY EXPLODE IN FIRE Use water spray to keep fire-exposed containers cool, but DO NOT direct water jet on liquid. FIRE MAY RESTART AFTER IT HAS BEEN EXTINGUISHED. Vapors may travel to a source of ignition and flash back. Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.	<b>Chlorodifluoroethane</b> reacts violently with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); ALKALI METALS (such as LITHIUM, SODIUM and POTASSIUM); and ALKALINE EARTH METALS (such as BERYLLIUM, MAGNESIUM and CALCIUM). DO NOT expose <b>Chlorodifluoroethane</b> to HEAT, FLAMES or RED HOT METAL as it will decompose to form <i>Hydrogen Fluoride</i> and <i>Phosgene gases</i> .

## SPILL/LEAKS

**Isolation Distance:**

Small Spill: 120 meters (400 feet)

Large Spill or Leak: 1,000 meters (3,000 feet)

Fire: 1,600 meters (1 mile)

Turn leaking cylinder with the leak up to prevent escape of the gas in liquid form.

May cause ozone depletion.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Slightly ethereal
<b>Flash Point:</b>	Flammable gas
<b>LEL:</b>	6%
<b>UEL:</b>	17.9%
<b>Auto Ignition:</b>	1,170°F (632°C)
<b>Vapor Density:</b>	3.5 (air = 1)
<b>Vapor Pressure:</b>	2,540 mm Hg at 77°F (25°C)
<b>Specific Gravity:</b>	1.1 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	14.4°F (-9.8°C)
<b>Freezing Point:</b>	-203°F (-130.8°C)
<b>Molecular Weight:</b>	100.47

## EXPOSURE LIMITS

ERPG-1: 10,000 ppm

ERPG-2: 15,000 ppm

ERPG-3: 25,000 ppm

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Insulated Neoprene
<b>Coveralls:</b>	Clothing designed to prevent freezing of body tissues
<b>Respirator:</b>	>10,000 ppm - Supplied air

## HEALTH EFFECTS

<b>Eyes:</b>	No information
<b>Skin:</b>	Frostbite
<b>Inhalation:</b>	Headache, dizziness, lightheadedness, irregular heartbeat

## FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Immerse** affected part in warm water. Seek medical attention.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** to a medical facility.

Common Name: **CHLORODIFLUOROMETHANE**

Synonyms: Difluoromonochloromethane; Freon 22®; Genetron-22®

CAS No: 75-45-6

 Molecular Formula:  $\text{CHClF}_2$ 

RTK Substance No: 0386

 Description: Colorless gas with a slight *Ether*-like odor which is shipped as a liquified gas

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>1 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 1018 ERG Guide #: 126 Hazard Class: 2.2 (Nonflammable gas)	Extinguish fire using an agent suitable for type of surrounding fire. <b>Chlorodifluoromethane</b> itself does not burn. Use water spray to reduce vapors. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Hydrogen Chloride</i> , <i>Hydrogen Fluoride</i> , <i>Phosgene</i> , and <i>Carbonyl Chloride</i> . CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool.	<i>Liquified Chlorodifluoromethane</i> , poured into WATER, can be violently explosive. Contact with <i>red-hot</i> METAL forms toxic gases of <i>Chlorine</i> , <i>Fluorine</i> , <i>Phosgene</i> and <i>Carbonyl Chloride</i> . <b>Chlorodifluoromethane</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); ALKALI METALS (such as LITHIUM, SODIUM and POTASSIUM); ALKALINE EARTH METALS (such as BERYLLIUM, MAGNESIUM and CALCIUM); POWDERED ALUMINUM; STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); and CHEMICALLY ACTIVE METALS (such as ZINC).

## SPILL/LEAKS

**Isolation Distance:**

Large Spill: 500 meters (1/3 mile)

Fire: 800 meters (1/2 mile)

Stop flow of gas. If source of leak is a cylinder and the leak cannot be stopped in place, remove the leaking cylinder to a safe place in the open air, and repair leak or allow cylinder to empty.

**Chlorodifluoromethane** is heavier than air and may accumulate in low ceiling spaces causing *Oxygen* deficiency.

**Chlorodifluoromethane** may be hazardous to the environment. It will accumulate and disperse in the atmosphere and damage the ozone layer.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	<i>Ether</i> -like odor
<b>Flash Point:</b>	Nonflammable
<b>Vapor Density:</b>	2.9 (air = 1)
<b>Vapor Pressure:</b>	7,144 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.2 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	-41°F (-40.7°C)
<b>Melting Point:</b>	-251°F (-157°C)
<b>Ionization Potential:</b>	12.5 eV
<b>Molecular Weight:</b>	86.5

## EXPOSURE LIMITS

**NIOSH:** 1,000 ppm, 10-hr TWA; 1,250 ppm STEL

**ACGIH:** 1,000 ppm, 8-hr TWA

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Polyvinyl Alcohol, Silver Shield®/4H®, Viton and Barrier® (>4-hr breakthrough for <i>Freons</i> )
<b>Coveralls:</b>	Tychem® BR, LV, Responder®, and TK; Zytron® 500; ONESuit®TEC; and Trelchem® (>8-hr breakthrough for <i>Halogenated compounds</i> )
<b>Respirator:</b>	Supplied air or SCBA

## HEALTH EFFECTS

<b>Eyes:</b>	Irritation, contact with liquid causes frostbite
<b>Skin:</b>	Irritation, contact with liquid causes frostbite
<b>Inhalation:</b>	Nose, throat and lung irritation with tightness in the chest and difficulty in breathing Headache, nausea, dizziness, loss of coordination, passing out, and death

## FIRST AID AND DECONTAMINATION

<b>Remove</b>	the person from exposure.
<b>Flush</b>	eyes with large amounts of water for at least 15 minutes.
<b>Remove</b>	contact lenses if worn. Seek medical attention.
<b>Immerse</b>	affected part in warm water. Seek medical attention.
<b>Begin</b>	artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b>	promptly to a medical facility

Common Name: **CHLOROFORM**

Synonyms: Trichloromethane; Formyl Trichloride

CAS No: 67-66-3

Molecular Formula:  $\text{CHCl}_3$

RTK Substance No: 0388

Description: Colorless liquid, with a pleasant, sweet odor

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>3 - Health</b></p> <p><b>0 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p>DOT#: UN 1888</p> <p>ERG Guide #: 151</p> <p>Hazard Class: 6.1 (Poison)</p>	<p>Extinguish fire using an agent suitable for type of surrounding fire. <b>Chloroform</b> itself does not burn.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Chlorine, Hydrogen Chloride</i> and <i>Phosgene</i>.</p> <p>Use water spray to keep fire-exposed containers cool.</p>	<p><b>Chloroform</b> reacts with CHEMICALLY ACTIVE METALS such as POTASSIUM, SODIUM, MAGNESIUM and ZINC); ALUMINUM; STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); and OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) to cause fires and explosions.</p> <p><b>Chloroform</b> is not compatible with ALKALI METALS (such as LITHIUM); MIXTURES of WATER and STRONG ALCOHOLS; ACETONE; PERCHLORIC ACID; DINITROGEN DIOXIDE; NITROGEN TETROXIDE; and DISILANE.</p>

### SPILL/LEAKS

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.

DO NOT wash into sewer.

Toxic to aquatic life.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	2.4 to 85 ppm
<b>Flash Point:</b>	Noncombustible
<b>Vapor Density:</b>	4.12 (air = 1)
<b>Vapor Pressure:</b>	160 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.5 (water = 1)
<b>Water Solubility:</b>	Very slightly soluble
<b>Boiling Point:</b>	143°F (62°C)
<b>Melting Point:</b>	-82°F (-64°C)
<b>Ionization Potential:</b>	11.42 eV
<b>Molecular Weight:</b>	119.4

### EXPOSURE LIMITS

<b>OSHA:</b>	50 ppm, Ceiling
<b>NIOSH:</b>	2 ppm, 60-min STEL
<b>ACGIH:</b>	10 ppm, 8-hr TWA
<b>IDLH LEVEL:</b>	500 ppm
<b>PAC LEVELS:</b>	PAC-1 = 2 ppm; PAC-2 = 64 ppm; PAC-3 = 3,200 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Silver Shield®/4H® and Viton (>8-hr breakthrough)
<b>Coveralls:</b>	DuPont Tychem® CPF 4, BR, LV, Responder®, and TK; Kappler® Zytron® 500; and Saint-Gobain ONESuit® PRO (>8-hr breakthrough)
<b>Respirator:</b>	>2 ppm - Pressure demand supplied-air >500 ppm - Pressure demand SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation, burns, tearing
<b>Skin:</b>	Irritation, burns, drying and cracking
<b>Inhalation:</b>	Nose and throat irritation Headache, nausea, dizziness and passing out
<b>Chronic:</b>	Cancer (liver, kidney, thyroid) in animals

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** to a medical facility.

Common Name: **2-(4-CHLORO-2-METHYLPHENOXY)PROPIONIC ACID**

Synonyms: MCPP; MECOPROP; 2-(2-Methyl-4-Chlorophenoxy)Propionic Acid

CAS No: 93-65-2

 Molecular Formula: C<sub>10</sub>H<sub>11</sub>ClO<sub>3</sub>

RTK Substance No: 3093

Description: Odorless, colorless to brown, crystalline powder

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 2765 ERG Guide #: 152 Hazard Class: 6.1 (Toxic)	<b>2-(4-Chloro-2-Methylphenoxy)Propionic Acid</b> does not burn, however, it may be dissolved in a liquid carrier that may be flammable or combustible. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Hydrogen Chloride</i> . Use water spray to keep fire-exposed containers cool.	<b>2-(4-Chloro-2-Methylphenoxy)Propionic Acid</b> is not compatible with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) and CHEMICALLY ACTIVE METALS (such as POTASSIUM, SODIUM, MAGNESIUM and ZINC). <b>2-(4-Chloro-2-Methylphenoxy)Propionic Acid</b> attacks some forms of COATINGS and METALS in the presence of MOISTURE.

## SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

DO NOT wash into sewer.

**2-(4-Chloro-2-Methylphenoxy)Propionic Acid** is harmful to aquatic organisms.

## PHYSICAL PROPERTIES

**Odor Threshold:** Odorless

**Flash Point:** Noncombustible solid

**Vapor Pressure:** 2.3 x 10<sup>-6</sup> mm Hg at 68°F (20°C)

**Water Solubility:** Soluble

**Boiling Point:** Decomposes

**Melting Point:** 201°F (94°C)

**Molecular Weight:** 214.7

## EXPOSURE LIMITS

 No occupational exposure limits have been established for **2-(4-Chloro-2-Methylphenoxy)Propionic Acid**.

## PROTECTIVE EQUIPMENT

**Gloves:** Nitrile and Natural Rubber

**Coveralls:** Tyvek®

**Respirator:** SCBA

## HEALTH EFFECTS

**Eyes:** Irritation

**Skin:** Irritation

**Inhalation:** Nose, throat and lung irritation with coughing, wheezing and shortness of breath

Headache, convulsions, and loss of coordination, unconsciousness and coma

**Chronic:** Cancer (lymphatic system) in humans

## FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.



Common Name: **4-CHLOROPHENOL**

Synonyms: p-Chlorophenol; 4-Hydroxychlorobenzene

CAS No: 106-48-9

Molecular Formula: C<sub>6</sub>H<sub>5</sub>ClO

RTK Substance No: 0401

Description: Colorless to yellow crystal with an unpleasant, penetrating odor

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b>  <b>DOT#:</b> UN 2020 <b>ERG Guide #:</b> 153 <b>Hazard Class:</b> 6.1 (Poison)	CORROSIVE COMBUSTIBLE SOLID Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Chlorine</i> and <i>Hydrogen Chloride</i> .	<b>4-Chlorophenol</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); ORGANIC ACIDS; and IRON.

**SPILL/LEAKS**

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Collect powdered material in the most convenient and safe manner and place into sealed containers for disposal.

DO NOT wash into sewer.

**4-Chlorophenol** is toxic to aquatic organisms and may cause long term effects to the aquatic environment.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	30 ppm
<b>Flash Point:</b>	250°F (121°C)
<b>Vapor Density:</b>	4.4 (air = 1)
<b>Vapor Pressure:</b>	0.1 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.31 (water = 1)
<b>Water Solubility:</b>	Slightly soluble
<b>Boiling Point:</b>	428°F (220°C)
<b>Melting Point:</b>	110°F (43°C)
<b>Molecular Weight:</b>	128.6

**EXPOSURE LIMITS**

No occupational exposure limits have been established for **4-Chlorophenol**.

The Protective Action Criteria values are:

PAC-1 = 400 mg/m<sup>3</sup>

PAC-2 = 400 mg/m<sup>3</sup>

PAC-3 = 400 mg/m<sup>3</sup>

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Nitrile and Natural Rubber
<b>Coveralls:</b>	Tyvek®
<b>Respirator:</b>	>400 mg/m <sup>3</sup> - SCBA

**HEALTH EFFECTS**

<b>Eyes:</b>	Severe irritation and burns
<b>Skin:</b>	Severe irritation and burns
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, wheezing and shortness of breath  Headache, dizziness, restlessness, seizures, coma, and even death

**FIRST AID AND DECONTAMINATION**

<b>Remove</b>	the person from exposure.
<b>Flush</b>	eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.
<b>Quickly</b>	remove contaminated clothing and wash contaminated skin with large amounts of water. Seek medical attention.
<b>Begin</b>	artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b>	promptly to a medical facility.

Common Name: **o-CHLOROTOLUENE**

Synonyms: 2-Chlorotoluene; o-Tolyl Chloride

CAS No: 95-49-8

 Molecular Formula: C<sub>7</sub>H<sub>7</sub>Cl

RTK Substance No: 1425

Description: Colorless liquid with a strong, irritating odor

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>2 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 2238 ERG Guide #: 129 Hazard Class: 3 (Flammable)	COMBUSTIBLE LIQUID Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Chlorine</i> and <i>Hydrogen Chloride</i> . CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool. Do not get water into containers. Vapors may travel to a source of ignition and flash back. Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.	<b>o-Chlorotoluene</b> reacts violently with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE). <b>o-Chlorotoluene</b> reacts with WATER to form toxic <i>Hydrogen Chloride gas</i> . <b>o-Chlorotoluene</b> is not compatible with STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE) and may react with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); ACID FUMES; and ELEVATED TEMPERATURES to form toxic <i>Chlorine gas</i> .

**SPILL/LEAKS**
**Isolation Distance:**

Small Spills: 50 meters (150 feet)

Large Spills: 300 meters (1,000 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.

DO NOT wash into sewer.

May bioaccumulate in aquatic life.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	0.32 ppm
<b>Flash Point:</b>	96° to 117°F (35° to 47°C)
<b>LEL:</b>	1.36%
<b>UEL:</b>	7.1%
<b>Vapor Density:</b>	4.4 (air = 1)
<b>Vapor Pressure:</b>	4 mm Hg at 77°F (25°C)
<b>Specific Gravity:</b>	1.08 (water = 1)
<b>Water Solubility:</b>	Slightly soluble
<b>Boiling Point:</b>	318°F (159°C)
<b>Ionization Potential:</b>	8.83 eV
<b>Molecular Weight:</b>	126.6

**EXPOSURE LIMITS**
**OSHA:** None

**NIOSH:** 50 ppm, 10 hr TWA; 75 ppm, 15- min STEL

**ACGIH:** 50 ppm, 8-hr TWA

**IDLH:** None

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Silver Shield®/4H® and Viton (>8-hr breakthrough for <i>Halogenated Hydrocarbons</i> )
<b>Coveralls:</b>	DuPont Tychem® BR, LV, Responder® and TK; Kappler® Zytron® 500; and Saint-Gobain ONESuit® TEC, (>8-hr breakthrough for <i>Aromatic Halogens</i> )
<b>Respirator:</b>	>50 ppm -Full facepiece APR with Organic vapor cartridge >500 ppm - Supplied air

**HEALTH EFFECTS**
**Eyes:** Irritation and burns

**Skin:** Irritation and burns

**Inhalation:** Nose, throat and lung irritation with coughing, wheezing and shortness of breath

Dizziness, loss of coordination, convulsions and coma

**FIRST AID AND DECONTAMINATION**
**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** to a medical facility.



Common Name: **CHROMIC CHLORIDE**

Synonyms: Chromium Chloride; Chromium Trichloride

CAS No: 10025-73-7

Molecular Formula: CrCl<sub>3</sub>

RTK Substance No: 2248

Description: Odorless, purple or violet, flake-like, or crystalline solid

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> DOT#: None ERG Guide #: None Hazard Class: None	Extinguish fire using an agent suitable for type of surrounding fire. <b>Chromic Chloride</b> itself does not burn. POISONOUS GASES ARE PRODUCED IN FIRE, including Chlorine compounds. Use water spray to keep fire-exposed containers cool.	<b>Chromic Chloride</b> reacts violently with LITHIUM and NITROGEN. <b>Chromic Chloride</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); MOISTURE; and WATER.

### SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Collect powdered material in the most convenient and safe manner and place into sealed containers for disposal.

DO NOT wash into sewer.

**Chromic Chloride** is a toxic water pollutant.

### PHYSICAL PROPERTIES

<b>Flash Point:</b>	Nonflammable
<b>Specific Gravity:</b>	2.8 (water = 1)
<b>Water Solubility:</b>	Insoluble (Reacts)
<b>Boiling Point:</b>	2,373°F (1,300°C)
<b>Melting Point:</b>	2,106°F (1,152°C)
<b>Molecular Weight:</b>	158.35

### EXPOSURE LIMITS

**OSHA:** 0.5 mg/m<sup>3</sup>, 8-hr TWA

**NIOSH:** 0.5 mg/m<sup>3</sup>, 8-hr TWA

**ACGIH:** 0.5 mg/m<sup>3</sup>, 8-hr TWA

**IDLH:** 25 mg/m<sup>3</sup>

(All of the above are for *Chromium*)

The Protective Action Criteria values are:

PAC-1 = 4.57 mg/m<sup>3</sup>

PAC-2 = 7.61 mg/m<sup>3</sup>

PAC-3 = 76.1 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Nitrile and Natural Rubber
<b>Coveralls:</b>	Tyvek®
<b>Respirator:</b>	>0.5 mg/m <sup>3</sup> - full facepiece APR with High efficiency filters >5 mg/m <sup>3</sup> - SCBA

### HEALTH EFFECTS

**Eyes:** Irritation and burns

**Skin:** Irritation and burns

**Inhalation:** Nose and throat irritation with coughing and wheezing

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **CHROMIUM**

Synonyms: Chrome; Metallic Chromium

CAS No: 7440-47-3

Molecular Formula: Cr

RTK Substance No: 0432

Description: Hard, gray, odorless solid with a metallic luster

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>3 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 3089 ERG Guide #: 170 Hazard Class: 4.1 (Flammable Solid)	Extinguish fire using an agent suitable for type of surrounding fire. <b>Chromium</b> itself does not burn. <b>Chromium</b> in <i>powder</i> form is FLAMMABLE and a DANGEROUS FIRE HAZARD. It may also spontaneously explode in air. Use dry sand or dry chemical extinguishing agents to fight <b>Chromium powder</b> fires. POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE. DO NOT get water inside container.	<b>Chromium</b> may react violently or explosively with AMMONIUM NITRATE; CARBON DIOXIDE ATMOSPHERES; BROMINE PENTAFLUORIDE; LITHIUM; NITROGEN OXIDES; and SULFUR DIOXIDE. <b>Chromium</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); STRONG ACIDS (such as HYDROCHLORIC and SULFURIC); and ALKALI METALS (such as SODIUM and POTASSIUM).

## SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

 Keep **Chromium powder** out of confined spaces, such as sewers, because of the possibility of an explosion.

DO NOT wash into sewer.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Noncombustible solid, Flammable <i>powder</i>
<b>Vapor Pressure:</b>	<0 mm Hg at 68°F (20°C) (approximate)
<b>Specific Gravity:</b>	7.2 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	4,788°F (2,642°C)
<b>Melting Point:</b>	3,452°F (1,900°C)
<b>Molecular Weight:</b>	52

## EXPOSURE LIMITS

**OSHA:** 1 mg/m<sup>3</sup>, 8-hr TWA

**NIOSH:** 0.5 mg/m<sup>3</sup>, 8-hr TWA

**ACGIH:** 0.5 mg/m<sup>3</sup>, 8-hr TWA

**IDLH:** 250 mg/m<sup>3</sup>

The Protective Action Criteria values are:

 PAC-1 = 1.5 mg/m<sup>3</sup>    PAC-3 = 250 mg/m<sup>3</sup>

 PAC-2 = 2.5 mg/m<sup>3</sup>

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Nitrile or Natural Rubber
<b>Coveralls:</b>	Tyvek®
<b>Respirator:</b>	>0.5 mg/m <sup>3</sup> - full facepiece APR with High efficiency filters >1.5 mg/m <sup>3</sup> - SCBA

## HEALTH EFFECTS

<b>Eyes:</b>	Irritation, burns and possible eye damage
<b>Skin:</b>	Irritation, burns, itching, rash and skin ulcers
<b>Inhalation:</b>	Nose and throat irritation with coughing and wheezing Headache, fever and chills

## FIRST AID AND DECONTAMINATION

<b>Remove</b>	the person from exposure.
<b>Flush</b>	eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention.
<b>Quickly</b>	remove contaminated clothing and wash contaminated skin with large amounts of soap and water.
<b>Begin</b>	artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b>	promptly to a medical facility.

Common Name: **CHRYSENE**

Synonyms: Benzo(a)phenanthrene

CAS No: 218-01-9

 Molecular Formula: C<sub>18</sub>H<sub>12</sub>

RTK Substance No: 0441

Description: Colorless to white, crystalline solid

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>0 - Fire</b> <b>1 - Reactivity</b> DOT#: UN 3077 ERG Guide #: 171 Hazard Class: 9 (Miscellaneous Hazardous Materials)	DOES NOT BURN Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE. Use water spray to keep fire-exposed containers cool.	<b>Chrysene</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).

**SPILL/LEAKS**
**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up.

DO NOT wash into sewer.

May biodegrade in water.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	Unknown
<b>Flash Point:</b>	Noncombustible
<b>Vapor Pressure:</b>	6.3 x 10.9 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.27 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	838°F (448°C)
<b>Melting Point:</b>	491° to 493°F (255° to 256°C)
<b>Ionization Potential:</b>	7.59+/-0.2 eV
<b>Molecular Weight:</b>	228.3

**EXPOSURE LIMITS**
**OSHA:** 0.2 mg/m<sup>3</sup>, 8-hr TWA

**NIOSH:** 0.1 mg/m<sup>3</sup>, 10-hr TWA

**ACGIH:** Lowest level possible

**IDLH:** 80 mg/m<sup>3</sup>

 (All of the above as *Coal Tar Pitch Volatile*)

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Nitrile or Natural Rubber
<b>Coveralls:</b>	DuPont Tyvek®
<b>Respirator:</b>	>0.1 mg/m <sup>3</sup> - Supplied air >80 mg/m <sup>3</sup> - SCBA

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation, rash or sunburn with blisters can occur if contaminated skin is exposed to sunlight
<b>Inhalation:</b>	Nose and throat irritation with coughing and wheezing
<b>Chronic:</b>	Cancer (skin, liver, lungs) in animals

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.  
**Remove** contaminated clothing and wash contaminated skin with soap and water.  
**Transfer** to a medical facility.

Common Name: **C.I. FOOD RED 15**

Synonyms: Basic Violet 10; Food Red 15; Rhodamine B

CAS No: 81-88-9

 Molecular Formula:  $C_{28}H_{31}ClN_2O_3$ 

RTK Substance No: 0505

Description: Green crystalline or reddish-violet, odorless powder

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b>  DOT#: None ERG Guide #: None Hazard Class: None	<b>C.I. Food Red 15</b> may burn, but does not readily ignite. Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> and <i>Hydrogen Chloride</i> . Use water spray to keep fire-exposed containers cool.	<b>C.I. Food Red 15</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).

**SPILL/LEAKS**
**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Collect powdered material in the most convenient and safe manner and place into sealed containers for disposal.

DO NOT wash into sewer.

**PHYSICAL PROPERTIES**
**Odor Threshold:** Odorless

**Flash Point:** May burn

**Water Solubility:** Soluble

**Melting Point:** 329°F (165°C)

**Molecular Weight:** 479

**EXPOSURE LIMITS**

The Protective Action Criteria values are:

 PAC-1 = 1.25 mg/m<sup>3</sup>

 PAC-2 = 7.5 mg/m<sup>3</sup>

 PAC-3 = 50 mg/m<sup>3</sup>
**PROTECTIVE EQUIPMENT**
**Gloves:** Nitrile and Natural Rubber

**Coveralls:** Tyvek®

**Respirator:** <1.25 mg/m<sup>3</sup> - Full facepiece APR with *Organic vapor* filter and *High efficiency* prefilters

 >1.25 mg/m<sup>3</sup> - Supplied air or SCBA

**HEALTH EFFECTS**
**Eyes:** Irritation and burns

**Skin:** Irritation and burns

**Inhalation:** Nose and throat irritation with coughing, wheezing and chest tightness  
 Headache, nausea and vomiting

**FIRST AID AND DECONTAMINATION**
**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **COAL TAR PITCH**

Synonyms: Coal Tar Pitch Volatiles; Coal Tar; Pitch

CAS No: 65996-93-2

Molecular Formula: Mixture

RTK Substance No: 0519

Description: Dark brown to black, thick liquid with a strong odor

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>4 - Health</b> <b>3 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 1136 ERG Guide #: 128 Hazard Class: 3 (Flammable)	<b>FLAMMABLE LIQUID</b> Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. <b>POISONOUS GASES ARE PRODUCED IN FIRE.</b> Use water spray to keep fire-exposed containers cool. <b>Coal Tar Pitch</b> may form an ignitable vapor/air mixture in closed tanks or containers.	<b>Coal Tar Pitch</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE).

**SPILL/LEAKS**
**Isolation Distance:**

Spills: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers for disposal.

 Use only non-sparking tools and equipment, especially when opening and closing containers of **Coal Tar Pitch**.

 Keep **Coal Tar Pitch** out of confined spaces, such as sewers, because of the possibility of an explosion.

DO NOT wash into sewer.

**Coal Tar Pitch** may be hazardous to the environment, especially to aquatic organisms, and may cause long-term effects.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	Coal Tar odor
<b>Flash Point:</b>	81° to 405°F (27° to 207°C)
<b>Auto Ignition Temp:</b>	>932°F (500°C)
<b>Vapor Pressure:</b>	<1 mm Hg at 77°F (25°C)
<b>Specific Gravity:</b>	>1.2 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	>482°F (250°C)
<b>Molecular Weight:</b>	Mixture

**EXPOSURE LIMITS**
**OSHA:** 0.2 mg/m<sup>3</sup>, 8-hr TWA (**Coal Tar Pitch volatiles**)

**NIOSH:** 0.1 mg/m<sup>3</sup>, 10-hr TWA (**Coal Tar Pitch volatiles**)

**ACGIH:** 0.2 mg/m<sup>3</sup>, 8-hr TWA (**Coal Tar Pitch volatiles**)

**IDLH:** 80 mg/m<sup>3</sup> (**Coal Tar Pitch volatiles**)

The Protective Action Criteria values are:

 PAC-1 = 0.6 mg/m<sup>3</sup> PAC-2 = 12.5 mg/m<sup>3</sup> PAC-3 = 80 mg/m<sup>3</sup>
**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Silvershield®/4H®, Viton and Barrier® (>8-hr breakthrough for <i>Hydrocarbons</i> )
<b>Coveralls:</b>	Tychem® SL and Responder® (>8-hr breakthrough for <i>Hydrocarbons, Aromatic Polynuclear</i> )
<b>Respirator:</b>	SCBA

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation, rash and burning feeling
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, wheezing and shortness of breath  Headache, dizziness, irritability, fainting and coma
<b>Chronic:</b>	Causes (lung, kidney, and skin) cancer in humans

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **COBALT NAPHTHENATE**

Synonyms: Cobalt Naphtha; Naftolite

CAS No: 61789-51-3

Molecular Formula:  $\text{Co}(\text{C}_{11}\text{H}_{10}\text{O}_2)_2$

RTK Substance No: 0523

Description: Brown powder or bluish-red solid which is often used in a solution of *Mineral Oil* or *Mineral Spirits*

**HAZARD DATA**

<b>Hazard Rating</b>	<b>Firefighting</b>	<b>Reactivity</b>
<b>2- Health</b> <b>2 - Fire</b> <b>0 - Reactivity</b> <b>DOT#:</b> UN 2001 <b>ERG Guide #:</b> 133 <b>Hazard Class:</b> 4.1 (Flammable solids)	Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agent. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Cobalt Oxide</i> . Use water spray to keep fire-exposed containers cool. FIRE MAY RESTART AFTER IT HAS BEEN EXTINGUISHED. <b>Cobalt Naphthenate</b> in powder or granular form may explode when mixed in air.	<b>Cobalt Naphthenate</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC).

**SPILL/LEAKS**

**Isolation Distance:**

Spills: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Collect powdered material in the most convenient and safe manner and deposit in sealed containers.

Aquatic life may be harmed by exposure to this chemical.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	Odorless (solution may have Mineral Spirits odor)
<b>Flash Point:</b>	121°F (49°C)
<b>LEL:</b>	0.07%
<b>UEL:</b>	6%
<b>Auto Ignition Temp:</b>	529°F (276°C)
<b>Vapor Density:</b>	3.9 (air = 1)
<b>Vapor Pressure:</b>	1 mm Hg at 77°F (25°C)
<b>Specific Gravity:</b>	0.95 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	515°F (268°C)
<b>Molecular Weight:</b>	407

**EXPOSURE LIMITS**

No occupational exposure limits have been established.

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Silver Shield®/4H®, Rubber or Nitrile for solid <b>Cobalt Naphthenate</b>
<b>Coveralls:</b>	DuPont Tyvek® for solid <b>Cobalt Naphthenate</b>
<b>Respirator:</b>	Full facepiece APR respirator with a High efficiency particulate filter or Supplied air

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation, skin allergy with itching and rash
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, wheezing and shortness of breath
<b>Chronic:</b>	Cobalt and Cobalt compounds may cause lung cancer in humans.

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.  
**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** to a medical facility.



Common Name: **COPPER**

Synonyms: Bronze Powder; Gold Bronze

CAS No: 7440-50-8

Molecular Formula: Cu

RTK Substance No: 0528

Description: Reddish-brown, odorless metal

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>2 - Health</b></p> <p><b>1 - Fire</b></p> <p><b>1 - Reactivity</b></p> <p><b>DOT#: UN 3077</b></p> <p><b>ERG Guide #: 171</b></p> <p><b>Hazard Class: 9</b> (Environmentally Hazardous Material)</p>	<p>Extinguish fire using an agent suitable for type of surrounding fire. <b>Copper</b> itself does not burn.</p> <p><i>Finely divided Copper powder</i> may burn in air or become an explosion hazard.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Copper fumes</i> and <i>Copper Oxides</i>.</p> <p>Use water spray to keep fire-exposed containers cool.</p>	<p><i>Finely divided Copper powder</i> reacts violently on contact with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); AZIDES; ETHYLENE OXIDE; IODATES; HYDRAZINES; POTASSIUM COMPOUNDS; SODIUM COMPOUNDS; and ACETYLENES.</p> <p><b>Copper</b> is not compatible with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); 1-BROMO-2-PROPENE; STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); and ANHYDROUS AMMONIA.</p>

### SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and deposit into sealed containers.

DO NOT wash into sewer.

**Copper** is a toxic water pollutant.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Noncombustible <i>solid</i> Combustible/Explosive <i>finely divided powder</i>
<b>Vapor Pressure:</b>	1 mm Hg at 2,962°F (1,628°C)
<b>Specific Gravity:</b>	8.9 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	4,653°F (2,567°C)
<b>Melting Point:</b>	1,981°F (1,083°C)
<b>Molecular Weight:</b>	63.6

### EXPOSURE LIMITS

**OSHA:** 1 mg/m<sup>3</sup>(Dust), 0.1 mg/m<sup>3</sup>(Fume), 8-hr TWA

**NIOSH:** 1 mg/m<sup>3</sup>(Dust), 0.1 mg/m<sup>3</sup>(Fume), 10-hr TWA

**ACGIH:** 1 mg/m<sup>3</sup>(Dust), 0.2 mg/m<sup>3</sup>(Fume), 8-hr TWA  
(All the above are for *Copper dust and fume*)

**IDLH:** 100 mg/m<sup>3</sup> (as *Copper*)

**PAC:** PAC-1 = 3 mg/m<sup>3</sup>; PAC-2 = 33 mg/m<sup>3</sup>  
PAC-3 = 200 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Nitrile and Natural Rubber
<b>Coveralls:</b>	DuPont Tyvek®
<b>Respirator:</b>	>0.1 mg/m <sup>3</sup> - Full facepiece APR with High efficiency filter >1 mg/m <sup>3</sup> - Supplied air (Fume) >10 mg/m <sup>3</sup> - Supplied air (Dust/Mist)

### HEALTH EFFECTS

**Eyes:** Irritation and burns

**Skin:** Irritation and burns

**Inhalation:** Nose and throat irritation with coughing and wheezing  
Headache, nausea, vomiting and abdominal pain

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.

**Quickly** remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility

Common Name: **CUMENE**

Synonyms: 2-Phenylpropane; Isopropylbenzene

CAS No: 98-82-8

 Molecular Formula: C<sub>9</sub>H<sub>12</sub>

RTK Substance No: 0542

Description: Clear, colorless liquid with a sharp, penetrating odor

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>3 - Fire</b> <b>1 - Reactivity</b> DOT#: UN 1918 ERG Guide #: 130 Hazard Class: 3 (Flammable)	<b>Cumene</b> is a FLAMMABLE LIQUID. Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool. Vapors may travel to a source of ignition and flash back. Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.	<b>Cumene</b> reacts violently with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); and CHLOROSULFONIC ACID to cause fires and explosions. <b>Cumene</b> may form explosive <i>Peroxides</i> above 88°F (31°C).

**SPILL/LEAKS**
**Isolation Distance:**

Small Spill: 50 meters (150 feet)

Large Spill: 300 meters (1,000 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.

 Keep **Cumene** out of confined spaces, such as sewers, because of the possibility of an explosion.

DO NOT wash into sewer.

**Cumene** is a marine pollutant and is toxic to aquatic organisms.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	0.032 ppm
<b>Flash Point:</b>	92°F (33°C)
<b>LEL:</b>	0.9%
<b>UEL:</b>	6.5%
<b>Auto Ignition:</b>	797°F (425°C)
<b>Vapor Density:</b>	4.2 (air = 1)
<b>Vapor Pressure:</b>	8 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	0.86 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	306°F (152°C)
<b>Ionization Potential:</b>	8.8 eV
<b>Molecular Weight:</b>	120.2

**EXPOSURE LIMITS**
**OSHA:** 50 ppm, 8-hr TWA

**NIOSH:** 50 ppm, 10-hr TWA

**ACGIH:** 50 ppm, 8-hr TWA

**IDLH:** 900 ppm

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Viton (>8-hr breakthrough)
<b>Coveralls:</b>	DuPont Tychem® CPF 4, BR, LV, CSM, Responder® and TK; Kappler® Zytron® 300; and Saint-Gobain ONESuit® TEC (>8-hr breakthrough)
<b>Respirator:</b>	<500 ppm - Full facepiece APR with Organic vapor cartridges >500 ppm - Supplied air

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation, rash, and drying and cracking of the skin with redness
<b>Inhalation:</b>	Nose and throat irritation Headache, dizziness, loss of coordination, lightheadedness and passing out

**FIRST AID AND DECONTAMINATION**

<b>Remove</b> the person from exposure.
<b>Flush</b> eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
<b>Quickly</b> remove contaminated clothing and wash contaminated skin with large amounts of soap and water.
<b>Begin</b> artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b> to a medical facility.

Common Name: **CUPRIC ACETATE**

Synonyms: Copper Diacetate; Crystals of Venus

CAS No: 142-71-2

 Molecular Formula:  $\text{Cu}(\text{CH}_3\text{COO})_2$ 

RTK Substance No: 0546

 Description: Blue-green, crystalline solid with a slight *Acetic Acid* odor

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 3077 ERG Guide #: 171 Hazard Class: 9 (Environmentally Hazardous Substance)	<b>Cupric Acetate</b> may burn, but does not readily ignite. Use dry chemical, $\text{CO}_2$ , water spray or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Acetic Acid</i> and <i>Copper Oxides</i> .	<b>Cupric Acetate</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); ACETYLENE; HYDRAZINE; MERCURIOS CHLORIDE; NITROMETHANE; and SODIUM HYPOBROMITE.

## SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Cover with dry lime, sand or sodium bicarbonate and place into sealed containers for disposal.

Cover spill with plastic sheet to prevent dissolving in rain or fire fighting water.

DO NOT wash into sewer.

**Cupric Acetate** is very toxic to aquatic life and it persists and bioaccumulates in the environment.

## PHYSICAL PROPERTIES

**Odor Threshold:** *Acetic Acid* odor

**Flash Point:** Noncombustible

**Specific Gravity:** 1.9 (water = 1)

**Water Solubility:** Soluble

**Boiling Point:** Decomposes

**Melting Point:** 239°F (115°C)

**Molecular Weight:** 199.7

## EXPOSURE LIMITS

**OSHA:** 0.1  $\text{mg}/\text{m}^3$ , 8-hr TWA (as *Copper fume*)

**NIOSH:** 0.1  $\text{mg}/\text{m}^3$ , 10-hr TWA (as *Copper fume*)

**ACGIH:** 0.2  $\text{mg}/\text{m}^3$ , 8-hr TWA (as *Copper fume*)

**IDLH:** 100  $\text{mg}/\text{m}^3$  (as *Copper*)

## PROTECTIVE EQUIPMENT

**Gloves:** Nitrile and Natural Rubber

**Coveralls:** Tyvek®

**Respirator:** >0.1  $\text{mg}/\text{m}^3$  - Full facepiece APR with High efficiency particulate filter  
 >1  $\text{mg}/\text{m}^3$  - Supplied air

## HEALTH EFFECTS

**Eyes:** Irritation and burns

**Skin:** Irritation and burns

**Inhalation:** Nose and throat irritation with coughing and wheezing

Headache, nausea, vomiting and abdominal pain

## FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **CUPRIC NITRATE**

Synonyms: Copper Dinitrate; Cupric Dinitrate

CAS No: 3251-23-8

Molecular Formula:  $\text{Cu}(\text{HNO}_3)_2$

RTK Substance No: 0547

Description: Bluish-green, odorless crystalline material

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>2 - Health</b></p> <p><b>0 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p>DOT#: UN 1477</p> <p>ERG Guide #: 140</p> <p>Hazard Class: 5.1 (Oxidizer)</p>	<p><b>Cupric Nitrate</b> is not combustible, but it is a STRONG OXIDIZER that enhances the combustion of other substances.</p> <p>Extinguish fire using an agent suitable for type of surrounding fire. <b>Cupric Nitrate</b> itself does not burn.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Copper fumes</i> and <i>Nitrogen Oxides</i>.</p> <p>Use water spray to keep fire-exposed containers cool.</p> <p><b>Cupric Nitrate</b> may ignite combustibles (wood, paper and oil).</p>	<p><b>Cupric Nitrate</b> is a strong OXIDIZER which will react with REDUCING AGENTS and other READILY OXIDIZABLE MATERIALS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES); COMBUSTIBLE MATERIALS; ORGANICS; ACETIC ANHYDRIDES; ETHERS; POTASSIUM FERROCYANIDE; and <i>finely divided</i> TIN.</p> <p><b>Cupric Nitrate</b> is not compatible with ACETYLENE; HYDRAZINE; NITROMETHANE; AMMONIA and POTASSIUM AMIDE; SODIUM HYPOBROMITE; METALS; and METAL SALTS.</p>

### SPILL/LEAKS

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

DO NOT wash into sewer.

**Cupric Nitrate** is very toxic to aquatic life and bioaccumulates.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Nonflammable
<b>Specific Gravity:</b>	2.3 ( <i>Anhydrous</i> ) (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	338°F (170°C) ( <i>Anhydrous</i> )
<b>Melting Point:</b>	491° to 493°F (255° to 256°C)
<b>Molecular Weight:</b>	187.6

### EXPOSURE LIMITS

<b>OSHA:</b>	0.1 mg/m <sup>3</sup> , 8-hr TWA ( <i>Copper fume</i> )
<b>NIOSH:</b>	0.1 mg/m <sup>3</sup> , 10-hr TWA ( <i>Copper fume</i> )
<b>ACGIH:</b>	0.2 mg/m <sup>3</sup> , 8-hr TWA ( <i>Copper fume</i> )
<b>IDLH:</b>	100 mg/m <sup>3</sup> (as <i>Copper</i> )

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Nitrile and Natural Rubber
<b>Coveralls:</b>	Tyvek®
<b>Respirator:</b>	>0.1 mg/m <sup>3</sup> - Full facepiece APR with High efficiency filter >1 mg/m <sup>3</sup> - Supplied air or SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns
<b>Inhalation:</b>	Nose and throat irritation with coughing and wheezing Headache, nausea, vomiting and abdominal pain

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **CUPRIC SULFATE**

Synonyms: Copper Sulfate; Blue Vitriol

CAS No: 7758-98-7

Molecular Formula: CuSO<sub>4</sub>

RTK Substance No: 0549

Description: Odorless, white or bluish-white granule or crystalline powder

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<p><b>2 - Health</b></p> <p><b>0 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p><b>DOT#:</b> UN 3077</p> <p><b>ERG Guide #:</b> 171</p> <p><b>Hazard Class:</b> 9 (Environmentally Hazardous Substance)</p>	<p>Extinguish fire using an agent suitable for type of surrounding fire. <b>Cupric Sulfate</b> itself does not burn.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Copper Oxides</i> and <i>Sulfur Oxides</i>.</p>	<p><b>Cupric Sulfate</b> reacts with MAGNESIUM to produce flammable and explosive <i>Hydrogen gas</i> and will react with ACETYLENE to form shock-sensitive <i>Copper Acetylides</i>.</p> <p><b>Cupric Sulfate</b> will ignite HYDROXYLAMINE.</p> <p><b>Cupric Sulfate</b> is not compatible with AMINES; METALS (such as IRON, POTASSIUM, MAGNESIUM and ZINC); REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES); OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); ISOCYANATES; SODIUM HYPOBROMITE; AMMONIA; and NITROMETHANE.</p>

**SPILL/LEAKS**

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Collect powdered material in the most convenient and safe manner and place into sealed containers for disposal.

Cover spill with plastic sheet to prevent dissolving in rain or firefighting water.

DO NOT wash into sewer.

**Cupric Sulfate** is harmful to aquatic life in very low concentrations.

**PHYSICAL PROPERTIES**

**Odor Threshold:** Odorless

**Flash Point:** Nonflammable

**Specific Gravity:** 2.3 (water = 1)

**Water Solubility:** Soluble

**Boiling Point:** 1,040° to 1,202°F (560° to 650°C)

**Melting Point:** >392°F (>200°C)

**Molecular Weight:** 249.7

**EXPOSURE LIMITS**

**OSHA:** 1 mg/m<sup>3</sup> (Dust), 0.1 mg/m<sup>3</sup> (Fume), 8-hr TWA

**NIOSH:** 1 mg/m<sup>3</sup> (Dust), 0.1 mg/m<sup>3</sup> (Fume), 10-hr TWA

**ACGIH:** 1 mg/m<sup>3</sup> (Dust), 0.2 mg/m<sup>3</sup> (Fume), 8-hr TWA  
(All the above are for *Copper dust and fume*)

**IDLH:** 100 mg/m<sup>3</sup> (as *Copper*)

**PAC:** PAC-1 = 7.5 mg/m<sup>3</sup>; PAC-2 = 10 mg/m<sup>3</sup>  
PAC-3 = 59 mg/m<sup>3</sup>

**PROTECTIVE EQUIPMENT**

**Gloves:** Neoprene and Polyvinyl Chloride

**Coveralls:** DuPont Tyvek®

**Respirator:** >0.1 mg/m<sup>3</sup> - Full facepiece APR with High efficiency particulate filter  
>1 mg/m<sup>3</sup> - Supplied air (Fume)  
>10 mg/m<sup>3</sup> - Supplied air (Dust/Mist)

**HEALTH EFFECTS**

**Eyes:** Irritation and burns

**Skin:** Irritation and burns

**Inhalation:** Nose and throat irritation with coughing and wheezing  
Headache, nausea, vomiting and abdominal pain

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **CYCLOHEXANE**

Synonyms: Benzene Hexahydride; Hexahydrobenzene; Hexamethylene

CAS No: 110-82-7

Molecular Formula: C<sub>6</sub>H<sub>12</sub>

RTK Substance No: 0565

Description: Colorless liquid with a sweet, pungent odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>1 - Health</b></p> <p><b>3 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p><b>DOT#:</b> UN 1145</p> <p><b>ERG Guide #:</b> 128</p> <p><b>Hazard Class:</b> 3 (Flammable)</p>	<p><b>FLAMMABLE LIQUID</b></p> <p>Use dry chemical, CO<sub>2</sub>, alcohol-resistant foam or other foam extinguishing agents, as water may not be effective in fighting fires.</p> <p><b>POISONOUS GASES ARE PRODUCED IN FIRE.</b></p> <p><b>CONTAINERS MAY EXPLODE IN FIRE.</b></p> <p>Use water spray to keep fire-exposed containers cool.</p> <p>Vapors may travel to a source of ignition and flash back.</p> <p>Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.</p> <p><b>Cyclohexane</b> may form an ignitable vapor/air mixture in closed tanks or containers.</p>	<p><b>Cyclohexane</b> reacts explosively with <b>NITRATES; NITROGEN DIOXIDE; and DINITROGEN TETRAOXIDE.</b></p> <p><b>Cyclohexane</b> is not compatible with <b>OXIDIZING AGENTS</b> (such as <b>PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE</b>).</p>

### SPILL/LEAKS

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers for disposal.

Metal containers involving the transfer of **Cyclohexane** should be grounded and bonded.

Use only non-sparking tools and equipment, especially when opening and closing containers of **Cyclohexane**.

DO NOT wash into sewer.

**Cyclohexane** is harmful to aquatic life.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	25 ppm
<b>Flash Point:</b>	-4°F (-20°C)
<b>LEL:</b>	1.3%
<b>UEL:</b>	8.4%
<b>Auto Ignition Temp:</b>	473°F (245°C)
<b>Vapor Density:</b>	2.9 (air = 1)
<b>Vapor Pressure:</b>	95 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	0.8 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	177°F (81°C)
<b>Freezing Point:</b>	44°F (7°C)
<b>Ionization Potential:</b>	9.88 eV
<b>Molecular Weight:</b>	84.2

### EXPOSURE LIMITS

**OSHA:** 300 ppm, 8-hr TWA

**NIOSH:** 300 ppm, 10-hr TWA

**ACGIH:** 100 ppm, 8-hr TWA

**IDLH:** 1,300 ppm

The Protective Action Criteria values are:

PAC-1 = 300 ppm PAC-2 = 1,700 ppm PAC-3 = 10,000 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Nitrile, Silver Shield®/4H®, Viton and Barrier® (>8-hr breakthrough)
<b>Coveralls:</b>	Tychem® BR, Responder® and TK (>8-hr breakthrough)
<b>Respirator:</b>	>100 ppm - full facepiece APR with Organic vapor cartridges >300 ppm - SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns
<b>Inhalation:</b>	Nose and throat irritation with coughing and wheezing Headache, dizziness, lightheadedness, and passing out

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.



Common Name: **CYCLOHEXANONE**

Synonyms: Cyclohexyl Ketone; Pimelic Ketone

CAS No: 108-94-1

Molecular Formula: C<sub>6</sub>H<sub>10</sub>O

RTK Substance No: 0570

Description: Clear, colorless to pale yellow liquid with a mint or *Acetone*-like odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>1 - Health</b> <b>2 - Fire</b> <b>0 - Reactivity</b> <b>DOT#:</b> UN 1915 <b>ERG Guide #:</b> 127 <b>Hazard Class:</b> 3 (Flammable)	<p><b>Cyclohexanone</b> is a COMBUSTIBLE LIQUID.</p> <p>Use dry chemical, CO<sub>2</sub>, water spray or alcohol-resistant foam as extinguishing agents.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE.</p> <p>Use water spray to keep fire-exposed containers cool. Vapors may travel to a source of ignition and flash back. Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.</p> <p><b>Cyclohexanone</b> may form an ignitable vapor/air mixture in closed tanks or containers.</p>	<p><b>Cyclohexanone</b> forms an explosive <i>Peroxide</i> with HYDROGEN PEROXIDE and NITRIC ACID.</p> <p><b>Cyclohexanone</b> reacts with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES).</p>

### SPILL/LEAKS

**Isolation Distance:**  
 Spill: 50 meters (150 feet)  
 Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers for disposal.

Metal containers involving the transfer of **Cyclohexanone** should be grounded and bonded.

Use only non-sparking tools and equipment, especially when opening and closing containers of **Cyclohexanone**.

### PHYSICAL PROPERTIES

**Odor Threshold:** 0.12 to 100 ppm  
**Flash Point:** 111°F (44°C)  
**LEL:** 1.1%  
**UEL:** 9.4%  
**Auto Ignition Temp:** 788°F (420°C)  
**Vapor Density:** 3.4 (air = 1)  
**Vapor Pressure:** 5.2 mm Hg at 77°F (25°C)  
**Specific Gravity:** 0.95 (water = 1)  
**Water Solubility:** Slightly soluble  
**Boiling Point:** 313°F (156°C)  
**Freezing Point:** 3°F (-16°C)  
**Ionization Potential:** 9.14 eV  
**Molecular Weight:** 98.2

### EXPOSURE LIMITS

**OSHA:** 50 ppm, 8-hr TWA  
**NIOSH:** 25 ppm, 10-hr TWA  
**ACGIH:** 20 ppm, 8-hr TWA; 50 ppm STEL  
**IDLH:** 700 ppm

The Protective Action Criteria values are:  
 PAC-1 = 50 ppm PAC-2 = 50 ppm PAC-3 = 700 ppm

### PROTECTIVE EQUIPMENT

**Gloves:** Butyl, Polyvinyl Alcohol, SilverShield®/4H® and Barrier® (>8-hr breakthrough)

**Coveralls:** Tychem® BR, Responder® and TK (>8-hr breakthrough)

**Respirator:** >20 ppm - full facepiece APR with *Organic vapor filters*  
 >200 ppm - SCBA

### HEALTH EFFECTS

**Eyes:** Irritation  
**Skin:** Irritation  
**Inhalation:** Nose and throat irritation with coughing and wheezing  
 Headache, dizziness, lightheadedness, and passing out

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **CYCLOHEXENE**

Synonyms: Benzene Tetrahydride; 1,2,3,4-Tetrahydrobenzene

CAS No: 110-83-8

Molecular Formula: C<sub>6</sub>H<sub>10</sub>

RTK Substance No: 0572

Description: Clear, colorless liquid with a sweet odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>1 - Health</b> <b>3 - Fire</b> <b>0 - Reactivity</b> <b>DOT#:</b> UN 2256 <b>ERG Guide #:</b> 130 <b>Hazard Class:</b> 3 (Flammable)	<b>FLAMMABLE LIQUID</b> Use dry chemical, CO <sub>2</sub> , water spray, alcohol-resistant foam or other foam as extinguishing agents. Water may not be effective in fighting fires. <b>POISONOUS GASES ARE PRODUCED IN FIRE.</b> <b>CONTAINERS MAY EXPLODE IN FIRE.</b> Use water spray to keep fire-exposed containers cool. Vapor is heavier than air and may travel a distance to cause a fire, explosion, or flashback far from the source. Flow or agitation may generate electrostatic charges.	<b>Cyclohexene</b> may react violently with <b>OXIDIZING AGENTS</b> (such as <b>PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE</b> ). <b>Cyclohexene</b> can form explosive Peroxides in <b>AIR</b> and may polymerize when exposed to <b>STRONG ACIDS</b> (such as <b>HYDROCHLORIC, SULFURIC and NITRIC</b> ).

### SPILL/LEAKS

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in dry sand, earth, or a similar material and place into sealed containers for disposal.

Use only non-sparking tools and equipment, especially when opening and closing containers of **Cyclohexene**.

Keep **Cyclohexene** out of confined spaces, such as sewers, because of the possibility of an explosion.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	0.18 to 0.36 ppm
<b>Flash Point:</b>	11°F (-11.7°C)
<b>LEL:</b>	1.2%
<b>UEL:</b>	5%
<b>Auto Ignition Temp:</b>	471° to 590°F (244° to 310°C)
<b>Vapor Density:</b>	2.8 (air = 1)
<b>Vapor Pressure:</b>	67 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	0.8 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	181°F (83°C)
<b>Freezing Point:</b>	-154°F (-103°C)
<b>Ionization Potential:</b>	8.95 eV
<b>Molecular Weight:</b>	82.14

### EXPOSURE LIMITS

**OSHA:** 300 ppm, 8-hr TWA

**NIOSH:** 300 ppm, 10-hr TWA

**ACGIH:** 300 ppm, 8-hr TWA

**IDLH:** 2,000 ppm

The Protective Action Criteria values are:

PAC-1 = 300 ppm    PAC-2 = 500 ppm

PAC-3 = 500 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Nitrile, SilverShield®/4H® and Barrier (>8-hr breakthrough for <i>Hydrocarbons, alicyclic, saturated</i> )
<b>Coveralls:</b>	Tychem® F, BR, Responder® and TK; Trelchem® HPS and VPS (>8-hr breakthrough for <i>Hydrocarbons, alicyclic, saturated</i> )
<b>Respirator:</b>	>300 ppm - full facepiece APR with <i>Organic vapor cartridges</i> >500 ppm - SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation
	Irritation
<b>Skin:</b>	Nose and throat irritation with coughing and wheezing
<b>Inhalation:</b>	Dizziness, lightheadedness, tremors (shakes), collapse and coma.

### FIRST AID AND DECONTAMINATION

<b>Remove</b> the person from exposure.
<b>Flush</b> eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
<b>Quickly</b> remove contaminated clothing and wash contaminated skin with large amounts of soap and water.
<b>Begin</b> artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b> promptly to a medical facility.

Common Name: **CYCLOHEXYLAMINE**

Synonyms: 1-Aminocyclohexane; Hexahydroaniline; Cyclohexanamine

CAS No: 108-91-8

Molecular Formula: C<sub>6</sub>H<sub>13</sub>N

RTK Substance No: 0576

Description: Clear, colorless to yellow liquid with a strong, fishy odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>3 - Fire</b> <b>0 - Reactivity</b> <b>DOT#:</b> UN 2357 <b>ERG Guide #:</b> 132 <b>Hazard Class:</b> 8 (Corrosive)	<b>FLAMMABLE LIQUID</b> Use dry chemical, CO <sub>2</sub> , water spray or alcohol-resistant foam as extinguishing agents. Water may not be effective in fighting fires. <b>POISONOUS GASES ARE PRODUCED IN FIRE,</b> including <i>Nitrogen Oxides</i> and <i>Ammonia</i> . <b>CONTAINERS MAY EXPLODE IN FIRE.</b> Use water spray to keep fire-exposed containers cool. Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source or flash back. <b>Cyclohexylamine</b> may form an ignitable vapor/air mixture in closed tanks or containers.	<b>Cyclohexylamine</b> is a <b>STRONG BASE</b> that can react violently with <b>OXIDIZING AGENTS</b> (such as <b>PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE</b> ) and <b>STRONG ACIDS</b> (such as <b>HYDROCHLORIC, SULFURIC and NITRIC</b> ). <b>Cyclohexylamine</b> will react with <b>REDUCING AGENTS</b> (such as <b>LITHIUM, SODIUM, ALUMINUM</b> and their <b>HYDRIDES</b> ) to release flammable and explosive <i>Hydrogen gas</i> . <b>Cyclohexylamine</b> is not compatible with <b>ISOCYANATES; ORGANIC COMPOUNDS; LEAD; EPOXIDES; ACID CHLORIDES; and ACID ANHYDRIDES</b> . <b>Cyclohexylamine</b> attacks <b>ALUMINUM, COPPER and ZINC</b> .

### SPILL/LEAKS

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in dry sand, earth, or a similar material and place into sealed containers for disposal.

Use only non-sparking tools and equipment, especially when opening and closing containers of **Cyclohexylamine**.

Metal containers involving the transfer of **Cyclohexylamine** should be grounded and bonded.

Keep **Cyclohexylamine** out of confined spaces, such as sewers, because of the possibility of an explosion.

DO NOT wash into sewer.

**Cyclohexylamine** is harmful to aquatic organisms.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	2.6 ppm
<b>Flash Point:</b>	88°F (31°C)
<b>LEL:</b>	1.5%
<b>UEL:</b>	9.4%
<b>Auto Ignition Temp:</b>	560°F (293°C)
<b>Vapor Density:</b>	3.42 (air = 1)
<b>Vapor Pressure:</b>	11 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	0.865 (water = 1)
<b>Water Solubility:</b>	Very soluble
<b>Boiling Point:</b>	274°F (134°C)
<b>Freezing Point:</b>	0.1°F (-17.7°C)
<b>pH:</b>	11.5
<b>Ionization Potential:</b>	8.37 eV
<b>Molecular Weight:</b>	99.2

### EXPOSURE LIMITS

**OSHA:** None

**NIOSH:** 10 ppm, 10-hr TWA

**ACGIH:** 10 ppm, 8-hr TWA

**IDLH:** None

The Protective Action Criteria values are:

PAC-1 = 1.8 ppm    PAC-2 = 8.6 ppm    PAC-3 = 30 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	SilverShield®/4H® and Barrier® (>4-hr breakthrough for <i>Amines, aliphatic and alicyclic</i> )
<b>Coveralls:</b>	Tychem® BR, Responder® and TK (>8-hr breakthrough for <i>Amines, aliphatic and alicyclic</i> ) >10% of the LEL use flash protection or turnout gear
<b>Respirator:</b>	>10 ppm - full facepiece APR with <i>Organic vapor cartridges</i> >30 ppm - SCBA

### HEALTH EFFECTS

**Eyes:** Severe irritation, burns and possible eye damage

**Skin:** Irritation and burns

**Inhalation:** Nose and throat irritation with coughing and wheezing

Headache, dizziness, lightheadedness, anxiety and passing out

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water. Seek medical attention.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **CYCLONITE**

Synonyms: Hexogen; RDX

CAS No: 121-82-4

Molecular Formula: C<sub>3</sub>H<sub>6</sub>N<sub>6</sub>O<sub>6</sub>

RTK Substance No: 0579

Description: White, crystalline powder

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>2 - Health</b></p> <p><b>* - Fire</b></p> <p><b>* - Reactivity</b></p> <p><b>DOT#:</b> UN 0483</p> <p><b>ERG Guide #:</b> 112</p> <p><b>Hazard Class:</b> 1.1 (Explosive)</p>	<p><b>* EXPLOSIVE</b></p> <p>Evacuate and let the fire burn or use large amounts of water from a sheltered position.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i>.</p> <p>Use water spray to keep fire-exposed containers cool.</p> <p><b>Cyclonite</b> may ignite combustibles (wood, paper and oil).</p>	<p><b>Cyclonite</b> detonates on contact with MERCURY FULMINATE. Detonation can also be initiated by SUDDEN SHOCK, HIGH TEMPERATURE and/or FRICTION.</p> <p><b>Cyclonite</b> reacts violently with COMBUSTIBLES; OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); and REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES).</p>

### SPILL/LEAKS

**Isolation Distance:**

Small Spill: 500 meters (1/3 mile)

Large Spill: 800 meters (1/2 mile)

Fire: 1,600 meters (1 mile)

Use a cleanup specialist .

Keep **Cyclonite** out of confined spaces, such as sewers, because of the possibility of an explosion.

DO NOT wash into sewer.

This substance is harmful to aquatic organisms.

### PHYSICAL PROPERTIES

**Odor Threshold:** None

**Flash Point:** Explodes

**Exothermic Decomp:** 212°F (100°C)

**Vapor Pressure:** 4.1 x 10<sup>-9</sup> mm Hg at 68°F (20°C)

**Specific Gravity:** 1.82 (water = 1)

**Water Solubility:** Insoluble

**Boiling Point:** 528° to 536°F (276° to 280°C)

**Melting Point:** 402°F (206°C)

**Molecular Weight:** 222.2

### EXPOSURE LIMITS

**OSHA:** None

**NIOSH:** 1.5 mg/m<sup>3</sup>, 10-hr TWA; 3 mg/m<sup>3</sup>, 15-min STEL

**ACGIH:** 0.5 mg/m<sup>3</sup>, 8-hr TWA

**IDLH:** None

### PROTECTIVE EQUIPMENT

**Gloves:** Neoprene

**Coveralls:** DuPont Tyvek®

**Respirator:** <0.5 mg/m<sup>3</sup> - Full facepiece APR with High efficiency filter  
>0.5 mg/m<sup>3</sup> - Supplied air

### HEALTH EFFECTS

**Eyes:** Irritation

**Skin:** Irritation, rash or burning feeling

**Inhalation:** Nose and throat irritation  
Headache, nausea, vomiting, weakness, confusion and seizures

**Chronic:** Cancer (liver) in animals

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **CYCLOPROPANE**

Synonym: Trimethylene

CAS No: 75-19-4

 Molecular Formula: C<sub>3</sub>H<sub>6</sub>

RTK Substance No: 0588

 Description: Colorless gas, or a liquid under pressure, with a mild, sweet, *Petroleum*-like odor

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>1 - Health</b> <b>4 - Fire</b> <b>0 - Reactivity</b> <b>DOT#:</b> UN 1027 <b>ERG Guide #:</b> 115 <b>Hazard Class:</b> 2.1 (Flammable gas)	<b>Cyclopropane</b> is a <b>FLAMMABLE GAS</b> . DO NOT extinguish fire unless flow can be stopped. Use water in flooding quantities. <b>POISONOUS GASES ARE PRODUCED IN FIRE.</b> <b>CYLINDERS MAY EXPLODE IN FIRE.</b> Use water spray to keep fire-exposed containers cool. Vapors may travel to a source of ignition and flash back. Flow or agitation may generate electrostatic charge.	<b>Cyclopropane</b> may react with <b>OXIDIZING AGENTS</b> (such as <b>PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE</b> ) to cause fires and explosions.

## SPILL/LEAKS

**Isolation Distance:**

Spill: 800 meters (1/2 mile)

Fire: 1,600 meters (1 mile)

 If **Cyclopropane** is leaked, take the following steps:

Stop flow of gas. If source of leak is a cylinder and the leak cannot be stopped in place, remove the leaking cylinder to a safe place in the open air, and repair leak or allow cylinder to empty.

 Keep **Cyclopropane** out of confined spaces, such as sewers, because of the possibility of an explosion.  
 DO NOT wash into sewer.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	<i>Petroleum</i> -like odor
<b>Flash Point:</b>	Flammable gas
<b>LEL:</b>	2.4%
<b>UEL:</b>	10.4%
<b>Auto Ignition Temp:</b>	928°F (498°C)
<b>Vapor Density:</b>	1.5 (air = 1)
<b>Vapor Pressure:</b>	5,400 mm Hg at 77°F (25°C)
<b>Specific Gravity:</b>	0.68 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	-29°F (-34°C)
<b>Freezing Point:</b>	-197°F (-127°C)
<b>Ionization Potential:</b>	9.86 eV
<b>Molecular Weight:</b>	42

## EXPOSURE LIMITS

The Protective Action Criteria values are:

PAC-1 = 600 ppm

PAC-2 = 4,000 ppm

PAC-3 = 6,000 ppm

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Silver Shield®/4H®, Viton and Barrier® over insulated gloves (>8-hr breakthrough for <i>Hydrocarbons, aliphatic, saturated</i> )
<b>Coveralls:</b>	Tychem® CPF 3, F, BR, LV, Responder®, and TK; and Trelchem® HPS and VPS (>8-hr breakthrough for <i>Hydrocarbons, aliphatic, saturated</i> )
<b>Respirator:</b>	>600 ppm - SCBA

## HEALTH EFFECTS

<b>Eyes:</b>	Contact with liquid causes frostbite
<b>Skin:</b>	Contact with liquid causes frostbite
<b>Inhalation:</b>	Headache, dizziness, nausea, loss of coordination, lightheadedness, and passing out
<b>Chronic:</b>	Irregular heartbeats (arrhythmias), difficulty breathing, coma and death

## FIRST AID AND DECONTAMINATION

<b>Remove</b>	the person from exposure.
<b>Flush</b>	eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention
<b>Immerse</b>	affected part in warm water. Seek medical attention.
<b>Begin</b>	artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b>	promptly to a medical facility.



Common Name: **2,4-D**

Synonyms: 2,4-D Acid; Dichlorophenoxyacetic Acid

CAS No: 94-75-7

Molecular Formula: C<sub>8</sub>H<sub>6</sub>Cl<sub>2</sub>O<sub>3</sub>

RTK Substance No: 0593

Description: White to yellow, odorless, crystalline powder

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b>  DOT#: UN 2765 ERG Guide #: 152 Hazard Class: 6.1 (Poison)	<b>2,4-D</b> does not burn, however it is often dissolved in a liquid carrier which may be flammable or combustible. Use dry chemical, water spray or foam as extinguishing agents.  POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Phosgene</i> and <i>Hydrogen Chloride</i> .  Use water spray to keep fire-exposed containers cool.	<b>2,4-D</b> reacts with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) to cause fires and explosions.  <b>2,4-D</b> is not compatible with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) and AMMONIA.  <b>2,4-D</b> attacks some METALS and COATINGS.

### SPILL/LEAKS

Isolation Distance:

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Collect powdered material in the most convenient and safe manner or use a HEPA-filter vacuum, and deposit in sealed containers.

DO NOT wash into sewer.

Dangerous to aquatic and plant life.

Marine pollutant.

### EXPOSURE LIMITS

**OSHA:** 10 mg/m<sup>3</sup>, 8-hr TWA

**NIOSH:** 10 mg/m<sup>3</sup>, 10-hr TWA

**ACGIH:** 10 mg/m<sup>3</sup>, 8-hr TWA

**IDLH LEVEL:** 100 mg/m<sup>3</sup>

**PAC LEVELS:** PAC-1 = 30 mg/m<sup>3</sup>; PAC-2 = 94 mg/m<sup>3</sup>;

PAC-3 = 500 mg/m<sup>3</sup>

### HEALTH EFFECTS

**Eyes:** Irritation

**Skin:** Irritation

**Inhalation:** Nose, throat and lung irritation with coughing and shortness of breath  
  
Headache, nausea, vomiting, muscle weakness, and poor coordination in arms and legs

**Chronic:** *Chlorophenoxy herbicides* cause non-Hodgkins lymphoma in humans

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Nonflammable
<b>Vapor Density:</b>	7.63 (air = 1)
<b>Vapor Pressure:</b>	0.4 mm Hg at 320°F (160°C)
<b>Specific Gravity:</b>	1.42 (water = 1)
<b>Water Solubility:</b>	Slightly soluble
<b>Boiling Point:</b>	320°F (160°C)
<b>Melting Point:</b>	280°F (138°C)
<b>Molecular Weight:</b>	221

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Natural Rubber and Silver Shield®
<b>Coveralls:</b>	DuPont <i>Tychem</i> ® Polycoat, SL, TF, TK, and Responder®; Kappler® Zytron® 300; and Saint-Gobain ONESuit® PRO
<b>Respirator:</b>	>10 mg/m <sup>3</sup> - Full facepiece APR with Organic Vapor cartridges with high efficiency pre-filters or pressure demand supplied-air  >100 mg/m <sup>3</sup> - Pressure demand SCBA

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** to a medical facility.

**Medical** observation is recommended as symptoms may be delayed.



Common Name: **DECABROMODIPHENYL ETHER**

Synonyms: Bis(Pentabromophenyl)Ether

CAS No: 1163-19-5

Molecular Formula: C<sub>12</sub>Br<sub>10</sub>O

RTK Substance No: 0598

Description: White to off-white powder

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> <b>DOT#:</b> None <b>ERG Guide #:</b> None <b>Hazard Class:</b> None	Extinguish fire using an agent suitable for type of surrounding fire. <b>Decabromodiphenyl Ether</b> itself does not burn. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Hydrogen Bromide</i> and <i>Carbonyl Bromide</i> . Use water spray to keep fire-exposed containers cool.	<b>Decabromodiphenyl Ether</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE). Protect from DIRECT SUNLIGHT, MOISTURE and STATIC DISCHARGE.

### SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

### PHYSICAL PROPERTIES

<b>Flash Point:</b>	Nonflammable
<b>Vapor Pressure:</b>	<1 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	3 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	797°F (425°C)
<b>Melting Point:</b>	560° to 577°F (293° to 303°C)
<b>Molecular Weight:</b>	952.2

### EXPOSURE LIMITS

No occupational exposure limits have been established for **Decabromodiphenyl Ether**.

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Nitrile, Natural Rubber and Polyvinyl Chloride
<b>Coveralls:</b>	Tyvek®
<b>Respirator:</b>	Full facepiece APR with <i>P100 filters</i> High levels - SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose and throat irritation
<b>Chronic:</b>	Cancer (liver) in animals

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.  
**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** promptly to a medical facility.

**Common Name:** DECEMTHION

Synonyms: Phosmet; APPA; Imidan; Phthalophos; PMP; Prolate; Smidan  
 CAS Number: 732-11-6  
 Molecular Formula: C<sub>11</sub>H<sub>12</sub>NO<sub>4</sub>PS<sub>2</sub>  
 RTK Number: 0603  
 Description: White, crystalline sand-like solid with an offensive odor, it can be dissolved in a liquid carrier

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>Health:</b> 3 <b>Fire:</b> 1 <b>Reactivity:</b> 1 <b>DOT #:</b> UN 2783/UN 3018 <b>ERG #:</b> 152 <b>DOT Hazard:</b> 6.1 (poison)	Use dry chemical, CO <sub>2</sub> , water spray, or foam extinguishers. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> , <i>Phosphorous Oxides</i> and <i>Sulfur Oxides</i> . CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool.	<b>Decemthion</b> is not compatible with other PESTICIDES under ALKALINE conditions.

### SPILLS/LEAKS

**Isolation Distances:**  
**Liquid Spill:** 50 meters (150 feet)  
**Solid Spill:** 25 meters (75 feet)  
**Fire:** 800 meters (1/2 mile)

Evacuate personnel.  
 Secure and control entrance to the area.  
 If it is safe to do so, remove potential ignition sources.  
 Absorb *liquids* in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.  
 Collect *powdered* material in the most convenient and safe manner and deposit in sealed containers. **DO NOT DRY SWEEP.**  
 Do not allow this substance to enter waterways, including the sewer system, as it is very toxic to aquatic life with long-lasting effects.  
 Ventilate the area of spill or leak.

### PHYSICAL PROPERTIES

**Molecular Weight:** 317.32  
**Melting Point:** 72 °C (161 °F)  
**Water Solubility:** Soluble  
**Vapor Pressure:** 4.9 x 10<sup>-7</sup> mm Hg at 20 °C (68 °F)

### EXPOSURE LIMITS

There are no occupational exposure limits for this substance.

**PAC:** PAC-1 = 0.049 mg/m<sup>3</sup>  
 PAC-2 = 0.54 mg/m<sup>3</sup>  
 PAC-3 = 77 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

**Gloves:** Nitrile and Neoprene  
**Coverall:** Tychem® BR, CSM, and TK  
**Respirator:** Supplied-air respirator, full facepiece, pressure-demand or other positive-pressure mode

### ACUTE HEALTH EFFECTS

**Eyes:** Irritation, blurred vision  
**Skin:** Irritation  
**Inhalation:** Headache, dizziness, chest tightness, twitching, loss of coordination, convulsions, coma, death

### FIRST AID AND DECONTAMINATION

Immediately flush with large amounts of water for at least 15 minutes.  
 Quickly remove contaminated clothing. Immediately wash area with large amounts of water.  
 Shampoo hair promptly if contaminated.  
 Remove the person from exposure.  
 Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.  
 Transfer promptly to a medical facility.

Common Name: **DIACETONE ALCOHOL**

Synonyms: 2-Methyl-2-Pentanol-4-One

CAS No: 123-42-2

Molecular Formula: C<sub>6</sub>H<sub>12</sub>O<sub>2</sub>

RTK Substance No: 0606

Description: Clear, colorless liquid with a pleasant odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>1 - Health</b> <b>2 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 1148 ERG Guide #: 129 Hazard Class: 3 (Flammable)	COMBUSTIBLE LIQUID Use dry chemical, CO <sub>2</sub> , water spray or alcohol-resistant foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool. Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.	<b>Diacetone Alcohol</b> reacts violently with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) to form flammable and explosive <i>Hydrogen gas</i> . <b>Diacetone Alcohol</b> is decomposed by STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); and AMINES to form <i>Acetone</i> and <i>Mesityl Alcohol</i> .

### SPILL/LEAKS

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers for disposal.

DO NOT wash into sewer.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	0.28 ppm
<b>Flash Point:</b>	126° to 147°F (52° to 64°C)
<b>LEL:</b>	1.8%
<b>UEL:</b>	6.9%
<b>Auto Ignition Temp:</b>	1,118° to 1,190°F (603° to 643°C)
<b>Vapor Density:</b>	4 (air = 1)
<b>Vapor Pressure:</b>	1 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	0.94 (water = 1)
<b>Water Solubility:</b>	Miscible
<b>Boiling Point:</b>	328° to 334°F (164° to 168°C)
<b>Freezing Point:</b>	-45° to -53°F (-43° to -47°C)
<b>Molecular Weight:</b>	116.2

### EXPOSURE LIMITS

**OSHA:** 50 ppm, 8-hr TWA

**NIOSH:** 50 ppm, 10-hr TWA

**ACGIH:** 50 ppm, 8-hr TWA

**IDLH:** 1,800 ppm

The Protective Action Criteria values are:

PAC-1 = 50 ppm   PAC-2 = 50 ppm   PAC-3 = 1,800 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl and Barrier® (>8-hr breakthrough)
<b>Coveralls:</b>	Tychem® BR and Responder®, and Trelchem® HPS and VPS (>8-hr breakthrough for <i>Ketones</i> )
<b>Respirator:</b>	>50 ppm - full facepiece APR with <i>Organic vapor</i> cartridges >500 ppm - SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose and throat irritation with coughing and wheezing Headache, dizziness, weakness, lightheadedness, and passing out

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.  
**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** promptly to a medical facility.

Common Name: **4,4'-DIAMINODIPHENYL ETHER**

Synonyms: 4,4'-Oxydianiline; DADPE

CAS No: 101-80-4

Molecular Formula: C<sub>12</sub>H<sub>12</sub>N<sub>2</sub>O

RTK Substance No: 0612

Description: Colorless crystalline solid

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>2 - Health</b></p> <p><b>0 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p><b>DOT#:</b> N/A</p> <p><b>ERG Guide #:</b> N/A</p> <p><b>Hazard Class:</b> N/A</p>	<p><b>4,4'-Diaminodiphenyl Ether</b> may burn, but does not readily ignite.</p> <p>Use dry chemical, CO<sub>2</sub>, water spray or alcohol-resistant foam as extinguishing agents.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i>.</p> <p>Use water spray to keep fire-exposed containers cool.</p>	<p><b>4,4'-Diaminodiphenyl Ether</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC).</p>

### SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and deposit into sealed containers.

DO NOT wash into sewer.

Does not bioaccumulate in aquatic organisms.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	426°F (219°C)
<b>Vapor Pressure:</b>	3.07 x 10 <sup>-7</sup> mm Hg at 77°F (25°C)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	>572°F (300°C)
<b>Melting Point:</b>	367° to 368°F (186° to 187°C)
<b>pH:</b>	5
<b>Molecular Weight:</b>	200.3

### EXPOSURE LIMITS

No occupational exposure limits have been established for **4,4'-Diaminodiphenyl Ether**.

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Nitrile and Polyethylene
<b>Coveralls:</b>	DuPont Tyvek®
<b>Respirator:</b>	Supplied air

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose and throat irritation
<b>Chronic:</b>	Cancer (liver and thyroid) in animals

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Remove** contaminated clothing and wash contaminated skin with soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name:  **DIAZINON** 

Synonyms: Dimpylate; Basudin®; Spectracide®

CAS No: 333-41-5

 Molecular Formula: C<sub>12</sub>H<sub>21</sub>N<sub>2</sub>O<sub>3</sub>PS

RTK Substance No: 0618

 Description: Colorless, nearly odorless liquid *Organophosphate* pesticide when pure; the technical product is pale to dark brown with a faint odor; and the commercial products may be liquids, solids or powders

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 2783 ERG Guide #: 152 Hazard Class: 6.1	<b>Diazinon</b> does not burn, however, it is often dissolved in a liquid carrier which may be flammable or combustible. Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> , <i>Sulfur Oxides</i> and <i>Phosphorus Oxides</i> . Use water spray to keep fire-exposed containers cool.	<b>Diazinon</b> may react with REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES) to form highly toxic and flammable <i>Phosphine gas</i> . <b>Diazinon</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); COPPER COMPOUNDS; and WATER.

**SPILL/LEAKS**
**Isolation Distance:**

Spill (liquid): 50 meters (150 feet)

Spill (solid): 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in dry sand, earth, or a noncombustible material and place into sealed containers for disposal. Collect powdered material in the most convenient and safe manner and place into sealed containers for disposal.

Keep *flammable solutions* of **Diazinon** out of confined spaces, such as sewers, because of the possibility of an explosion.

DO NOT wash into sewer.

**PHYSICAL PROPERTIES**

<b>Flash Point:</b>	82 ° to 180 °F (28 ° to 82 °C) (for <b>Diazinon</b> in <i>solution</i> , pure <b>Diazinon</b> is difficult to burn)
<b>Auto Ignition Temp:</b>	>752 °F (>400 °C)
<b>Vapor Pressure:</b>	0.0001 mm Hg at 68 °F (20 °C) ( <i>Solid</i> )
<b>Specific Gravity:</b>	1.1 (water = 1)
<b>Water Solubility:</b>	Very slightly soluble
<b>Boiling Point:</b>	>248 °F (>120 °C) (Decomposes)
<b>Molecular Weight:</b>	304.4

**EXPOSURE LIMITS**
**NIOSH:** 0.1 mg/m<sup>3</sup>, 10-hr TWA

**ACGIH:** 0.01 mg/m<sup>3</sup>, 8-hr TWA

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Nitrile and Neoprene (>8-hr breakthrough for <i>Organophosphorus compounds</i> )
<b>Coveralls:</b>	Tychem® CSM (>8-hr breakthrough)
<b>Respirator:</b>	SCBA

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Headache, sweating, nausea and vomiting, loss of coordination, and death ( <i>Organophosphate poisoning</i> )

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention immediately.  
**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention.  
**Shampoo** hair immediately if contaminated.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** promptly to a medical facility.

Common Name: **DIBENZ(a,h)ANTHRACENE**

Synonyms: 1,2,5,6-DBA; 1,2,5,6-Dibenzanthracene

CAS No: 53-70-3

Molecular Formula: C<sub>22</sub>H<sub>14</sub>

RTK Substance No: 0622

Description: Colorless, white or light yellow, crystalline solid

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b> <b>DOT#:</b> UN 3077 <b>ERG Guide #:</b> 171 <b>Hazard Class:</b> 9 (Environmentally Hazardous Substance)	<b>Dibenz(a,h)Anthracene</b> may burn, but does not readily ignite. Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE. Use water spray to keep fire-exposed containers cool.	<b>Dibenz(a,h)Anthracene</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE). Protect from SUNLIGHT.

### SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

DO NOT wash into sewer.

**Dibenz(a,h)Anthracene** may bioaccumulate in sea food.

### PHYSICAL PROPERTIES

**Vapor Pressure:** 1 x 10<sup>-10</sup> mm Hg at 68°F (20°C)

**Specific Gravity:** 1.28 (water = 1)

**Water Solubility:** Insoluble

**Boiling Point:** 975°F (524°C)

**Melting Point:** 511° to 513°F (266° to 267°C)

**Molecular Weight:** 278.36

### EXPOSURE LIMITS

No occupational exposure limits have been established for **Dibenz(a,h)Anthracene**.

The Protective Action Criteria values are:

PAC-1 = 0.0025 mg/m<sup>3</sup>

PAC-2 = 0.015 mg/m<sup>3</sup>

PAC-3 = 15 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

**Gloves:** Nitrile and Natural Rubber

**Coveralls:** Tyvek®

**Respirator:** Full facepiece APR with P100 filters  
>15 mg/m<sup>3</sup> - SCBA

### HEALTH EFFECTS

**Eyes:** Irritation

**Skin:** Irritation, skin rash, dryness and redness

**Inhalation:** Nose and throat irritation with coughing and wheezing

Headache, dizziness, nausea and vomiting

**Chronic:** Cancer (lung, skin, mammary) in animals

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.



Common Name: **DIBENZ[a,j]ACRIDINE**

Synonyms: 1,2,7,8-Dibenzacridine

CAS No: 224-42-0

Molecular Formula: C<sub>21</sub>H<sub>13</sub>N

RTK Substance No: 0623

Description: Yellow, crystalline powder or solid

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b> DOT#: None ERG Guide #: None Hazard Class: None	<b>Dibenz[a,j]Acridine</b> may burn, but does not readily ignite. Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> . Use water spray to keep fire-exposed containers cool. <b>Dibenz[a,j]Acridine</b> may form an explosive dust/air mixture.	<b>Dibenz[a,j]Acridine</b> may react with REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES) to produce flammable <i>Hydrogen gas</i> . <b>Dibenz[a,j]Acridine</b> is not compatible with HALIDES (such as CHLOROFLUOROCARBONS, METHYLENE CHLORIDE and METHYL BROMIDE) and SULFATES.

### SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

DO NOT wash into sewer.

### PHYSICAL PROPERTIES

**Flash Point:** May burn

**Water Solubility:** Insoluble

**Melting Point:** 421° to 426°F (216° to 219°C)

**Molecular Weight:** 279.35

### EXPOSURE LIMITS

No occupational exposure limits have been established for **Dibenz[a,j]Acridine**.

### PROTECTIVE EQUIPMENT

**Gloves:** Nitrile and Neoprene

**Coveralls:** Tyvek®

**Respirator:** Spill: full facepiece APR with *P100 filters*  
 Fire: SCBA

### HEALTH EFFECTS

**Eyes:** Irritation

**Skin:** Irritation

**Inhalation:** Nose and throat irritation with coughing and wheezing

Headache, dizziness, nausea and vomiting

**Chronic:** Cancer (lung and skin) in animals

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **DIBORANE**

Synonyms: Boroethane; Boron Hydride

CAS No: 19287-45-7

Molecular Formula: B<sub>2</sub>H<sub>6</sub>

RTK Substance No: 0629

Description: Colorless gas with a sickly, sweet odor which is usually shipped in pressurized cylinders diluted with *Hydrogen, Argon, Nitrogen or Helium*

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>4 - Health</b> <b>4 - Fire</b> <b>3-W - Reactivity</b> <b>DOT#:</b> UN 1911 <b>ERG Guide #:</b> 119 <b>Hazard Class:</b> 2.3 (Poisonous Gas)	<p><b>FLAMMABLE AND REACTIVE GAS</b> that can ignite on contact with AIR.</p> <p>Stop flow of gas and allow to burn out or use dry chemical or <i>liquid Nitrogen</i> as extinguishing agents. <b>DO NOT USE WATER</b> or HALOGENATED AGENTS to extinguish fire as fires and explosions will occur.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Hydrogen, Boric Acid, and Boric Oxide</i>. <b>CYLINDERS MAY EXPLODE IN FIRE.</b></p> <p>Use water spray only to keep fire-exposed containers cool.</p>	<p><b>Diborane</b> will ignite spontaneously in MOIST AIR at room temperature and will react with WATER, ALCOHOLS, and HALOGENATED COMPOUNDS (such as CARBON TETRACHLORIDE and TRICHLOROETHYLENE) to generate flammable and explosive <i>Hydrogen gas</i> and shock-sensitive mixtures.</p> <p><b>Diborane</b> reacts explosively with BENZENE VAPOR; NITRIC ACID; TETRAVINYL LEAD; DIMETHYL SULFOXIDE; and OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).</p> <p><b>Diborane</b> will react with AMMONIA; METAL OXIDES; REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES); and other READILY OXIDIZABLE MATERIALS to form <i>Hydrides</i> which may ignite spontaneously in air.</p>

### SPILL/LEAKS

**Isolation Distance:**

Small Spill: 60 meters (200 feet)  
 Large Spill: 300 meters (1,000 feet)  
 Fire: 1,600 meters (1 mile)

Stop flow of gas. If source of leak is a cylinder and the leak cannot be stopped in place, remove the leaking cylinder to a safe place in the open air, and repair leak or allow cylinder to empty.

Keep **Diborane** out of confined spaces, such as sewers, because of the possibility of an explosion. Use only non-sparking tools and equipment, especially when opening and closing containers of **Diborane**.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	1.8 to 3.5 ppm
<b>Flash Point:</b>	-130°F (-90°C)
<b>LEL:</b>	0.8%
<b>UEL:</b>	98%
<b>Auto Ignition Temp:</b>	104° to 122°F (40° to 50°C)
<b>Vapor Density:</b>	0.96 (air = 1)
<b>Vapor Pressure:</b>	224 mm Hg at -170°F (-112°C)
<b>Specific Gravity:</b>	0.2 to 0.4 (water = 1)
<b>Water Solubility:</b>	Decomposes
<b>Boiling Point:</b>	-135°F (-93°C)
<b>Melting Point:</b>	-265°F (-165°C)
<b>Ionization Potential:</b>	11.4 eV
<b>Molecular Weight:</b>	27.7

### EXPOSURE LIMITS

<b>OSHA:</b>	0.1 ppm, 8-hr TWA
<b>NIOSH:</b>	0.1 ppm, 10-hr TWA
<b>ACGIH:</b>	0.1 ppm, 8-hr TWA
<b>IDLH LEVEL:</b>	15 ppm
<b>PAC LEVELS:</b>	PAC-1 = 0.3 ppm; PAC-2 = 1.0 ppm; PAC-3 = 3.7 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Plastic, Butyl or Rubber (<1-hr breakthrough)
<b>Coveralls:</b>	Tychem® BR, LV, Responder® and TK (>8-hr breakthrough)
<b>Respirator:</b>	>0.1 ppm – Pressure demand supplied air >15 ppm – Pressure demand SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing and severe shortness of breath (pulmonary edema)  Headache, dizziness, nausea, vomiting, tremor, convulsions and confusion

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

**Medical** observation is recommended as symptoms may be delayed.

Common Name: **DI-n-BUTYL PHTHALATE**

Synonyms: n-Butyl Phthalate; DBP; Dibutyl 1,2-Benzenedicarboxylate

CAS No: 84-74-2

 Molecular Formula: C<sub>16</sub>H<sub>22</sub>O<sub>4</sub>

RTK Substance No: 0773

Description: Colorless to slightly yellow, oily liquid with a slight odor

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 3082 ERG Guide #: 171 Hazard Class: 9 (Environmentally Hazardous Substance)	COMBUSTIBLE LIQUID Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. Water jets may not be effective in fighting fires. POISONOUS GASES ARE PRODUCED IN FIRE. Use water spray to keep fire-exposed containers cool.	<b>Di-n-Butyl Phthalate</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); and STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC).

**SPILL/LEAKS**
**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers for disposal.

DO NOT wash into sewer.

**Di-n-Butyl Phthalate** is toxic to aquatic organisms.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	Faint odor ( <i>aromatic</i> )
<b>Flash Point:</b>	315°F (157°C)
<b>LEL:</b>	0.5%
<b>UEL:</b>	2.5%
<b>Auto Ignition Temp:</b>	757°F (403°C)
<b>Vapor Density:</b>	9.6 (air = 1)
<b>Vapor Pressure:</b>	<1 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.0 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	644°F (340°C)
<b>Freezing Point:</b>	-31°F (-35°C)
<b>Molecular Weight:</b>	278.34

**EXPOSURE LIMITS**
**OSHA:** 5 mg/m<sup>3</sup>, 8-hr TWA

**NIOSH:** 5 mg/m<sup>3</sup>, 10-hr TWA

**ACGIH:** 5 mg/m<sup>3</sup>, 8-hr TWA

**IDLH:** 4,000 mg/m<sup>3</sup>, 8-hr TWA

The Protective Action Criteria values are:

 PAC-1 = 15 mg/m<sup>3</sup> PAC-2 = 75 mg/m<sup>3</sup> PAC-3 = 500 mg/m<sup>3</sup>
**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Butyl, Nitrile, SilverShield®/4H® and Viton (>8-hr breakthrough)
<b>Coveralls:</b>	Tychem® BR, Responder®, and TK (>8-hr breakthrough for <i>Esters, Carboxylic</i> )
<b>Respirator:</b>	>5 mg/m <sup>3</sup> - Full facepiece APR with <i>High efficiency filters</i> >50 mg/m <sup>3</sup> - SCBA

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose and throat irritation Headache, dizziness and seizures

**FIRST AID AND DECONTAMINATION**

<b>Remove</b>	the person from exposure.
<b>Flush</b>	eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
<b>Remove</b>	contaminated clothing and wash contaminated skin with soap and water.
<b>Begin</b>	artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b>	promptly to a medical facility.

Common Name: **DICAMBA**

Synonyms: Banvel; Mediben

CAS No: 1918-00-9

 Molecular Formula: C<sub>8</sub>H<sub>6</sub>Cl<sub>2</sub>O<sub>3</sub>

RTK Substance No: 0634

Description: Colorless, white or brown crystalline solid

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>1 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b>  <b>DOT#:</b> UN 2769 <b>ERG Guide #:</b> 151 <b>Hazard Class:</b> 6.1 (Poison)	Extinguish fire using an agent suitable for type of surrounding fire. <b>Dicamba</b> itself does not burn. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Hydrogen Chloride</i> . Use water spray to keep fire-exposed containers cool.	<b>Dicamba</b> is not compatible with SULFURIC ACID; STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); AMMONIA, ALIPHATIC AMINES; ALKANOLAMINES; ISOCYANATES; ALKYLENE OXIDES; and EPICHLOROHYDRIN.

### SPILL/LEAKS

**Isolation Distance:** 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Collect powdered material in the most convenient and safe manner and deposit in sealed containers.

**Dicamba** is harmful to aquatic organisms.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	250.8 ppm
<b>Flash Point:</b>	Not combustible
<b>Vapor Density:</b>	7.64 (air = 1)
<b>Vapor Pressure:</b>	0.00375 mm Hg at 212°F (100°C)
<b>Specific Gravity:</b>	1.56 (water = 1)
<b>Water Solubility:</b>	Slightly soluble
<b>Melting Point:</b>	237° to 241°F (114° to 116°C)
<b>Molecular Weight:</b>	221

### EXPOSURE LIMITS

 No occupational exposure limits have been established for **Dicamba**.

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Rubber
<b>Coveralls:</b>	DuPont Tyvek®
<b>Respirator:</b>	APR with High efficiency filters or Supplied air

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation, burns
<b>Skin:</b>	Irritation, burns
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing and shortness of breath Headache, nausea, vomiting and muscle weakness

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** to a medical facility.

Common Name: **3,3'-DICHLOROBENZIDINE**

Synonyms: o,o'-Dichlorobenzidine; 4,4'-Diamino-3,3'-Dichlorophenol

CAS No: 91-94-1

Molecular Formula: C<sub>12</sub>H<sub>10</sub>Cl<sub>2</sub>N<sub>2</sub>

RTK Substance No: 0644

Description: Gray to purple, crystalline powder

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 3077 ERG Guide #: 171 Hazard Class: 9 (Environmentally Hazardous Substance)	<b>3,3'-Dichlorobenzidine</b> may burn, but does not readily ignite. Use dry chemical, CO <sub>2</sub> , water spray, alcohol-resistant foam or other foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> and <i>Hydrogen Chlorides</i> . Use water spray to keep fire-exposed containers cool.	<b>3,3'-Dichlorobenzidine</b> may react with REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES) to produce flammable and explosive <i>Hydrogen gas</i> .

### SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

DO NOT wash into sewer.

**3,3'-Dichlorobenzidine** is toxic to aquatic organisms.

### PHYSICAL PROPERTIES

**Auto Ignition Temp:** 662°F (350°C)

**Water Solubility:** Insoluble

**Boiling Point:** 788°F (420°C)

**Melting Point:** 270° to 271°F (132° to 133°C)

**Molecular Weight:** 253.13

### EXPOSURE LIMITS

Exposure by all routes should be controlled to levels as low as possible.

The Protective Action Criteria values are:

PAC-1 = 6 mg/m<sup>3</sup>

PAC-2 = 40 mg/m<sup>3</sup>

PAC-3 = 2,000 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

**Gloves:** Nitrile and Natural Rubber

**Coveralls:** Tyvek®

**Respirator:** Full facepiece APR with *P100 filters*  
>6 mg/m<sup>3</sup> - SCBA

### HEALTH EFFECTS

**Eyes:** Irritation and burns

**Skin:** Irritation and burns

**Inhalation:** Nose and throat irritation with coughing and wheezing

Headache, dizziness, nausea and vomiting

**Chronic:** Cancer (liver, breast, bladder) in animals

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **1,1-DICHLOROETHANE**

Synonyms: 1,1-DCE; Ethylidene Chloride

CAS No: 75-34-3

 Molecular Formula: C<sub>2</sub>H<sub>4</sub>Cl<sub>2</sub>

RTK Substance No: 0651

 Description: Colorless, oily liquid with an *Ether* or *Chloroform*-like odor

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>3 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 2362 ERG Guide #: 130 Hazard Class: 3 (Flammable)	FLAMMABLE LIQUID Use dry chemical, CO <sub>2</sub> , water spray or alcohol-resistant foam as extinguishing agents. Solid streams of water may not be effective. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Phosgene</i> . CONTAINERS MAY EXPLODE IN FIRE. Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.	<b>1,1 Dichloroethane</b> reacts violently with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and POTASSIUM.  <b>1,1 Dichloroethane</b> is not compatible with AMINES; STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); ALKALI METALS (such as LITHIUM, SODIUM and CESIUM); and ALKALINE EARTH METALS (such as BARIUM, MAGNESIUM and CALCIUM).

## SPILL/LEAKS

**Isolation Distance:**

Small Spill: 30 meters (100 feet)

Large Spill: 60 meters (200 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit into sealed containers.

 Keep **1,1 Dichloroethane** out of confined spaces, such as sewers, because of the possibility of an explosion.

DO NOT wash into sewer.

**1,1 Dichloroethane** is a marine pollutant.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	100 to 200 ppm
<b>Flash Point:</b>	2°F (-17°C)
<b>LEL:</b>	5.4%
<b>UEL:</b>	16%
<b>Auto Ignition Temp:</b>	856°F (458°C)
<b>Vapor Density:</b>	3.4 (air = 1)
<b>Vapor Pressure:</b>	182 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.2 (water = 1)
<b>Water Solubility:</b>	Slightly soluble
<b>Boiling Point:</b>	135° to 138°F (57° to 59°C)
<b>Ionization Potential:</b>	11.06 eV
<b>Molecular Weight:</b>	99

## EXPOSURE LIMITS

<b>OSHA:</b>	100 ppm, 8-hr TWA
<b>NIOSH:</b>	100 ppm, 10-hr TWA
<b>ACGIH:</b>	100 ppm, 8-hr TWA
<b>IDLH:</b>	3,000 ppm

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Viton (2.4-hr breakthrough)
<b>Coveralls:</b>	Tychem® BR, LV, Responder® and TK; Zytron® 500; and ONESuit® TEC (>8-hr breakthrough for <i>Halogen compounds</i> )
<b>Respirator:</b>	>100 ppm - Supplied air

## HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose and throat irritation with coughing and wheezing Headache, nausea, vomiting, dizziness and passing out
<b>Chronic:</b>	Cancer (liver, circulatory, and mammary gland) in animals

## FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.  
**Quickly** remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** promptly to a medical facility



Common Name: **1,2-DICHLOROETHANE**

Synonyms: 1,2-DCE; Ethylene Dichloride

CAS No: 107-06-2

Molecular Formula: C<sub>2</sub>H<sub>4</sub>Cl<sub>2</sub>

RTK Substance No: 0652

Description: Clear, colorless liquid with a pleasant odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>3 - Fire</b> <b>0 - Reactivity</b> <b>DOT#:</b> UN 1184 <b>ERG Guide #:</b> 131 <b>Hazard Class:</b> 3 (Flammable)	<b>FLAMMABLE LIQUID</b> Use dry chemical, CO <sub>2</sub> , water spray or alcohol-resistant foam as extinguishing agents. <b>POISONOUS GASES ARE PRODUCED IN FIRE</b> , including <i>Hydrogen Chloride, Vinyl Chloride, Acetylene</i> and <i>Phosgene</i> . <b>CONTAINERS MAY EXPLODE IN FIRE.</b> Use water spray to keep fire-exposed containers cool. Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source. Flow or agitation may generate electrostatic charges. <b>1,2-Dichloroethane</b> may form an ignitable vapor/air mixture in closed tanks or containers.	<b>1,2-Dichloroethane</b> may explode when mixed with <i>liquid AMMONIA; NITROGEN TETROXIDE</i> ; and other <b>OXIDIZING AGENTS</b> (such as <i>PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE</i> and <i>FLUORINE</i> ). <b>1,2-Dichloroethane</b> is not compatible with <b>STRONG BASES</b> (such as <i>SODIUM HYDROXIDE</i> and <i>POTASSIUM HYDROXIDE</i> ); <b>CHEMICALLY ACTIVE METALS</b> (such as <i>POTASSIUM, SODIUM, MAGNESIUM</i> and <i>ZINC</i> ); <b>ALKALI AMIDES</b> (such as <i>SODIUM AMIDE</i> ). <b>1,2-Dichloroethane</b> attacks <b>METALS</b> in the presence of <b>WATER</b> .

### SPILL/LEAKS

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in dry sand, earth, or a similar material and place into sealed containers for disposal.

Use only non-sparking tools and equipment, especially when opening and closing containers of **1,2-Dichloroethane**.

Use foam to blanket release and to suppress vapors.

Keep **1,2-Dichloroethane** out of confined spaces, such as sewers, because of the possibility of an explosion.

DO NOT wash into sewer.

**1,2-Dichloroethane** is dangerous to aquatic life in high concentrations.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	88 ppm
<b>Flash Point:</b>	56°F (13°C)
<b>LEL:</b>	6.2%
<b>UEL:</b>	15.9%
<b>Auto Ignition Temp:</b>	775°F (413°C)
<b>Vapor Density:</b>	3.4 (air = 1)
<b>Vapor Pressure:</b>	64 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.25 (water = 1)
<b>Water Solubility:</b>	Slightly soluble
<b>Boiling Point:</b>	182°F (83°C)
<b>Freezing Point:</b>	-32°F (-36°C)
<b>Ionization Potential:</b>	11.05 eV
<b>Molecular Weight:</b>	98.96

### EXPOSURE LIMITS

**NIOSH:** 1 ppm, 10-hr TWA; 2 ppm, Ceiling

**ACGIH:** 10 ppm

**IDLH:** 50 ppm

The Protective Action Criteria values are:

PAC-1 = 50 ppm PAC-2 = 200 ppm PAC-3 = 300 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	SilverShield®/4H®, Viton and Barrier® (>8-hr breakthrough)
<b>Coveralls:</b>	Tychem® BR, Responder® and TK (>8-hr breakthrough)
<b>Respirator:</b>	SCBA

### HEALTH EFFECTS

**Eyes:** Irritation and burns

**Skin:** Irritation and burns

**Inhalation:** Nose, throat and lung irritation, with coughing, and severe shortness of breath (pulmonary edema)

Headache, dizziness, lightheadedness, confusion, tremor, loss of memory and even passing out

**Chronic:** Cancer (blood vessel, lung, breast) in animals

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

**Medical** observation is recommended as symptoms may be delayed.

Common Name: **DICHLOROFLUOROMETHANE**

Synonyms: HCFC-21; CFC 21; Freon® 21; Halon® 112; Genetron® 21

CAS No: 75-43-4

 Molecular Formula: CHCl<sub>2</sub>F

RTK Substance No: 3109

 Description: Colorless gas, or a compressed liquefied gas, with a sweet *Ether*-like odor

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>1 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 1029 ERG Guide #: 126 Hazard Class: 2.2 (Nonflammable)	Extinguish fire using an agent suitable for type of surrounding fire. <b>Dichlorofluoromethane</b> itself does not burn. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Hydrogen Fluoride, Carbonyl Fluoride, Hydrogen Chloride, and Phosgene.</i> CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool.	<b>Dichlorofluoromethane</b> reacts with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) and ACID FUMES to produce toxic and corrosive <i>Hydrogen Fluoride and Hydrogen Chloride gases.</i> <b>Dichlorofluoromethane</b> is not compatible with POWDERED ALUMINUM; MAGNESIUM; ZINC; SODIUM; POTASSIUM; CALCIUM; and OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).

## SPILL/LEAKS

**Isolation Distance:**

Spill: 100 meters (330 feet)

Fire: 800 meters (1/2 mile)

Stop flow of gas. If source of leak is a cylinder and the leak cannot be stopped in place, remove the leaking cylinder to a safe place in the open air, and repair leak or allow cylinder to empty.

Turn leaking cylinder with leak up to prevent escape of gas in the liquid state.

DO NOT DIRECT water jet on liquid.

DO NOT wash into sewer.

**Dichlorofluoromethane** is considered to be an *Ozone* depleting substance.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	<i>Ether</i> -like
<b>Flash Point:</b>	Nonflammable gas
<b>Auto Ignition Temp:</b>	972°F (522°C)
<b>Vapor Density:</b>	3.8 (air = 1)
<b>Vapor Pressure:</b>	1,193 mm Hg at 70°F (21°C)
<b>Specific Gravity:</b>	1.48 (water = 1)
<b>Water Solubility:</b>	Slightly soluble
<b>Boiling Point:</b>	48°F (8.9°C)
<b>Freezing Point:</b>	-211°F (-135°C)
<b>Ionization Potential:</b>	12.39 eV
<b>Molecular Weight:</b>	102.92

## EXPOSURE LIMITS

**Dichlorofluoromethane** is an asphyxiant at high concentrations.

**NIOSH:** 10 ppm, 10-hr TWA

**ACGIH:** 10 ppm, 8-hr TWA

**IDLH:** 5,000 ppm

The Protective Action Criteria values are:

PAC-1 = 30 ppm PAC-2 = 100 ppm PAC-3 = 5,000 ppm

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Insulated Neoprene (<1-hr breakthrough) and Barrier® (>8-hr breakthrough)
<b>Coveralls:</b>	Tychem® Responder® (>8-hr breakthrough)
<b>Respirator:</b>	>30 ppm - SCBA

## HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation. Contact with liquid causes frostbite
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, wheezing and/or shortness of breath Headache, dizziness, lightheadedness, confusion, tremors, unconsciousness and death

## FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Immerse** affected part in warm water. Seek medical attention.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **1,3-DICHLOROPROPENE**

Synonyms: DCP; 3-Chloroallyl Chloride

CAS No: 542-75-6

 Molecular Formula: C<sub>3</sub>H<sub>4</sub>Cl<sub>2</sub>

RTK Substance No: 0666

 Description: Clear to straw-colored liquid with a sharp, sweet, irritating (*Chloroform*-like) odor

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>3 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 2047 ERG Guide #: 129 Hazard Class: 3 (Flammable)	<b>FLAMMABLE LIQUID</b> Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. <b>POISONOUS GASES ARE PRODUCED IN FIRE</b> , including <i>Hydrogen Chloride</i> . <b>CONTAINERS MAY EXPLODE IN FIRE.</b> Use water spray to keep fire-exposed containers cool. Vapors may travel to a source of ignition and flash back. Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.	<b>1,3-Dichloropropene</b> may polymerize (uncontrolled reaction) with ALUMINUM and MAGNESIUM (and their ALLOYS); HALOGENS (such as CHLORINE, BROMINE and FLUORINE); CHEMICALLY ACTIVE METALS (such as POTASSIUM, SODIUM, MAGNESIUM and ZINC); and METAL SALTS. <b>1,3-Dichloropropene</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, and NITRATES); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); and STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE).

## SPILL/LEAKS

**Isolation Distance:**

Small Spill: 60 meters (150 feet)

Large Spill: 270 meters (900 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.

 Keep **1,3-Dichloropropene** out of confined spaces, such as sewers, because of the possibility of an explosion.

DO NOT wash into sewer.

Low to moderate toxicity to birds and aquatic life.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	1 to 3 ppm
<b>Flash Point:</b>	77° to 95°F (25° to 35°C)
<b>LEL:</b>	5%
<b>UEL:</b>	14.5%
<b>Vapor Density:</b>	3.8 (air = 1)
<b>Vapor Pressure:</b>	28 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.2 (water =1)
<b>Water Solubility:</b>	Very slightly soluble
<b>Boiling Point:</b>	219°F (104°C)
<b>Melting Point:</b>	232°F (111°C)
<b>Molecular Weight:</b>	111

## EXPOSURE LIMITS

<b>OSHA:</b>	None
<b>NIOSH:</b>	1 ppm, 10-hr TWA
<b>ACGIH:</b>	1 ppm, 8-hr TWA
<b>IDLH:</b>	None

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Viton (>8-hr breakthrough)
<b>Coveralls:</b>	DuPont Responder® and CSM; Kappler® Zytron® 500; and Saint-Gobain ONESuit® TEC (>8-hr breakthrough for <i>halogen compounds</i> )
<b>Respirator:</b>	>1 ppm - Supplied air

## HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, wheezing and shortness of breath  Headache, dizziness, nausea and vomiting, and passing out
<b>Chronic:</b>	Cancer (bladder and lung) in animals

## FIRST AID AND DECONTAMINATION

<b>Remove</b> the person from exposure.
<b>Flush</b> eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention immediately.
<b>Quickly</b> remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water.
<b>Begin</b> artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b> promptly to a medical facility.

Common Name: **2,2-DICHLOROPROPIONIC ACID**

Synonyms: Dalapon; 2,2-DPA

CAS No: 75-99-0

Molecular Formula: C<sub>3</sub>H<sub>4</sub>Cl<sub>2</sub>O<sub>2</sub>

RTK Substance No: 0668

Description: Colorless liquid, or the commercial product can be a light tan powder, with a strong, sharp odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>0- Fire</b> <b>1 - Reactivity</b> <b>DOT#:</b> UN 1760 <b>ERG Guide #:</b> 154 <b>Hazard Class:</b> 8 (Corrosive)	Extinguish fire using an agent suitable for type of surrounding fire. <b>2,2-Dichloropropionic Acid</b> itself does not burn. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Hydrogen Chloride</i> . Use water spray to keep fire-exposed containers cool.	<b>2,2-Dichloropropionic Acid</b> reacts slowly with WATER and MOIST AIR to produce corrosive <i>Hydrogen Chloride</i> . <b>2,2-Dichloropropionic Acid</b> attacks and corrodes ALUMINUM, COPPER and their ALLOYS. <b>2,2-Dichloropropionic Acid</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC).

### SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Cover *liquid* spills with dry lime, sand or soda ash and place into sealed containers for disposal.

Moisten *solid* material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

DO NOT wash into sewer.

**2,2-Dichloropropionic Acid** is harmful to aquatic organisms.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Strong, sharp odor
<b>Flash Point:</b>	Noncombustible
<b>Vapor Density:</b>	4.9 (air = 1)
<b>Vapor Pressure:</b>	5.1 mm Hg at 160°F (71°C)
<b>Specific Gravity:</b>	1.4 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	374°F (190°C)
<b>Melting Point:</b>	46°F (8°C)
<b>Molecular Weight:</b>	143

### EXPOSURE LIMITS

**NIOSH:** 1 ppm (6 mg/m<sup>3</sup>), 10-hr TWA

**ACGIH:** 5 mg/m<sup>3</sup>, 8-hr TWA

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl, Neoprene, Silver Shield®/4H®, Viton and Barrier® (>4-hr breakthrough for <i>Acids, carboxylic, substituted</i> )
<b>Coveralls:</b>	Tychem® F, BR, Responder® and TK (>8-hr breakthrough for <i>Acids, carboxylic, substituted</i> )
<b>Respirator:</b>	>5 mg/m <sup>3</sup> - APR with <i>Organic vapor</i> cartridges and P100 prefilters >50 mg/m <sup>3</sup> - SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Severe irritation, burns and possible eye damage
<b>Skin:</b>	Irritation and burns
<b>Inhalation:</b>	Nose, throat and lung irritation, with coughing, wheezing and shortness of breath Headache, dizziness, weakness, nausea and vomiting

### FIRST AID AND DECONTAMINATION

<b>Remove</b> the person from exposure.
<b>Flush</b> eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention.
<b>Quickly</b> remove contaminated clothing and wash contaminated skin with large amounts of water. Seek medical attention.
<b>Begin</b> artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b> promptly to a medical facility.

Common Name: **DIELDRIN**

Synonyms: HEOD; Octalox®; Quintox®

CAS No: 60-57-1

Molecular Formula: C<sub>12</sub>H<sub>8</sub>Cl<sub>6</sub>O

RTK Substance No: 0683

Description: White (when pure) to light-tan, crystalline or flaked powder with a chemical-like odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>2 - Health</b></p> <p><b>0 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p><b>DOT#:</b> UN 2761</p> <p><b>ERG Guide #:</b> 151</p> <p><b>Hazard Class:</b> 6.1 (Poison)</p>	<p><b>Dieldrin</b> does not burn, however, it is often dissolved in a liquid carrier which may be flammable or combustible.</p> <p><b>POISONOUS GASES ARE PRODUCED IN FIRE</b>, including <i>Hydrogen Chloride</i> and <i>Chlorine</i>.</p> <p>Use water spray to keep fire-exposed containers cool.</p>	<p><b>Dieldrin</b> may react violently with <b>OXIDIZING AGENTS</b> (such as <b>PERCHLORATES</b>, <b>PEROXIDES</b>, <b>PERMANGANATES</b>, <b>CHLORATES</b>, <b>NITRATES</b>, <b>CHLORINE</b>, <b>BROMINE</b> and <b>FLUORINE</b>) and <b>STRONG ACIDS</b> (such as <b>HYDROCHLORIC</b>, <b>SULFURIC</b> and <b>NITRIC</b>).</p> <p><b>Dieldrin</b> is not compatible with <b>MINERAL ACIDS</b>; <b>ACID CATALYSTS</b>; <b>PHENOLS</b>; <b>METALS</b> (such as <b>COPPER</b>, <b>ZINC</b>, and <b>IRON</b> and their <b>SALTS</b>); and <b>ALKALI METALS</b> (such as <b>MAGNESIUM</b>, <b>SODIUM</b> and <b>POTASSIUM</b>).</p>

### SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

Ventilate and wash area after clean-up is complete.

DO NOT wash into sewer.

**Dieldrin** is very toxic to aquatic life and bees. It is also persistent in the environment.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	0.041 ppm
<b>Flash Point:</b>	Noncombustible
<b>Vapor Density:</b>	13.2 (air = 1)
<b>Vapor Pressure:</b>	8 x 10 <sup>-7</sup> mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.75 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	Decomposes
<b>Melting Point:</b>	347° to 349°F (175° to 176°C)
<b>Molecular Weight:</b>	380.9

### EXPOSURE LIMITS

**OSHA:** 0.25 mg/m<sup>3</sup>, 8-hr TWA

**NIOSH:** 0.25 mg/m<sup>3</sup>, 10-hr TWA

**ACGIH:** 0.1 mg/m<sup>3</sup>, 8-hr TWA

**IDLH:** 50 mg/m<sup>3</sup>

The Protective Action Criteria values are:

PAC-1 = 0.3 mg/m<sup>3</sup>; PAC-2 = 6.8 mg/m<sup>3</sup>;

PAC-3 = 450 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Nitrile and Natural Rubber
<b>Coveralls:</b>	Tyvek®
<b>Respirator:</b>	>0.1 mg/m <sup>3</sup> – Pressure demand supplied air >50 mg/m <sup>3</sup> – Pressure demand SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	No information available
<b>Inhalation:</b>	Headache, nausea, vomiting, dizziness, lightheadedness, and passing out
<b>Chronic:</b>	Cancer (liver) in animals

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention.

**Quickly** remove contaminated clothing and immediately wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.



Common Name: **DIETHANOLAMINE**

Synonyms: DEA; 2,2'-Dihydroxydiethylamine; Ethanol, 2,2'-Iminobis-

CAS No: 111-42-2

Molecular Formula: C<sub>4</sub>H<sub>11</sub>NO<sub>2</sub>

RTK Substance No: 0686

Description: White, crystalline solid or colorless to yellow, syrupy liquid with a mild *Ammonia*-like odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>3 - Health</b></p> <p><b>1 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p><b>DOT#:</b> UN 1760</p> <p><b>ERG Guide #:</b> 154</p> <p><b>Hazard Class:</b> 8 (Corrosive)</p>	<p><b>Diethanolamine</b> may burn, but does not readily ignite.</p> <p>Use dry chemical, CO<sub>2</sub>, water spray or alcohol-resistant foam as extinguishing agents.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i>.</p> <p>Use water spray to keep fire-exposed containers cool.</p>	<p><b>Diethanolamine</b> reacts violently with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC).</p> <p><b>Diethanolamine</b> is not compatible with STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); ALDEHYDES; KETONES; ACRYLATES; ORGANIC ANHYDRIDES; ORGANIC HALIDES; FORMATES; and OXALATES.</p> <p><b>Diethanolamine</b> reacts with NITROGEN COMPOUNDS (such as SODIUM NITRITE and NITROGEN OXIDES) to form cancer-causing <i>Nitrosamines</i>.</p> <p><b>Diethanolamine</b> reacts with CARBON DIOXIDE and absorbs MOISTURE in the air.</p> <p><b>Diethanolamine</b> is corrosive to ALUMINUM, COPPER, ZINC, and GALVANIZED IRON.</p>

### SPILL/LEAKS

**Isolation Distance:**

**Spill (solid):** 25 meters (75 feet)

**Spill (liquid):** 50 meters (150 feet)

**Fire:** 800 meters (1/2 mile)

Absorb liquids in dry sand, earth, or a similar material and place into sealed containers for disposal.

Moisten *solid* spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

DO NOT wash into sewer.

**Diethanolamine** is harmful to aquatic organisms.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	0.27 ppm
<b>Flash Point:</b>	273° to 342°F (134° to 172°C)
<b>LEL:</b>	1.6%
<b>UEL:</b>	9.8%
<b>Auto Ignition Temp:</b>	1,224°F (662°C)
<b>Vapor Density:</b>	3.65 (air = 1)
<b>Vapor Pressure:</b>	<0.01 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.1 (water = 1)
<b>Water Solubility:</b>	Very soluble
<b>Boiling Point:</b>	514°F (268°C)
<b>Melting Point:</b>	82°F (28°C)
<b>Critical Temp:</b>	828°F (442°C)
<b>Molecular Weight:</b>	105.2

### EXPOSURE LIMITS

**NIOSH:** 15 mg/m<sup>3</sup>, 10-hr TWA

**ACGIH:** 1 mg/m<sup>3</sup>, 8-hr TWA

The Protective Action Criteria values are:

PAC-1 = 25 mg/m<sup>3</sup>    PAC-2 = 150 mg/m<sup>3</sup>  
PAC-3 = 300 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl, Nitrile, Neoprene, Polyvinyl Chloride, Viton and Barrier® (>8-hr breakthrough)
<b>Coveralls:</b>	Tychem® CPF 3 and CSM (>8-hr breakthrough)
<b>Respirator:</b>	>1 mg/m <sup>3</sup> - full facepiece APR with <i>Organic vapor</i> and <i>P100</i> cartridges >10 mg/m <sup>3</sup> or Fire - SCBA

### HEALTH EFFECTS

**Eyes:** Irritation, burns and possible eye damage

**Skin:** Irritation and burns

**Inhalation:** Nose and throat irritation with coughing and wheezing

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses. Seek medical attention.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.



Common Name: **DIETHYL CARBINOL**

Synonyms: Isoamyl Alcohol; Pentan-3-ol; 3-Pentanol

CAS No: 584-02-1

 Molecular Formula: C<sub>5</sub>H<sub>12</sub>O

RTK Substance No: 0696

Description: Colorless liquid with a strong, sweet odor

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>1 - Health</b> <b>2 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 1105 ERG Guide #: 129 Hazard Class: 3 (Flammable)	<b>Diethyl Carbinol</b> is a COMBUSTIBLE LIQUID that may become HIGHLY FLAMMABLE in the presence of SPARKS and STATIC DISCHARGE. Use dry chemical, CO <sub>2</sub> , water spray or alcohol-resistant foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE. Use water spray to keep fire-exposed containers cool. Vapors may travel to a source of ignition and flash back. Flow or agitation may generate electrostatic charges.	<b>Diethyl Carbinol</b> reacts violently with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and HYDROGEN TRISULFIDE, to cause fires and explosions. <b>Diethyl Carbinol</b> will react with ALKALINE EARTH METALS (such as BERYLLIUM, MAGNESIUM and CALCIUM) to form flammable and explosive <i>Hydrogen gas</i> . <b>Diethyl Carbinol</b> is not compatible with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); ALIPHATIC AMINES; ISOCYANATES; ALKALI METALS (such as LITHIUM, SODIUM and POTASSIUM); and NITRIDES.

## SPILL/LEAKS

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers for disposal.

 Keep **Diethyl Carbinol** out of confined spaces, such as sewers, because of the possibility of an explosion.

DO NOT wash into sewer.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Strong, sweet odor
<b>Flash Point:</b>	93° to 105°F (34° to 41°C)
<b>LEL:</b>	1.2%
<b>UEL:</b>	9%
<b>Auto Ignition Temp:</b>	650° to 680°F (343° to 360°C)
<b>Vapor Density:</b>	3 (air = 1)
<b>Vapor Pressure:</b>	8.3 mm Hg at 77°F (25°C)
<b>Specific Gravity:</b>	0.82 (water = 1)
<b>Water Solubility:</b>	Slightly soluble
<b>Boiling Point:</b>	241°F (116°C)
<b>Freezing Point:</b>	-92°F (-69°C)
<b>Ionization Potential:</b>	9.8 +/- 0.2 eV
<b>Molecular Weight:</b>	88.2

## EXPOSURE LIMITS

 The Protection Action Criteria values for *Pentanol* are:

PAC-1 = 150 ppm

PAC-2 = 150 ppm

PAC-3 = 1,500 ppm

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl, Nitrile, Viton and Barrier® (>8-hr breakthrough for <i>n-Pentanol</i> )
<b>Coveralls:</b>	Tychem® Responder® and TK (>8-hr breakthrough for <i>Hydroxyl compounds, aliphatic</i> )
<b>Respirator:</b>	>150 ppm - Supplied air or SCBA

## HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose and throat irritation with coughing and wheezing Headache, dizziness, lightheadedness and passing out Higher levels can cause coma and death

## FIRST AID AND DECONTAMINATION

<b>Remove</b>	the person from exposure.
<b>Flush</b>	eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
<b>Quickly</b>	remove contaminated clothing and wash contaminated skin with large amounts of soap and water.
<b>Begin</b>	artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b>	promptly to a medical facility.

Common Name: **DIETHYLENE GLYCOL DINITRATE**

Synonyms: DEGDN; Diglycol Dinitrate

CAS No: 693-21-0

Molecular Formula: C<sub>4</sub>H<sub>8</sub>N<sub>2</sub>O<sub>7</sub>

RTK Substance No: 0699

Description: Colorless, odorless, thick, oily liquid

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>2 - Health</b></p> <p><b>4 - Fire</b></p> <p><b>4 - Reactivity</b></p> <p><b>DOT#:</b> UN 0075</p> <p><b>ERG Guide #:</b> 112</p> <p><b>Hazard Class:</b> 1 (Explosive)</p>	<p><b>Diethylene Glycol Dinitrate</b> is an EXPLOSIVE that can be ignited by HEAT, FRICTION, SHOCK, VIBRATION, and/or ELECTROSTATIC CHARGE.</p> <p><b>Diethylene Glycol Dinitrate</b> is FLAMMABLE and REACTIVE and a DANGEROUS FIRE and EXPLOSION HAZARD.</p> <p>DO NOT FIGHT FIRE. Evacuate area and let burn. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i>.</p> <p>CONTAINERS MAY EXPLODE IN FIRE.</p> <p>Use water spray to keep fire-exposed containers cool.</p> <p><b>Diethylene Glycol Dinitrate</b> may ignite combustibles (wood, paper and oil).</p>	<p><b>Diethylene Glycol Dinitrate</b> is an EXTREMELY SENSITIVE EXPLOSIVE if not properly desensitized with an additive (phlegmatizer) for stabilization.</p> <p><b>Diethylene Glycol Dinitrate</b> may react with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); and REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES), resulting in detonation.</p>

### SPILL/LEAKS

**Isolation Distance:**

Spill: 800 meters (1/2 mile)

Fire: 1,600 meters (1 mile)

DO NOT CLEAN-UP OR DISPOSE OF EXCEPT UNDER SUPERVISION OF A SPECIALIST.

Keep **Diethylene Glycol Dinitrate** out of confined spaces, such as sewers, because of the possibility of an explosion.

DO NOT wash into sewer.

**Diethylene Glycol Dinitrate** is harmful to aquatic organisms.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Explosive
<b>Vapor Pressure:</b>	0.00015 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.4 (water = 1)
<b>Water Solubility:</b>	Slightly soluble
<b>Boiling Point:</b>	Decomposes at 387°F (197°C)
<b>Melting Point:</b>	11°F (-12°C)
<b>Molecular Weight:</b>	196

### EXPOSURE LIMITS

No occupational exposure limits have been established for **Diethylene Glycol Dinitrate**.

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl, Silver Shield®/4H® and Barrier® (>8-hr breakthrough for <i>Glycol Ethers</i> )
<b>Coveralls:</b>	Tychem® Responder® and TK (>8-hr breakthrough for <i>Glycol Ethers</i> )
<b>Respirator:</b>	SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	No information
<b>Skin:</b>	No information
<b>Inhalation:</b>	Headache, fatigue, dizziness, and a blue color to the skin and lips ( <i>methemoglobinemia</i> )

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Remove** contaminated clothing and wash contaminated skin with soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **DIETHYL PHTHALATE**

Synonyms: DEP; Diethyl 1,2-Benzenecarboxylate; Ethyl Phthalate

CAS No: 84-66-2

 Molecular Formula: C<sub>12</sub>H<sub>14</sub>O<sub>4</sub>

RTK Substance No: 0707

Description: Odorless, colorless, oil liquid

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>1 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 3082 ERG Guide #: 171 Hazard Class: 9 (Environmentally Hazardous Substance)	<b>Diethyl Phthalate</b> may burn, but does not readily ignite. Use dry chemical, CO <sub>2</sub> , water spray or alcohol-resistant foam as extinguishing agents. <b>DO NOT</b> use water jet directly on <b>Diethyl Phthalate</b> . POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Phthalic Anhydride</i> . Use water spray to keep fire-exposed containers cool.	<b>Diethyl Phthalate</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC). <b>Diethyl Phthalate</b> may attack plastics.

**SPILL/LEAKS**
**Isolation Distance:**
**Spill:** 50 meters (150 feet)

**Fire:** 800 meters (1/2 mile)

 Absorb liquids in dry sand, earth, or a similar material and place into sealed containers for disposal. **DO NOT** wash into sewer.

**Diethyl Phthalate** may be hazardous to the environment, especially to fish.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	322°F (161°C)
<b>LEL:</b>	0.7%
<b>UEL:</b>	Unknown
<b>Auto Ignition Temp:</b>	855°F (457°C)
<b>Vapor Density:</b>	7.7 (air = 1)
<b>Vapor Pressure:</b>	0.002 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.2 (water = 1)
<b>Water Solubility:</b>	Very slightly soluble
<b>Boiling Point:</b>	568°F (298°C)
<b>Freezing Point:</b>	-41°F (-40.6°C)
<b>Molecular Weight:</b>	222.3

**EXPOSURE LIMITS**
**NIOSH:** 5 mg/m<sup>3</sup>, 10-hr TWA

**ACGIH:** 5 mg/m<sup>3</sup>, 8-hr TWA

The Protective Action Criteria values are:

 PAC-1 = 15 mg/m<sup>3</sup>    PAC-2 = 100 mg/m<sup>3</sup>  
 PAC-3 = 300 mg/m<sup>3</sup>
**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Butyl, Nitrile, Neoprene and Viton (>8-hr breakthrough)
<b>Coveralls:</b>	Tychem® F, BR, CSM and TK (>8-hr breakthrough for <i>Esters, Carboxylic</i> )
<b>Respirator:</b>	>5 mg/m <sup>3</sup> - full facpiece APR with <i>P100 filters</i> Fire or >15 mg/ m <sup>3</sup> - SCBA

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation (skin absorbable)
<b>Inhalation:</b>	Nose and throat irritation with coughing and wheezing

**FIRST AID AND DECONTAMINATION**

<b>Remove</b>	the person from exposure.
<b>Flush</b>	eyes with large amounts of water for at least 15 minutes. Remove contact lenses.
<b>Remove</b>	contaminated clothing and wash contaminated skin with soap and water.
<b>Begin</b>	artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b>	promptly to a medical facility.

Common Name: **DIETHYLSTILBESTROL**

Synonyms: DES; Estrogen

CAS No: 56-53-1

Molecular Formula: C<sub>18</sub>H<sub>20</sub>O<sub>2</sub>

RTK Substance No: 0709

Description: Odorless, tasteless, white, crystalline powder

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>4 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b> <b>DOT#:</b> None <b>ERG Guide #:</b> None <b>Hazard Class:</b> None	Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE. Use water spray to keep fire-exposed containers cool.	<b>Diethylstilbestrol</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); ACID CHLORIDES; and ACID ANHYDRIDES.

### SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

### PHYSICAL PROPERTIES

**Odor Threshold:** Odorless

**Water Solubility:** Very slightly soluble

**Melting Point:** 336° to 342°F (169° to 172°C)

**Molecular Weight:** 268.38

### EXPOSURE LIMITS

The Protective Action Criteria values are:

PAC-1 = 0.075 mg/m<sup>3</sup>

PAC-2 = 0.6 mg/m<sup>3</sup>

PAC-3 = 15 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

**Gloves:** Nitrile and Natural Rubber

**Coveralls:** Tyvek®

**Respirator:** Full facepiece APR with *P100 filters*  
>15 mg/m<sup>3</sup> - SCBA

### HEALTH EFFECTS

**Eyes:** Irritation

**Skin:** Irritation

**Inhalation:** Nose and throat irritation  
Headache, nausea, dizziness, weakness and irritability

**Chronic:** Cancer (breast and liver) in humans

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **DIETHYL SULFATE**

Synonyms: Ethyl Sulfate

CAS No: 64-67-5

 Molecular Formula: C<sub>4</sub>H<sub>10</sub>O<sub>4</sub>S

RTK Substance No: 0710

 Description: Clear, colorless, oily liquid with a mint or *Ether*-like odor

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>1 - Fire</b> <b>1 - Reactivity</b> DOT#: UN 1594 ERG Guide #: 152 Hazard Class: 6.1 (Poison)	COMBUSTIBLE LIQUID Use dry chemical, CO <sub>2</sub> , water spray or alcohol-resistant foam as extinguishing agents. DO NOT USE WATER directly on <b>Diethyl Sulfate</b> . POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Ethyl Ether</i> , <i>Ethylene Oxide</i> and <i>Sulfur Oxides</i> . Use water spray to keep fire-exposed containers cool.	<b>Diethyl Sulfate</b> reacts slowly with WATER, and decomposes in HOT WATER, to form <i>Ethyl Alcohol</i> , <i>Ethyl Sulfate</i> and <i>Sulfuric Acid</i> . <b>Diethyl Sulfate</b> reacts violently with a combination of 3,8-DINITRO-9-PHENYLPHENANTHRIDINE and WATER. <b>Diethyl Sulfate</b> is not compatible with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); and NITRATES. Keep <b>Diethyl Sulfate</b> away from METALS and MOISTURE as flammable and explosive <i>Hydrogen gas</i> can be released.

**SPILL/LEAKS**
**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in dry sand, earth, or a similar material and place into sealed containers for disposal.

DO NOT wash into sewer.

**Diethyl Sulfate** is harmful to aquatic life at very low concentrations.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	Mint or <i>Ether</i> -like
<b>Flash Point:</b>	220°F (104°C)
<b>LEL:</b>	4.1%
<b>UEL:</b>	12.2%
<b>Auto Ignition Temp:</b>	817°F (436°C)
<b>Vapor Density:</b>	5.3 (air = 1)
<b>Vapor Pressure:</b>	1 mm Hg at 117°F (47°C)
<b>Specific Gravity:</b>	1.2 (water =1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	409°F (209.4°C)
<b>Freezing Point:</b>	-13°F (-25°C)
<b>Molecular Weight:</b>	154.2

**EXPOSURE LIMITS**

 No occupational exposure limits have been established for **Diethyl Sulfate**.

The Protective Action Criteria values are:

PAC-1 = 0.2 ppm PAC-2 = 1.5 ppm PAC-3 = 25 ppm

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Butyl/Viton (>8-hr breakthrough)
<b>Coveralls:</b>	Tychem® CSM and TK (>8-hr breakthrough)
<b>Respirator:</b>	SCBA

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, wheezing and shortness of breath Nausea, vomiting and abdominal pain
<b>Chronic:</b>	Cancer (skin) in animals

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.  
**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** promptly to a medical facility.

Common Name: **1,1-DIFLUOROETHANE**

Synonyms: Ethylidene Fluoride; Freon 152A; Genetron 100

CAS No: 75-37-6

 Molecular Formula: C<sub>2</sub>H<sub>4</sub>F<sub>2</sub>

RTK Substance No: 0715

Description: Colorless and odorless gas used as a liquefied compressed gas

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>1 - Health</b> <b>4 - Fire</b> <b>0 - Reactivity</b>  DOT#: UN 1030 ERG Guide #: 115 Hazard Class: 2.1 (Flammable gas)	FLAMMABLE GAS. Stop flow and use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. If flow cannot be stopped, let fire burn. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Hydrogen Fluoride</i> and <i>Carbonyl Fluoride</i> . CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool. Vapors may travel to a source of ignition and flash back. Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.	<b>1,1-Difluoroethane</b> may react violently with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE), and forms explosive compounds with BARIUM; SODIUM; POTASSIUM; and other <i>divalent light</i> METALS and METALLIC AZIDES.  <b>1,1-Difluoroethane</b> is not compatible with <i>powdered</i> ALUMINUM and MAGNESIUM, and their ALLOYS; LIQUID OXYGEN; BRASS; and STEEL.

SPILL/LEAKS
<b>Isolation Distance:</b> Small Spill: 100 meters (300 feet) Large Spill: 800 meters (1/2 mile) Fire: 1,600 meters (1 mile) Stop flow of gas. Keep <b>1,1-Difluoroethane</b> out of confined spaces, such as sewers, because of the possibility of an explosion. May be toxic to aquatic life. Considered to be an <i>Ozone</i> depleting substance.

PHYSICAL PROPERTIES
<b>Odor Threshold:</b> Odorless <b>LEL:</b> 3.7% <b>UEL:</b> 18% <b>Vapor Density:</b> 2.4 (air = 1) <b>Vapor Pressure:</b> 4,437 mm Hg at 77°F (25°C) <b>Specific Gravity:</b> 0.95 (water = 1) <b>Water Solubility:</b> Very slightly soluble <b>Boiling Point:</b> -16.6°F (-27°C) <b>Melting Point:</b> -179°F (-117°C) <b>Molecular Weight:</b> 66.1

EXPOSURE LIMITS
No occupational exposure limits have been established for <b>1,1-Difluoroethane</b> .

PROTECTIVE EQUIPMENT
<b>Gloves:</b> Insulated Neoprene or Rubber <b>Coveralls:</b> DuPont Tychem® CSM, Responder®, and TK; Kappler Zytron® 400; and Saint-Gobain ONESuit® TEC <b>Respirator:</b> Supplied air

HEALTH EFFECTS
<b>Eyes:</b> Irritation. Contact with liquid can cause frostbite. <b>Skin:</b> Irritation, drying and cracking of the skin Contact with liquid can cause frostbite <b>Inhalation:</b> Nose, throat and lung irritation with coughing, wheezing and/or shortness of breath Headache, dizziness, lightheadedness and passing out

FIRST AID AND DECONTAMINATION
<b>Remove</b> the person from exposure. <b>Flush</b> eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention. <b>Immerse</b> affected part in warm water. Seek medical attention. <b>Transfer</b> to a medical facility. <b>Medical</b> observation is recommended as symptoms may be delayed.



Common Name: **1,2-DIHYDROXYBENZENE**

Synonyms: Catechol; o-Dihydroxybenzene; Pyrocatechol

CAS No: 120-80-9

 Molecular Formula: C<sub>6</sub>H<sub>6</sub>O<sub>2</sub>

RTK Substance No: 0722

 Description: Colorless, crystalline solid, with a slight *Phenolic* odor, that becomes a vapor at ordinary temperatures

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 2811 ERG Guide #: 154 Hazard Class: 6.1 (Poison)	COMBUSTIBLE SOLID Use dry chemical, CO <sub>2</sub> , water spray or alcohol-resistant foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE. Use water spray to keep fire-exposed containers cool. Flow or agitation may generate electrostatic charge.	<b>1,2-Dihydroxybenzene</b> reacts violently with NITRIC ACID. <b>1,2-Dihydroxybenzene</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); ACID CHLORIDES; ACID ANHYDRIDES; and STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE).

## SPILL/LEAKS

**Isolation Distance:**

Small Spills: 30 meters (100 feet)

Large Spills: 100 meters (300 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

DO NOT wash into sewer.

**1,2-Dihydroxybenzene** is moderately to highly toxic to aquatic organisms.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	<i>Phenolic</i> odor
<b>Flash Point:</b>	260°F (127°C)
<b>Auto Ignition Temp:</b>	950°F (510°C)
<b>Vapor Density:</b>	3.8 (air = 1)
<b>Vapor Pressure:</b>	5 mm Hg at 219°F (104°C)
<b>Specific Gravity:</b>	1.34 (water = 1)
<b>Water Solubility:</b>	Slightly soluble
<b>Boiling Point:</b>	473°F (245°C)
<b>Melting Point:</b>	221°F (105°C)
<b>Ionization Potential:</b>	8.15 +/- 1.0 eV
<b>Molecular Weight:</b>	110

## EXPOSURE LIMITS

**NIOSH:** 5 ppm, 10-hr TWA

**ACGIH:** 5 ppm, 8-hr TWA

The Protective Action Criteria values are:

PAC-1 = 5 ppm

PAC-2 = 7.5 ppm

PAC-3 = 20 ppm

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl and Viton (>8-hr breakthrough for <i>aromatic Phenols</i> )
<b>Coveralls:</b>	Tychem® BR, LV, Responder® and TK (>8-hr breakthrough for <i>aromatic Phenols</i> )
<b>Respirator:</b>	>5 ppm -Supplied air or SCBA

## HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns
<b>Inhalation:</b>	Nose and throat irritation with coughing and wheezing Dizziness, nausea, vomiting and convulsions Methemoglobinemia with headache, fatigue and blue color to the skin and lips
<b>Chronic:</b>	Cancer (stomach) in animals

## FIRST AID AND DECONTAMINATION

<b>Remove</b>	the person from exposure.
<b>Flush</b>	eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention.
<b>Quickly</b>	remove contaminated clothing and wash contaminated skin with large amounts of water.
<b>Begin</b>	artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b>	promptly to a medical facility.

Common Name: **DIMEFOX**

Synonyms: Bis(Dimethylamido)Fluorophosphate; DMF

CAS No: 115-26-4

 Molecular Formula: C<sub>4</sub>H<sub>12</sub>FN<sub>2</sub>OP

RTK Substance No: 2342

Description: Colorless liquid with a fishy odor

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b> DOT#: None ERG Guide #: 152 Hazard Class: 6.1 (Toxic)	<b>Dimefox</b> may burn, but does not readily ignite. Use dry chemical, CO <sub>2</sub> or water spray as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Phosphine</i> . CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool.	<b>Dimefox</b> can form highly toxic and flammable <i>Phosphine gas</i> in the presence of REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES). <b>Dimefox</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE). <b>Dimefox</b> is corrosive to METALS.

## SPILL/LEAKS

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers for disposal.

DO NOT wash into sewer.

**Dimefox** may pollute waterways.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Fishy odor
<b>Flash Point:</b>	May burn
<b>Vapor Pressure:</b>	0.36 mm Hg at 77°F (25°C)
<b>Specific Gravity:</b>	1.1 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	187°F (86°C)
<b>Molecular Weight:</b>	154.1

## EXPOSURE LIMITS

**IDLH:** 1 mg/m<sup>3</sup>

The Protective Action Criteria values are:

 PAC-1 = 0.6 mg/m<sup>3</sup>

 PAC-2 = 1 mg/m<sup>3</sup>

 PAC-3 = 1 mg/m<sup>3</sup>

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Neoprene and Silver Shield®/4H® (>8-hr breakthrough for <i>Organo-phosphorus compounds</i> )
<b>Coveralls:</b>	Tychem® BR, LV, Responder® and TK (>8-hr breakthrough for <i>Organo-phosphorus compounds</i> )
<b>Respirator:</b>	SCBA

## HEALTH EFFECTS

<b>Eyes:</b>	No information
<b>Skin:</b>	No information
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, wheezing and shortness of breath  Headache, sweating, nausea and vomiting, loss of coordination, and death ( <i>Organophosphate poisoning</i> )

## FIRST AID AND DECONTAMINATION

<b>Remove</b>	the person from exposure.
<b>Flush</b>	eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
<b>Quickly</b>	remove contaminated clothing and wash contaminated skin with large amounts of water. Seek medical attention immediately.
<b>Shampoo</b>	hair immediately if contaminated.
<b>Begin</b>	artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b>	promptly to a medical facility.

Common Name: **3,3'-DIMETHOXYBENZIDINE**

Synonyms: o-Dianisidine; 3,3'-Dianisidine

CAS No: 119-90-4

Molecular Formula: C<sub>14</sub>H<sub>16</sub>N<sub>2</sub>O<sub>2</sub>

RTK Substance No: 0734

Description: Colorless, crystalline solid

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 2431 ERG Guide #: 153 Hazard Class: 6.1 (Poison)	<b>3,3'-Dimethoxybenzidine</b> may burn, but does not readily ignite. Use dry chemical, CO <sub>2</sub> , or water spray as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> .	<b>3,3'-Dimethoxybenzidine</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE). Protect from LIGHT, HEAT and AIR.

### SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

### PHYSICAL PROPERTIES

**Flash Point:** 403°F (206°C)

**Vapor Density:** 8.5 (air = 1)

**Vapor Pressure:** 8.8 x 10<sup>-9</sup> mm Hg at 77°F (25°C)

**Water Solubility:** Very slightly soluble

**Melting Point:** 279°F (137°C)

**Molecular Weight:** 244.3

### EXPOSURE LIMITS

No occupational exposure limits have been established for **3,3'-Dimethoxybenzidine**.

The Protective Action Criteria values are:

PAC-1 = 4 mg/m<sup>3</sup>

PAC-2 = 25 mg/m<sup>3</sup>

PAC-3 = 400 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

**Gloves:** Nitrile and Natural Rubber

**Coveralls:** Tyvek®

**Respirator:** Full facepiece APR with P100 filters  
>4 mg/m<sup>3</sup> - SCBA

### HEALTH EFFECTS

**Eyes:** Irritation

**Skin:** Irritation, rash, redness and itching

**Inhalation:** Nose and throat irritation

**Chronic:** Cancer (bladder, intestines, skin) in animals

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Chemical Name: **DIMETHYLAMINOETHANOL**

Synonym: Dimethylethanolamine

CAS No: 108-01-0

Molecular Formula: C<sub>4</sub>H<sub>11</sub>NO

RTK Substance No: 3111

Description: Colorless, corrosive, combustible liquid with a strong fishy odor.

**NFPA RATINGS**

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>2 - Fire</b> <b>0 - Reactivity</b>  <b>DOT#:</b> UN 2051 <b>ERG Guide#:</b> 132 <b>Hazard Class:</b> 8.3 (Corrosive)	<ul style="list-style-type: none"> <li>- Combustible</li> <li>- Use dry chemical, CO<sub>2</sub>, or alcohol-resistant foam, as water may not be effective in fighting fires.</li> <li>- POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i>.</li> <li>- May flash back</li> <li>- Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.</li> </ul>	<ul style="list-style-type: none"> <li>- <b>Dimethylaminoethanol</b> reacts violently with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); ACID CHLORIDES; OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); and ISOCYANATES.</li> <li>- <b>Dimethylaminoethanol</b> is not compatible with CELLULOSE NITRATE; ZINC ALLOYS; GALVANIZED IRON; COPPER and COPPER ALLOYS; NITROGEN COMPOUNDS; ACRYLATES; ALCOHOLS; ALDEHYDES; KETONES; HALOGENATED COMPOUNDS; and GLYCOLS.</li> </ul>

**DOT ERG**

**Isolation Distance:** 60 meters (200 feet) for toxic, corrosive, organic liquids.

- Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in non-metallic sealed containers.

**PHYSICAL PROPERTIES**

**Odor Threshold:** No Information  
**Flash Point:** 105°F (41°C)  
**LEL:** 1.6  
**UEL:** 11.9  
**Vapor Density:** 3.1 (air = 1)  
**Vapor Pressure:** 4 mm Hg at 68°F (20°C)  
**Water Solubility:** Soluble  
**Boiling Point:** 272°F (133°C)  
**Ionization Potential:** No Information

**EXPOSURE LIMITS**

**OSHA:** N/A  
**NIOSH:** N/A  
**ACGIH:** N/A  
**IDLH LEVEL:** N/A

**PROTECTIVE EQUIPMENT**

**Gloves:** Butyl, Nitrile, Polyvinyl Alcohol, Viton®  
**Coverall:** No Information  
**Boot:** Butyl  
**Respirator:** Supplied Air

**HEALTH EFFECTS**

**Eyes:** Irritation, burning  
**Skin:** Irritation, skin burns  
**Acute:** Nose, throat and lung Irritation, pulmonary edema, headache  
**Chronic:** Cancer – Not tested.  
 Symptoms of asthma – cough, wheezing, shortness of breath. May affect the nervous system.

**FIRST AID AND DECONTAMINATION**

- Remove the person from exposure.
- Flush eyes with large amount of water for at least 30 minutes. Remove contact lenses if worn.
- Remove contaminated clothing and wash contaminated skin with water.
- Begin artificial respiration if breathing has stopped and CPR if necessary.
- Transfer to a medical facility.
- Observation is recommended as symptoms may be delayed.

Common Name: **DIMETHYLANILINE**

Synonyms: N,N-Dimethylaminobenzene; Dimethylphenylamine

CAS No: 121-69-7

Molecular Formula: C<sub>8</sub>H<sub>11</sub>N

RTK Substance No: 0741

Description: Yellow to brownish, oily liquid with a fish-like odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>2 - Fire</b> <b>0 - Reactivity</b> <b>DOT#:</b> UN 2253 <b>ERG Guide #:</b> 153 <b>Hazard Class:</b> 6.1 (Poison)	COMBUSTIBLE LIQUID Use dry chemical, CO <sub>2</sub> , water spray or alcohol-resistant foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> and <i>Aniline</i> . CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool. <b>Dimethylaniline</b> , when heated, may form an ignitable vapor/air mixture in closed tanks or containers.	<b>Dimethylaniline</b> reacts explosively with DIISOPROPYL PEROXYDICARBONATE; BENZOYL PEROXIDE; and OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE). <b>Dimethylaniline</b> may react with METALS to release flammable and explosive <i>Hydrogen gas</i> . <b>Dimethylaniline</b> is not compatible with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); ACID CHLORIDES; ACID ANHYDRIDES; and CHLOROFORMATES.

### SPILL/LEAKS

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in dry sand, earth, or a similar material and place into sealed containers for disposal.

Use only non-sparking tools and equipment, especially when opening and closing containers of **Dimethylaniline**.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	0.013 ppm
<b>Flash Point:</b>	145°F (63°C)
<b>LEL:</b>	1%
<b>UEL:</b>	7%
<b>Auto Ignition Temp:</b>	700°F (371°C)
<b>Vapor Density:</b>	4.2 (air = 1)
<b>Vapor Pressure:</b>	1 mm Hg at 85°F (29.4°C)
<b>Specific Gravity:</b>	0.95 (water = 1)
<b>Water Solubility:</b>	Slightly soluble
<b>Boiling Point:</b>	379°F (193°C)
<b>Melting Point:</b>	36.4°F (2.5°C)
<b>Ionization Potential:</b>	7.14 eV
<b>Molecular Weight:</b>	121.2

### EXPOSURE LIMITS

**OSHA:** 5 ppm, 8-hr TWA

**NIOSH:** 5 ppm, 10-hr TWA; 10 ppm STEL

**ACGIH:** 5 ppm, 8-hr TWA; 10 ppm STEL

**IDLH:** 100 ppm

The Protective Action Criteria values are:

PAC-1 = 10 ppm   PAC-2 = 10 ppm   PAC-3 = 100 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	SilverShield®/4H® (>4-hr breakthrough)
<b>Coveralls:</b>	Tychem® BR, Responder® and TK (>8-hr breakthrough)
<b>Respirator:</b>	>5 ppm - Supplied air >50 ppm - SCBA

### HEALTH EFFECTS

**Eyes:** Irritation

**Skin:** Irritation

**Inhalation:** Headache, fatigue and blue color to the skin and lips (methemoglobinemia)

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **3,3'-DIMETHYLBENZIDINE**

Synonyms: o-Toluidine

CAS No: 119-93-7

 Molecular Formula: C<sub>14</sub>H<sub>16</sub>N<sub>2</sub>

RTK Substance No: 0742

Description: White to reddish crystal or powder

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 2811 ERG Guide #: 154 Hazard Class: 6.1 (Poison)	<b>3,3'-Dimethylbenzidine</b> may burn, but does not readily ignite. Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE. Use water spray to keep fire-exposed containers cool.	<b>3,3'-Dimethylbenzidine</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).

## SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

## PHYSICAL PROPERTIES

**Flash Point:** 471°F (244°C)

**Auto Ignition Temp:** 979°F (526°C)

**Specific Gravity:** 1 (water = 1)

**Water Solubility:** Very slightly soluble

**Boiling Point:** 392°F (200°C)

**Melting Point:** 264° to 270°F (129° to 132°C)

**Molecular Weight:** 212.3

## EXPOSURE LIMITS

**NIOSH:** 0.02 mg/m<sup>3</sup>, 60-minute Ceiling

The Protective Action Criteria values are:

 PAC-1 = 0.3 mg/m<sup>3</sup>

 PAC-2 = 2 mg/m<sup>3</sup>

 PAC-3 = 100 mg/m<sup>3</sup>

## PROTECTIVE EQUIPMENT

**Gloves:** Nitrile and Natural Rubber

**Coveralls:** Tyvek®

**Respirator:** Full facepiece APR with *P100 filters*  
 >0.2 mg/m<sup>3</sup> - SCBA

## HEALTH EFFECTS

**Eyes:** Irritation

**Skin:** No information

**Inhalation:** Nose and throat irritation with coughing and wheezing.

**Chronic:** Cancer (liver, bladder, mammary gland) in animals

## FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

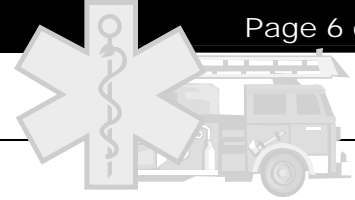
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Remove** contaminated clothing and wash contaminated skin with soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.





Common Name: **2,3-DIMETHYLBUTANE**

Synonyms: Diisopropyl

CAS No: 79-29-8

Molecular Formula: C<sub>6</sub>H<sub>14</sub>

RTK Substance No: 0744

Description: Clear, colorless liquid

HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>1 - Health</b></p> <p><b>3 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p><b>DOT#:</b> UN 2457</p> <p><b>ERG Guide #:</b> 128</p> <p><b>Hazard Class:</b> 3 (Flammable)</p>	<p>Use dry chemical, CO<sub>2</sub>, alcohol-resistant foam or other foaming agent as extinguishing agents. Water may not be effective in fighting fires. POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE.</p> <p>Use water spray to keep fire-exposed containers cool. Vapors may travel to a source of ignition and flash back.</p> <p>Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.</p>	<p><b>2,3-Dimethylbutane</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).</p>

SPILL/LEAKS

**Isolation Distance:**

Small Spills: 50 meters (150 feet)

Large Spills: 300 meters (1,000 feet)

Fire: 800 meters (1/2 mile)

Cover with an activated carbon adsorbent and place in covered containers for disposal.

May be harmful to animal and plant life.

PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	65 to 248 ppm
<b>Flash Point:</b>	-20°F (-29°C)
<b>LEL:</b>	1.2%
<b>UEL:</b>	7.0%
<b>Vapor Density:</b>	3 (air = 1)
<b>Vapor Pressure:</b>	200 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	0.65 - 0.66 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	122° to 145°F (50° to 63°C)
<b>Molecular Weight:</b>	86.2

EXPOSURE LIMITS

**OSHA:** None

**NIOSH:** 100 ppm, 10-hr TWA; 510 ppm, 15-min Ceiling

**ACGIH:** 500 ppm, 8-hr TWA; 1,000 ppm, 15-min STEL

**IDLH:** 1,100 ppm (as *Hexane*)

PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Viton, Nitrile or Silver Shield®/4H® (>8-hr breakthrough)
<b>Coveralls:</b>	DuPont Tychem® CPF 3, CPF 4, BR and LV, Responder®, TK; Kappler Zytron® 300; and Saint-Gobain ONESuit®/TEC or equivalent (>8-hr breakthrough)
<b>Respirator:</b>	>100 ppm - Supplied air

HEALTH EFFECTS

**Eyes:** Irritation

**Skin:** Irritation

**Inhalation:** Nose, throat and lungs  
Headache, nausea, dizziness and lightheadedness

FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** to a medical facility.

Common Name: **DIMETHYLCARBAMOYL CHLORIDE**

Synonyms: DMCC; Chloroformic Acid Dimethylamide

CAS No: 79-44-7

Molecular Formula: C<sub>3</sub>H<sub>6</sub>ClNO

RTK Substance No: 0746

Description: Clear, colorless liquid with an unpleasant odor

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>2 - Fire</b> <b>1 - Reactivity</b>  <b>DOT#:</b> UN 2262 <b>ERG Guide #:</b> 156 <b>Hazard Class:</b> 8 (Corrosive)	<p><b>Dimethylcarbamoyl Chloride</b> is a COMBUSTIBLE LIQUID.</p> <p>Use dry chemical, CO<sub>2</sub>, alcohol-resistant foam or other foam extinguishing agents.</p> <p>DO NOT USE WATER.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Hydrogen Chloride</i> and <i>Nitrogen Oxides</i>.</p> <p>CONTAINERS MAY EXPLODE IN FIRE.</p> <p>Use water spray only to keep fire-exposed containers cool as water will decompose <b>Dimethylcarbamoyl Chloride</b> to form toxic <i>Hydrogen Chloride</i> and <i>Dimethylamine</i>.</p>	<p><b>Dimethylcarbamoyl Chloride</b> will react with WATER, STEAM and MOISTURE to produce toxic <i>Hydrogen Chloride</i> and <i>Dimethylamine</i>.</p> <p><b>Dimethylcarbamoyl Chloride</b> reacts vigorously or explosively if mixed with DIISOPROPYL ETHER or other ETHERS in the presence of small amounts of METAL SALTS.</p> <p><b>Dimethylcarbamoyl Chloride</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); ALCOHOLS; STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); and AMINES.</p>

**SPILL/LEAKS**

**Isolation Distance:**

Small Spill: 60 meters (200 feet)

Large Spill: 270 meters (900 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.

DO NOT USE WATER OR WET METHOD.

DO NOT wash into sewer.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	Unpleasant odor
<b>Flash Point:</b>	155°F (68°C)
<b>Vapor Density:</b>	3.7 (air = 1)
<b>Vapor Pressure:</b>	2.5 mm Hg at 77°F (25°C)
<b>Specific Gravity:</b>	1.2 (water = 1)
<b>Water Solubility:</b>	Reactive/Decomposes
<b>Boiling Point:</b>	329° to 333°F (165° to 167°C)
<b>Melting Point:</b>	-27°F (-33°C)
<b>Molecular Weight:</b>	107.6

**EXPOSURE LIMITS**

**OSHA:** None

**NIOSH:** Lowest feasible concentration

**ACGIH:** 0.005 ppm, 8-hr TWA

**IDLH:** None

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Silver Shield®/4H®
<b>Coveralls:</b>	DuPont Tychem® CSM, Responder®, and TK (for <i>known carcinogens</i> )
<b>Respirator:</b>	>0.005 ppm - Supplied air

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, wheezing and shortness of breath
	Headache, nausea and vomiting
<b>Chronic:</b>	Cancer (nose and skin) in animals

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention immediately.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **DIMETHYLFORMAMIDE**

Synonyms: DMF; Formyldimethylamine; N,N-Dimethylformamide

CAS No: 68-12-2

Molecular Formula: C<sub>3</sub>H<sub>7</sub>NO

RTK Substance No: 0759

Description: Colorless to pale yellow liquid with a fishy or *Ammonia*-like odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>2 - Fire</b> <b>0 - Reactivity</b> <b>DOT#:</b> UN 2265 <b>ERG Guide #:</b> 129 <b>Hazard Class:</b> 3 (Flammable)	<b>COMBUSTIBLE LIQUID</b> Use dry chemical, CO <sub>2</sub> , water spray or alcohol-resistant foam as extinguishing agents. <b>POISONOUS GASES ARE PRODUCED IN FIRE,</b> including <i>Nitrogen</i> . Use water spray to keep fire-exposed containers cool.	<b>Dimethylformamide</b> reacts violently with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); ALKALI METALS (such as LITHIUM, SODIUM and POTASSIUM); and CARBON TETRACHLORIDE and other CHLORINATED HYDROCARBONS in the presence of IRON. <b>Dimethylformamide</b> is not compatible with ALKYL ALUMINUM COMPOUNDS (such as TRIETHYLALUMINUM) and <i>inorganic</i> NITRATES.

### SPILL/LEAKS

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in dry sand, earth, or a similar material and place into sealed containers for disposal.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	0.47 ppm to 100 ppm
<b>Flash Point:</b>	136°F (58°C)
<b>LEL:</b>	2.2%
<b>UEL:</b>	15.2%
<b>Auto Ignition Temp:</b>	883°F (473°C)
<b>Vapor Density:</b>	2.5 (air = 1)
<b>Vapor Pressure:</b>	4 mm Hg at 77°F (25°C)
<b>Specific Gravity:</b>	0.95 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	307°F (153°C)
<b>Freezing Point:</b>	-78°F (-61°C)
<b>Critical Temp:</b>	653°F (345°C)
<b>Ionization Potential:</b>	9.12 eV
<b>Molecular Weight:</b>	73.09

### EXPOSURE LIMITS

<b>OSHA:</b>	10 ppm, 8-hr TWA
<b>NIOSH:</b>	10 ppm, 10-hr TWA
<b>ACGIH:</b>	10 ppm, 8-hr TWA
<b>IDLH:</b>	500 ppm

The Protective Action Criteria values are:

PAC-1 = 2 ppm    PAC-2 = 91 ppm    PAC-3 = 530 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Barrier® (>8-hr breakthrough)
<b>Coveralls:</b>	Tychem® BR, CSM and TK (>8-hr breakthrough)
<b>Respirator:</b>	SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose and throat irritation with coughing and wheezing Headache, dizziness, nausea and vomiting

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.  
**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** promptly to a medical facility.

Common Name: **1,2-DIMETHYLHYDRAZINE**

Synonyms: N,N'-Dimethylhydrazine; SDMH

CAS No: 540-73-8

Molecular Formula: C<sub>2</sub>H<sub>8</sub>N<sub>2</sub>

RTK Substance No: 1008

Description: Clear, colorless liquid, with a strong, *Ammonia*-like odor, that turns yellow and fumes in air

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>3 - Fire</b> <b>1 - Reactivity</b> DOT#: UN 2382 ERG Guide #: 131 Hazard Class: 6.1 (Poison)	<b>FLAMMABLE AND CORROSIVE</b> Use dry chemical, CO <sub>2</sub> , water in flooding quantities or alcohol-resistant foam as extinguishing agents. <b>1,2-Dimethylhydrazine</b> may re-ignite if not diluted with water. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> . Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source and flashback. Flow or agitation may generate electrostatic charges.	Contact with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); and METALLIC OXIDES (such as COPPER OXIDES, LEAD OXIDES and IRON OXIDES) may result in fires and explosions. <b>1,2-Dimethylhydrazine</b> is not compatible with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) and STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE). Protect from AIR and LIGHT.

### SPILL/LEAKS

**Isolation Distance:**

Small Spill: 30 meters (100 feet)

Large Spill: 100 meters (300 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in dry sand, earth, or a noncombustible material and place into sealed containers for disposal.

Use only non-sparking tools and equipment.

Metal containers involving the transfer of

**1,2-Dimethylhydrazine** should be grounded and bonded.

Keep **1,2-Dimethylhydrazine** out of confined spaces, such as sewers, because of the possibility of an explosion.

### PHYSICAL PROPERTIES

<b>Flash Point:</b>	5 °F (-15 °C)
<b>LEL:</b>	2% (for <i>1,1-Dimethylhydrazine</i> )
<b>UEL:</b>	95% (for <i>1,1-Dimethylhydrazine</i> )
<b>Vapor Density:</b>	0.76 (air = 1)
<b>Specific Gravity:</b>	0.83 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	178 °F (81 °C)
<b>Melting Point:</b>	160 °F (-9 °C)
<b>Molecular Weight:</b>	60.12

### EXPOSURE LIMITS

**ACGIH:** 0.01 ppm, 8-hr TWA  
(as *1,1-Dimethylhydrazine*)

The Protective Action Criteria values are:

PAC-1 = 1.5 ppm    PAC-2 = 3 ppm    PAC-3 = 11 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl (>8-hr breakthrough for <i>Dimethylhydrazine</i> )
<b>Coveralls:</b>	Tychem® BR, CSM and TK; Trelchem® HPS and VPS (>8-hr breakthrough for <i>Dimethylhydrazine</i> )
<b>Respirator:</b>	SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation, burns and possible eye damage
<b>Skin:</b>	Severe irritation and burns
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, and severe shortness of breath (pulmonary edema)  Headache, dizziness, lightheadedness, and passing out
<b>Chronic:</b>	Cancer (blood vessels, intestines, liver) in animals

### FIRST AID AND DECONTAMINATION

<b>Remove</b> the person from exposure.
<b>Flush</b> eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention immediately.
<b>Quickly</b> remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention.
<b>Begin</b> artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b> promptly to a medical facility.
<b>Medical</b> observation is recommended as symptoms may be delayed.

Common Name: **DIMETHYL MERCURY**

Synonyms: None  
 CAS No: 593-74-8  
 Molecular Formula: C<sub>2</sub>H<sub>6</sub>Hg  
 RTK Substance No: 0763  
 Description: Colorless liquid

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>3 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 2024 ERG Guide #: 151 Hazard Class: 6.1 (Poison)	<b>Dimethyl Mercury</b> is a FLAMMABLE LIQUID. Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Mercury vapors</i> . CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool. Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.	<b>Dimethyl Mercury</b> reacts with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) to cause a fire hazard.

## SPILL/LEAKS

**Isolation Distance:**

Small Spills: 60 meters (200 feet)

Large Spills: 270 meters (900 feet)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.

DO NOT wash into sewer.

DO NOT let this substance enter the environment as it bioaccumulates.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	No information
<b>Flash Point:</b>	41°F (5°C)
<b>Vapor Density:</b>	7.9 (air = 1)
<b>Vapor Pressure:</b>	50 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	3 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	204°F (96°C)
<b>Melting Point:</b>	-45.4°F (-43°C)
<b>Molecular Weight:</b>	230.7

## EXPOSURE LIMITS

<b>OSHA:</b>	0.01 mg/m <sup>3</sup> , 8-hr TWA; 0.04 mg/m <sup>3</sup> , STEL
<b>NIOSH:</b>	0.01 mg/m <sup>3</sup> , 10-hr TWA; 0.03 mg/m <sup>3</sup> , STEL
<b>ACGIH:</b>	0.01 mg/m <sup>3</sup> , 8-hr TWA; 0.03 mg/m <sup>3</sup> , STEL
<b>IDLH:</b>	2 mg/m <sup>3</sup>

(All the above are as Mercury)

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	4-H/Silver Shield® (60-minutes breakthrough)
<b>Coveralls:</b>	DuPont Tychem® Responder®, CSM and TK for toxic and corrosive chemical vapors
<b>Boots:</b>	No information
<b>Respirator:</b>	>0.01 mg/m <sup>3</sup> - Supplied air

## HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns
<b>Acute:</b>	Irritation of the nose, throat and lungs with coughing, wheezing and/or shortness of breath
<b>Chronic:</b>	Carcinogen (kidney) in animals Several <i>Methyl Mercury compounds</i> are known teratogens Sore gums, tingling or "pins and needles" feeling in fingers, irritability and weakness, slurred speech and metallic taste

## FIRST AID AND DECONTAMINATION

<b>Remove</b>	the person from exposure.
<b>Flush</b>	eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
<b>Remove</b>	contaminated clothing and wash contaminated skin with large amounts of soap and water.
<b>Begin</b>	artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b>	to a medical facility.

Common Name: **2,3-DIMETHYLPENTANE**

Synonyms: 3,4 Dimethylpentane

CAS No: 565-59-3

 Molecular Formula: C<sub>7</sub>H<sub>16</sub>

RTK Substance No: 4147

Description: Colorless liquid with a gasoline odor

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>3 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 1206 ERG Guide #: 128 Hazard Class: 3 (Flammable)	FLAMMABLE LIQUID Use dry chemical, CO <sub>2</sub> , alcohol-resistant foam or other foam extinguishing agents, as water may not be effective in fighting fires. POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool. Vapors may travel to a source of ignition and flash back. Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source. Electrostatic discharges may be generated resulting in ignition or explosion.	<b>2,3-Dimethylpentane</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).

**SPILL/LEAKS**
**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers for disposal.

 Keep **2,3-Dimethylpentane** out of confined spaces, such as sewers, because of the possibility of an explosion.

DO NOT wash into sewer.

**PHYSICAL PROPERTIES**

<b>Flash Point:</b>	<20°F (-7°C)
<b>LEL:</b>	1.1%
<b>UEL:</b>	6.7%
<b>Auto Ignition Temp:</b>	635°F (335°C)
<b>Vapor Density:</b>	3.5 (air = 1)
<b>Vapor Pressure:</b>	48 mm Hg at 77°F (25°C)
<b>Specific Gravity:</b>	0.7 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	194°F (90°C)
<b>Molecular Weight:</b>	94.2

**EXPOSURE LIMITS**
**ACGIH:** 400 ppm, 8-hr TWA; 500 ppm, STEL

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Nitrile, Polyvinyl Alcohol, Silver Shield®/4H®, Viton and Barrier® (>8-hr breakthrough for <i>n-Heptane</i> )
<b>Coveralls:</b>	Tychem® CPF 3, BR, LV, Responder®, and TK; Zytron® 300; ONESuit®TEC; and Trelchem® fabrics (>8-hr breakthrough for <i>n-Hexane</i> and <i>n-Heptane</i> )
<b>Respirator:</b>	>400 ppm - Supplied air or SCBA

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose and throat irritation Headache, dizziness, lack of coordination, nausea and vomiting

**FIRST AID AND DECONTAMINATION**

<b>Remove</b>	the person from exposure.
<b>Flush</b>	eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
<b>Remove</b>	contaminated clothing and wash contaminated skin with soap and water.
<b>Begin</b>	artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b>	promptly to a medical facility



Common Name: **2,4-DIMETHYLPHENOL**

Synonym: m-Xylenol

CAS No: 105-67-9

 Molecular Formula: C<sub>8</sub>H<sub>10</sub>O

RTK Substance No: 0764

Description: Colorless, crystalline solid or yellow-brown liquid

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b>  DOT#: UN 2261 ERG Guide #: 153 Hazard Class: 6.1 (Poison)	<b>2,4-Dimethylphenol</b> is a COMBUSTIBLE LIQUID or SOLID.  Use dry chemical, water spray or foam as extinguishing agents.  POISONOUS GASES ARE PRODUCED IN FIRE.  Use water spray to keep fire-exposed containers cool.  <b>2,4-Dimethylphenol</b> can be ignited by static discharge or sparks.	<b>2,4-Dimethylphenol</b> may react violently with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) resulting in fires.  <b>2,4-Dimethylphenol</b> is not compatible with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); ACID CHLORIDES; ACID ANHYDRIDES; and AMMONIA.

**SPILL/LEAKS**
**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers for disposal.

Collect solid material in the most convenient and safe manner and place into sealed containers for disposal.

DO NOT wash into sewer.

**2,4-Dimethylphenol** is toxic to aquatic organisms and may bioaccumulate.

**PHYSICAL PROPERTIES**

<b>Flash Point:</b>	>230°F (>110°C)
<b>LEL:</b>	1.1%
<b>UEL:</b>	6.4%
<b>Auto Ignition Temp:</b>	1,110°F (599°C)
<b>Vapor Pressure:</b>	0.062 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	0.97 (water = 1)
<b>Water Solubility:</b>	Very slightly soluble
<b>Boiling Point:</b>	413°F (212°C)
<b>Melting Point:</b>	78° to 79°F (25° to 26°C)
<b>Ionization Potential:</b>	8 +/- 0.2 eV
<b>Molecular Weight:</b>	122.2

**EXPOSURE LIMITS**

The Protective Action Criteria values are:

 PAC-1 = 1 mg/m<sup>3</sup>

 PAC-2 = 6 mg/m<sup>3</sup>

 PAC-3 = 500 mg/m<sup>3</sup>
**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Butyl, Nitrile and Viton (>8-hr breakthrough for <i>aromatic Phenols</i> )
<b>Coveralls:</b>	Tychem® BR, LV, Responder® and TK (>8-hr breakthrough for <i>aromatic Phenols</i> )
<b>Respirator:</b>	>1 mg/m <sup>3</sup> - Supplied air or SCBA

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, wheezing and shortness of breath  Headache, nausea and vomiting

**FIRST AID AND DECONTAMINATION**

<b>Remove</b> the person from exposure.
<b>Flush</b> eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.
<b>Quickly</b> remove contaminated clothing and wash contaminated skin with large amounts of soap and water.
<b>Begin</b> artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b> promptly to a medical facility.

Common Name: **DIMETHYL SULFATE**

Synonyms: DMS; Methyl Sulfate; Sulfuric Acid, Dimethyl Ester

CAS No: 77-78-1

Molecular Formula: C<sub>2</sub>H<sub>6</sub>O<sub>4</sub>S

RTK Substance No: 0768

Description: Colorless, oily liquid with a faint onion-like odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>4 - Health</b></p> <p><b>2 - Fire</b></p> <p><b>1 - Reactivity</b></p> <p><b>DOT#:</b> UN 1595</p> <p><b>ERG Guide #:</b> 156</p> <p><b>Hazard Class:</b> 6.1 (Poison)</p>	<p><b>Dimethyl Sulfate</b> is a COMBUSTIBLE LIQUID. Use dry chemical, CO<sub>2</sub>, water spray or foam as extinguishing agents.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Sulfur Oxides</i>.</p> <p>Use water spray to keep fire-exposed containers cool and to reduce vapors.</p> <p><b>Dimethyl Sulfate</b> may form an ignitable vapor/air mixture in closed tanks or containers at temperatures above 182°F (83°C).</p>	<p><b>Dimethyl Sulfate</b> reacts violently with concentrated AMMONIA and ignites on contact with BARIUM CHLORIDE.</p> <p><b>Dimethyl Sulfate</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); and SODIUM AZIDE.</p> <p><b>Dimethyl Sulfate</b> decomposes in WATER and MOIST AIR to form corrosive <i>Sulfuric Acid</i>.</p>

### SPILL/LEAKS

**Isolation Distance:**

Small Spill: 30 meters (100 feet)

Large Spill: 60 meters (200 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in dry sand, earth, or a similar material and place into sealed containers for disposal.

**Dimethyl Sulfate** can be neutralized using dilute (<10%) *Ammonia*.

**Dimethyl Sulfate** is harmful to aquatic organisms.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Onion-like
<b>Flash Point:</b>	182°F (83°C)
<b>Auto Ignition Temp:</b>	370°F (188°C)
<b>Vapor Density:</b>	4.35 (air = 1)
<b>Vapor Pressure:</b>	0.1 to 0.5 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.3 (water = 1)
<b>Water Solubility:</b>	Slightly soluble
<b>Boiling Point:</b>	370°F (188°C)
<b>Freezing Point:</b>	-25°F (-32°C)
<b>Molecular Weight:</b>	126.1

### EXPOSURE LIMITS

**OSHA:** 1 ppm, 8-hr TWA

**NIOSH:** 0.1 ppm, 10-hr TWA

**ACGIH:** 0.1 ppm, 8-hr TWA

**IDLH:** 7 ppm

The Protective Action Criteria values are:

PAC-1 = 0.024 ppm; PAC-2 = 0.12 ppm;

PAC-3 = 1.6 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Neoprene, Viton/Butyl and SilverShield®/4H® (>4-hr breakthrough)
<b>Coveralls:</b>	Tychem® SL, C3, TF, BR, TK, and Responder (>8-hr breakthrough)
<b>Respirator:</b>	>0.1 ppm – Pressure demand supplied air >7 ppm – Pressure demand SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Severe irritation and burns
<b>Skin:</b>	Irritation, burns, itching and ulcers (skin absorbable)
<b>Inhalation:</b>	Nose, throat and lung irritation, with coughing and severe shortness of breath (pulmonary edema)  Headache, dizziness, nausea, vomiting and coma
<b>Chronic:</b>	Cancer (nasal cavity and brain) in animals

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention immediately.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

**Medical** observation is recommended as symptoms may be delayed.

Common Name: **2,4 DINITROTOLUENE**

Synonyms: 2,4-DNT; 2,4-Dinitrotoluol

CAS No: 121-14-2

Molecular Formula: C<sub>6</sub>H<sub>3</sub>CH<sub>3</sub>(NO<sub>2</sub>)<sub>2</sub>

RTK Substance No: 0783

Description: Orange-yellow, crystalline solid often shipped in a molten state

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>1 - Fire</b> <b>3 - Reactivity</b> <b>DOT#:</b> UN 2038 <b>ERG Guide #:</b> 152 <b>Hazard Class:</b> 6.1 (Poison)	<p><b>2,4-Dinitrotoluene</b> is REACTIVE and a DANGEROUS EXPLOSION HAZARD.</p> <p><b>2,4-Dinitrotoluene</b> may burn, but does not readily ignite.</p> <p>Use dry chemical, CO<sub>2</sub>, water spray, alcohol-resistant foam or other foam as extinguishing agents.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i>.</p> <p>CONTAINERS MAY EXPLODE IN FIRE.</p> <p>Use water spray to keep fire-exposed containers cool.</p>	<p><b>2,4-Dinitrotoluene</b> becomes explosive when exposed to PRESSURE and HIGH TEMPERATURES.</p> <p><b>2,4-Dinitrotoluene</b> reacts with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); TIN; ZINC; and REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES) to cause fires and/or explosions.</p>

SPILL/LEAKS
<p><b>Isolation Distance:</b></p> <p>Spill: 25 meters (75 feet) for solid 50 meters (150 feet) for molten</p> <p>Cover <i>liquid</i> spill with dry sand, earth, or a similar material and place into sealed containers for disposal. Moisten spilled <i>solid</i> material first and place into sealed containers for disposal.</p>

PHYSICAL PROPERTIES	
<b>Odor Threshold:</b>	Slight odor
<b>Flash Point:</b>	404°F (207°C)
<b>LEL:</b>	1.4%
<b>Vapor Density:</b>	6.27 (air = 1)
<b>Vapor Pressure:</b>	1 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.3 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	572°F (300°C)
<b>Melting Point:</b>	153° to 158°F (67° to 70°C)
<b>Molecular Weight:</b>	182.13

EXPOSURE LIMITS	
<b>OSHA:</b>	1.5 mg/m <sup>3</sup> , 8-hr TWA
<b>NIOSH:</b>	1.5 mg/m <sup>3</sup> , 10-hr TWA
<b>ACGIH:</b>	0.2 mg/m <sup>3</sup> , 8-hr TWA
<b>IDLH:</b>	50 mg/m <sup>3</sup>
(All of the above are for <i>Dinitrotoluene</i> )	
The Protective Action Criteria values are:	
PAC-1 = 7.5 mg/m <sup>3</sup>	PAC-2 = 50 mg/m <sup>3</sup>
PAC-3 = 50 mg/m <sup>3</sup>	

PROTECTIVE EQUIPMENT	
<b>Gloves:</b>	Butyl (>8-hr breakthrough for <b>2,4-Dinitrotoluene</b> in 30% to 70% solution)
<b>Coveralls:</b>	Tyvek® ( <i>solid 2,4-Dinitrotoluene</i> ); Tychem® BR, CSM and TK; Trelchem® HPS and VPS (>8-hr breakthrough for <i>Nitro compounds, unsubstituted</i> )
<b>Respirator:</b>	SCBA

HEALTH EFFECTS	
<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns (skin absorbable)
<b>Inhalation:</b>	Nose and throat irritation with coughing and wheezing  Headache, fatigue and blue color to the skin and lips (methemoglobinemia)
<b>Chronic:</b>	Cancer (skin, mammary) in animals

FIRST AID AND DECONTAMINATION	
<b>Remove</b> the person from exposure.	
<b>Flush</b> eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention immediately.	
<b>Quickly</b> remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention.	
<b>Begin</b> artificial respiration if breathing has stopped and CPR if necessary.	
<b>Transfer</b> promptly to a medical facility.	

Common Name: **DIOXOLANE**

Synonyms: 1,3-Dioxolan; Formal Glycol; Glycol Methylene Ether

CAS No: 646-06-0

 Molecular Formula: C<sub>3</sub>H<sub>6</sub>O<sub>2</sub>

RTK Substance No: 0791

 Description: Clear, colorless liquid with an *Ether*-like odor

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>1 - Health</b> <b>3 - Fire</b> <b>2 - Reactivity</b> DOT#: UN 1166 ERG Guide #: 127 Hazard Class: 3 (Flammable)	FLAMMABLE LIQUID Use dry chemical, CO <sub>2</sub> , alcohol-resistant foam or other foaming agent as extinguishing agents, as water may not be effective in fighting fires. POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool. Vapors may travel to a source of ignition and flash back. Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.	<b>Dioxolane</b> reacts with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE). <b>Dioxolane</b> reacts with ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) to form <i>Hemiacetals</i> and <i>Formaldehyde</i> . <i>Peroxides</i> can form on exposure to AIR.

## SPILL/LEAKS

**Isolation Distance:**

Small Spill: 60 meters (200 feet)

Large Spill: 270 meters (900 feet)

Fire: 800 meters (1/2 mile)

Cover with dry lime, sand or soda ash, and place in covered containers for disposal.

 Keep **Dioxolane** out of confined spaces, such as sewers, because of the possibility of an explosion.

 Metal containers involving the transfer of **Dioxolane** should be grounded and bonded.

 Use only non-sparking tools and equipment, especially when opening and closing containers of **Dioxolane**.

Biodegradation products are not toxic.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Ether-like
<b>Flash Point:</b>	35°F (2°C)
<b>LEL:</b>	2.1%
<b>UEL:</b>	20.5%
<b>Auto Ignition Temp:</b>	525°F (274°C)
<b>Vapor Density:</b>	2.6 (air = 1)
<b>Vapor Pressure:</b>	79 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.1 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	78°F (26°C)
<b>Molecular Weight:</b>	74.09

## EXPOSURE LIMITS

<b>OSHA:</b>	None
<b>NIOSH:</b>	None
<b>ACGIH:</b>	20 ppm, 8-hr TWA
<b>IDLH:</b>	None

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Silver Shield®/4H® (>8-hr breakthrough for <i>Ethylene Glycol</i> )
<b>Coveralls:</b>	DuPont Tychem® Responder®, CSM, and TK; Kappler® Zytron® 500; and Saint-Gobain ONESuit® TEC
<b>Respirator:</b>	>20 ppm - Supplied air

## HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns
<b>Inhalation:</b>	Nose and throat irritation with coughing and wheezing

## FIRST AID AND DECONTAMINATION

<b>Remove</b>	the person from exposure.
<b>Flush</b>	eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.
<b>Remove</b>	contaminated clothing and wash contaminated skin with water.
<b>Begin</b>	artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b>	to a medical facility.

Common Name: **DIPHENYL**

Synonyms: Biphenyl; Lemonene; Phenyl Benzene

CAS No: 92-52-4

 Molecular Formula: C<sub>12</sub>H<sub>10</sub>

RTK Substance No: 0795

Description: Colorless, white to yellow, leaf-like or crystalline solid with a pleasant, characteristic odor

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 3077 ERG Guide #: 171 Hazard Class: 9 (Miscellaneous Hazardous Material)	<b>Diphenyl</b> is a COMBUSTIBLE SOLID and <i>finely dispersed particles</i> may form explosive mixtures in air. Use dry chemical, CO <sub>2</sub> , water spray or alcohol-resistant foam as extinguishing agents. Water or foam may cause frothing. POISONOUS GASES ARE PRODUCED IN FIRE. Use water spray to keep fire-exposed containers cool.	<b>Diphenyl</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and contact may cause fire and explosion.

**SPILL/LEAKS**
**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

DO NOT wash into sewer.

**Diphenyl** is very toxic to aquatic organisms and bioaccumulation may occur.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	Pleasant odor
<b>Flash Point:</b>	235°F (113°C)
<b>LEL:</b>	0.6%
<b>UEL:</b>	5.8%
<b>Auto Ignition Temp:</b>	1,004°F (540°C)
<b>Vapor Density:</b>	5.3 (air = 1)
<b>Vapor Pressure:</b>	0.005 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.2
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	489° to 491°F (254° to 255°C)
<b>Melting Point:</b>	156° to 160°F (69° to 71°C)
<b>Ionization Potential:</b>	7.95 eV
<b>Molecular Weight:</b>	154.2

**EXPOSURE LIMITS**
**OSHA:** 1 mg/m<sup>3</sup>, 8-hr TWA

**NIOSH:** 1 mg/m<sup>3</sup>, 10-hr TWA

**ACGIH:** 1 mg/m<sup>3</sup>, 8-hr TWA

**IDLH:** 100 mg/m<sup>3</sup>

The Protective Action Criteria values are:

 PAC-1 = 8 mg/m<sup>3</sup>

 PAC-2 = 60 mg/m<sup>3</sup>

 PAC-3 = 100 mg/m<sup>3</sup>
**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Butyl and Neoprene
<b>Coveralls:</b>	Tyvek®
<b>Respirator:</b>	>1 mg/m <sup>3</sup> - Full facepiece APR with Organic vapor cartridge and High efficiency particulate prefilter >8 mg/m <sup>3</sup> - Supplied air or SCBA

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, wheezing and shortness of breath  Nausea, vomiting and abdominal pain
<b>Chronic:</b>	<i>Polychlorinated Biphenyls</i> cause liver cancer in humans and animals.

**FIRST AID AND DECONTAMINATION**

<b>Remove</b> the person from exposure.
<b>Flush</b> eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
<b>Quickly</b> remove contaminated clothing and wash contaminated skin with large amounts of soap and water.
<b>Begin</b> artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b> promptly to a medical facility.

Common Name: **1,2-DIPHENYLHYDRAZINE**

Synonyms: Hydrazobenzene; DPH

CAS No: 122-66-7

Molecular Formula: C<sub>12</sub>H<sub>12</sub>N<sub>2</sub>

RTK Substance No: 0800

Description: Odorless, white to yellow or orange crystalline powder

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>2 - Fire</b> <b>1 - Reactivity</b>  DOT#: UN 3077 ERG Guide #: 171 Hazard Class: 9 (Environmentally Hazardous Material)	<b>1,2-Diphenylhydrazine</b> is a COMBUSTIBLE SOLID.  Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents.  POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> .  CONTAINERS MAY EXPLODE IN FIRE.  Use water spray to keep fire-exposed containers cool.	<b>1,2-Diphenylhydrazine</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).  <b>1,2-Diphenylhydrazine</b> reacts with MINERAL ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); ACID CHLORIDES; and ACID ANHYDRIDES to produce toxic <i>Benzidine</i> .

### SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up, and deposit in sealed containers.

DO NOT wash into sewer.

**1,2-Diphenylhydrazine** is toxic to aquatic life and will bioaccumulate in fish.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Combustible
<b>Vapor Density:</b>	1.158 (air = 1)
<b>Vapor Pressure:</b>	1 mm Hg at 217°F (103°C)
<b>Specific Gravity:</b>	1.158 (water = 1)
<b>Water Solubility:</b>	Slightly soluble
<b>Boiling Point:</b>	559°F (293°C)
<b>Melting Point:</b>	253° to 259°F (123° to 126°C)
<b>Molecular Weight:</b>	184.24

### EXPOSURE LIMITS

No occupational exposure limits have been established for **1,2-Diphenylhydrazine**.

The Protective Action Criteria values are:

PAC-1 = 120 mg/m<sup>3</sup>; PAC-2 = 1,300 mg/m<sup>3</sup>;

PAC-3 = 7,900 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Natural Rubber and Nitrile
<b>Coveralls:</b>	DuPont Tyvek®
<b>Respirator:</b>	Pressure demand supplied air

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose and throat irritation with coughing and wheezing  Headache, fatigue, dizziness and blue color to the skin and lips ( <i>methemoglobinemia</i> )
<b>Chronic:</b>	Cancer (liver and mammary gland) in animals

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.  
**Remove** contaminated clothing and wash contaminated skin with soap and water.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** to a medical facility.



Common Name: **DIPROPYLENE GLYCOL METHYL ETHER**

Synonyms: Dowanol® DPM; DPGME

CAS No: 34590-94-8

 Molecular Formula: C<sub>7</sub>H<sub>16</sub>O<sub>3</sub>

RTK Substance No: 0804

Description: Colorless liquid with a mild and pleasant odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>2 - Fire</b> <b>0 - Reactivity</b> DOT#: None ERG Guide #: None Hazard Class: None	<b>Dipropylene Glycol Methyl Ether</b> is a COMBUSTIBLE LIQUID. Use dry chemical, CO <sub>2</sub> , water spray, alcohol-resistant foam or other foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE. Use water spray to keep fire-exposed containers cool.	<b>Dipropylene Glycol Methyl Ether</b> will react with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) to cause fires and explosions. May form explosive <i>Peroxides</i> on contact with AIR. Attacks METALS to form flammable and explosive <i>Hydrogen gas</i> .

### SPILL/LEAKS

**Isolation Distance:**

Small Spills: 50 meters (200 feet)

Large Spills: 270 meters (900 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.

May be toxic to aquatic life.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	35 ppm
<b>Flash Point:</b>	180°F (82°C)
<b>LEL:</b>	1.1%
<b>UEL:</b>	3.0%
<b>Auto Ignition Temp:</b>	518°F (270°C)
<b>Vapor Density:</b>	5.1 (air = 1)
<b>Vapor Pressure:</b>	0.28 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	0.95 (water = 1)
<b>Water Solubility:</b>	Miscible
<b>Boiling Point:</b>	408°F (209°C)
<b>Molecular Weight:</b>	148.2

### EXPOSURE LIMITS

<b>OSHA:</b>	100 ppm, 8-hr TWA
<b>NIOSH:</b>	100 ppm, 10-hr TWA 150 ppm, 15-min STEL
<b>ACGIH:</b>	100 ppm, 8-hr TWA 150 ppm, 15-min STEL
<b>IDLH LEVEL:</b>	600 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl and Nitrile (>8-hr breakthrough)
<b>Coveralls:</b>	DuPont <i>Tychem® CPF 4</i> , or equivalent for <i>hydroxylic compounds</i> (>8-hr breakthrough)
<b>Respirator:</b>	>100 ppm - full facepiece APR with an Organic vapor cartridge >600 ppm - SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose and throat irritation Headache, dizziness, lightheadedness and passing out

### FIRST AID AND DECONTAMINATION

<b>Remove</b>	the person from exposure.
<b>Flush</b>	eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
<b>Remove</b>	contaminated clothing and wash contaminated skin with soap and water.
<b>Begin</b>	artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b>	to a medical facility.

# RIGHT TO KNOW

## HAZARDOUS SUBSTANCE FACT SHEET

**Common Name:** DISULFOTON

**Synonyms:** Solvirex; Thiodemeton; Di-Syston

**CAS Number:** 298-04-4

**Molecular Formula:** C<sub>8</sub>H<sub>19</sub>O<sub>2</sub>PS<sub>3</sub>

**RTK Number:** 0812

**Description:** Oily, colorless to yellow liquid in the *Organophosphate* class of pesticides; also available in granular form

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>Health:</b> 4 <b>Fire:</b> 1 <b>Reactivity:</b> 1 <b>DOT #:</b> UN 3018/2783 <b>ERG #:</b> 152 <b>DOT Hazard:</b> 6.1 (poison)	<b>Disulfoton</b> is COMBUSTIBLE. <b>Disulfoton</b> may burn but does not readily ignite. Use dry chemical, CO <sub>2</sub> , water spray or foam extinguishers. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Sulfur Oxides</i> and <i>Phosphorus Oxide gases</i> . CONTAINERS MAY EXPLODE IN FIRE when organic solvent is used as a carrier.	Store separately from <i>Alkalis</i> .

### SPILLS/LEAKS

**Isolation Distances:**

**Liquid Spill:** 50 meters (150 feet)  
**Solid Spill:** 25 meters (75 feet)  
**Fire:** 800 meters (1/2 mile)

Evacuate personnel.  
 Secure and control entrance to the area.  
 If it is safe to do so, remove potential ignition sources.  
 Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.  
 Do not allow this substance to enter waterways, including sewer systems, as this substance is toxic to aquatic life with long-lasting effects.  
 Ventilate area of spill or leak after clean-up is complete.

### EXPOSURE LIMITS

The following exposure limits are for **Disulfoton**:

**NIOSH:** 0.1 mg/m<sup>3</sup>, 10-hour average  
**ACGIH:** 0.1 mg/m<sup>3</sup>, 8-hour average  
**PAC:** PAC-1 = 0.18 mg/m<sup>3</sup>  
 PAC-2 = 2 mg/m<sup>3</sup>  
 PAC-3 = 8.8 mg/m<sup>3</sup>

### ACUTE HEALTH EFFECTS

**Eyes:** Irritation, burns, permanent damage  
**Skin:** Rash, burning sensation  
**Inhalation:** Headache, dizziness, chest tightness, twitching, loss of coordination, convulsions, pulmonary edema, coma, death

### PHYSICAL PROPERTIES

**Molecular Weight:** 274.38  
**Flash Point:** >82 °C (>180 °F)  
**Melting Point:** > -10°C (>13 °F)  
**Vapor Pressure:** 0.0002 mm Hg at 20 °C (68 °F)  
**Specific Gravity:** 1.144  
**Water Solubility:** Insoluble  
**Boiling Point:** 132-133 °C (270-271 °F)

### PROTECTIVE EQUIPMENT

**Gloves:** Nitrile and Neoprene (>8-h breakthrough for *Organophosphorus Compounds*)  
**Coverall:** Tychem® BR, CSM, and TK (>8-h breakthrough for *Organophosphorus Compounds*)  
**Respirator:** >0.1 mg/m<sup>3</sup> – supplied-air, full-facepiece, pressure-demand or another positive-pressure mode

### FIRST AID AND DECONTAMINATION

Immediately flush eyes with large amounts of water for at least 15 minutes, occasionally lifting upper and lower lids.  
 Remove contact lenses, if worn, while flushing.  
 Quickly remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water.  
 Shampoo hair promptly if contaminated.  
 Remove the person from exposure.  
 Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.  
 Transfer promptly to a medical facility.  
 Medical observation is recommended for 24 to 48 hours after breathing overexposure.

**Common Name: EPICHLOROHYDRIN**

Synonyms: Chloromethyl Oxirane; 3-Chloropropylene Oxide; 1-Chloro-2,3-Epoxypropane

CAS No: 106-89-8

Molecular Formula: C<sub>3</sub>H<sub>5</sub>ClO

RTK Substance No: 0828

Description: Clear, colorless liquid with an irritating odor

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>4 - Health</b></p> <p><b>3 - Fire</b></p> <p><b>2 - Reactivity</b></p> <p><b>DOT#:</b> UN 2023</p> <p><b>ERG Guide #:</b> 131P</p> <p><b>Hazard Class:</b> 6.1 (Poison)</p>	<p><b>Epichlorohydrin</b> is a FLAMMABLE and REACTIVE LIQUID that can polymerize violently when exposed to HEAT.</p> <p>Use dry chemical, CO<sub>2</sub>, water spray or alcohol-resistant foam as extinguishing agents.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Hydrogen Chloride</i> and <i>Phosgene</i>.</p> <p>CONTAINERS MAY EXPLODE IN FIRE.</p> <p>Use water spray to keep fire-exposed containers cool.</p> <p>Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source or flash back.</p> <p><b>Epichlorohydrin</b> may form an ignitable vapor/air mixture in closed tanks or containers.</p>	<p><b>Epichlorohydrin</b> can react with HEAT; STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) and STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE) to cause violent and uncontrollable polymerization.</p> <p><b>Epichlorohydrin</b> may react violently or explosively with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); ALCOHOLS; AMINES (especially ANILINE and ETHYLENE DIAMINE); ALUMINUM; ZINC; METAL SALTS (such as IRON and ALUMINUM CHLORIDE); PHENOLS; POTASSIUM TERT-BUTOXIDE; and WATER.</p> <p><b>Epichlorohydrin</b> will react with TRICHLOROETHYLENE to form explosive <i>Dichloroacetylene</i>.</p>

## SPILL/LEAKS

**Isolation Distance:**

**Spill:** 50 meters (150 feet)

**Fire:** 800 meters (1/2 mile)

Absorb liquids in dry sand, earth, or a similar material and place into sealed containers for disposal.

Use only non-sparking tools and equipment.

Metal containers involving the transfer of **Epichlorohydrin** should be grounded and bonded.

Keep **Epichlorohydrin** out of confined spaces, such as sewers, because of the possibility of an explosion.

**Epichlorohydrin** is harmful to aquatic life.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	0.08 to 12 ppm
<b>Flash Point:</b>	88°F (31°C)
<b>LEL:</b>	3.8%
<b>UEL:</b>	21%
<b>Auto Ignition Temp:</b>	772°F (411°C)
<b>Vapor Density:</b>	3.29 (air = 1)
<b>Vapor Pressure:</b>	13 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.17 (water = 1)
<b>Water Solubility:</b>	Slightly soluble
<b>Boiling Point:</b>	242°F (117°C)
<b>Freezing Point:</b>	-54°F (-47.8°C)
<b>Ionization Potential:</b>	10.6 eV
<b>Molecular Weight:</b>	92.53

## EXPOSURE LIMITS

**OSHA:** 5 ppm, 8-hr TWA

**NIOSH:** Lowest feasible concentration

**ACGIH:** 0.5 ppm, 8-hr TWA

**IDLH:** 75 ppm

The Protective Action Criteria values are:

PAC-1 = 1.7 ppm    PAC-2 = 24 ppm    PAC-3 = 72 ppm

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl, Viton and Barrier® (>8-hr breakthrough)
<b>Coveralls:</b>	Tychem® BR, CSM and TK; Trelchem® HPS and VPS (>8-hr breakthrough)
<b>Respirator:</b>	>0.5 ppm - SCBA

## HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns (skin absorbable)
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, and severe shortness of breath (pulmonary edema)
<b>Chronic:</b>	Cancer (nasal cavity and skin) in animals

## FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

**Medical** observation is recommended as symptoms may be delayed.

Common Name: **2,3-EPOXY-1-PROPANOL**

Synonyms: Glycidol; Epoxypropyl Alcohol

CAS No: 556-52-5

Molecular Formula: C<sub>3</sub>H<sub>6</sub>O<sub>2</sub>

RTK Substance No: 0831

Description: Colorless, slightly thick liquid

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<p><b>4 - Health</b></p> <p><b>2 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p><b>DOT#:</b> UN 2810</p> <p><b>ERG Guide #:</b> 153</p> <p><b>Hazard Class:</b> 6.1 (Poison)</p>	<p><b>2,3-Epoxy-1-Propanol</b> is a COMBUSTIBLE LIQUID.</p> <p>Use dry chemical, CO<sub>2</sub>, water spray or foam as extinguishing agents.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE.</p> <p>Use water spray to keep fire-exposed containers cool.</p>	<p><b>2,3-Epoxy-1-Propanol</b> reacts violently with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).</p> <p><b>2,3-Epoxy-1-Propanol</b> may decompose and/or polymerize, with the release of HEAT, when in contact with STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); METALS (such as ALUMINUM, COPPER and ZINC); METAL SALTS (such as IRON CHLORIDE and TIN CHLORIDE); and TRICHLOROETHYLENE.</p>

**SPILL/LEAKS**

**Isolation Distance:**

Small Spill: 60 meters (200 feet)

Large Spill: 300 meters (1,200 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.

DO NOT wash into sewer.

No environmental information available.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	Unknown
<b>Flash Point:</b>	162°F (72°C)
<b>LEL:</b>	3.7%
<b>UEL:</b>	Unknown
<b>Auto Ignition Temp:</b>	779°F (415°C)
<b>Vapor Density:</b>	2.15 (air = 1)
<b>Vapor Pressure:</b>	0.9 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.1 (water = 1)
<b>Water Solubility:</b>	Miscible
<b>Boiling Point:</b>	320°F (160°C)
<b>Molecular Weight:</b>	74.1

**EXPOSURE LIMITS**

**OSHA:** 50 ppm, 8-hr TWA

**NIOSH:** 25 ppm, 10-hr TWA

**ACGIH:** 2 ppm, 8-hr TWA

**IDLH:** 150 ppm

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Butyl and Silver Shield®/4H®
<b>Coveralls:</b>	DuPont Tychem® BR, LV, Responder®, and TK; Kappler® Zytron® 500; and Saint-Gobain ONESuit® TEC (>8-hr breakthrough for <i>Heterocyclic compounds, Oxygen</i> ,
<b>Respirator:</b>	<i>Epoxides</i> ) >2 ppm - Supplied air

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation, burns, rash, dryness and redness
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, wheezing, and shortness of breath  Headache, dizziness, lightheadedness, and passing out
<b>Chronic:</b>	Cancer (lung, skin, mammary glands) in animals

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention immediately.

**Quickly** remove contaminated clothing. Immediately wash contaminated skin with large amounts of water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** to a medical facility.

Common Name: **ETHANOL, 1,2-DICHLORO-, ACETATE**

Synonyms: 1,2-Dichloroethyl Acetate

CAS No: 10140-87-1

Molecular Formula: C<sub>4</sub>H<sub>6</sub>Cl<sub>2</sub>O<sub>2</sub>

RTK Substance No: 2394

Description: Water-white liquid

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b> <b>DOT#:</b> UN 1993 <b>ERG Guide #:</b> 128 <b>Hazard Class:</b> 3 (Flammable)	COMBUSTIBLE LIQUID Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Chlorine</i> and <i>Phosgene</i> . CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool. Vapors may travel to a source of ignition and flash back. <b>Ethanol, 1,2-Dichloro-, Acetate</b> may form an ignitable vapor/air mixture in closed tanks or containers.	<b>Ethanol, 1,2-Dichloro-, Acetate</b> explodes when heated with NITRATES. <b>Ethanol, 1,2-Dichloro-, Acetate</b> reacts with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) to release heat and poisonous gases (such as <i>Hydrogen Chloride</i> ). <b>Ethanol, 1,2-Dichloro-, Acetate</b> is not compatible with STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES).

### SPILL/LEAKS

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in dry sand, earth, or a similar material and place into sealed containers for disposal.

Foam can be used to suppress vapors.

### PHYSICAL PROPERTIES

**Flash Point:** 162.3°F (72.4°C)

**Specific Gravity:** 1.29 (water = 1)

**Water Solubility:** Insoluble

**Boiling Point:** 136° to 149°F (58° to 65°C)

**Freezing Point:** -26°F (-32.2°C)

**Molecular Weight:** 157

### EXPOSURE LIMITS

No occupational exposure limits have been established for **Ethanol, 1,2-Dichloro-, Acetate**.

The Protective Action Criteria values are:

PAC-1 = 1 ppm    PAC-2 = 1.71 ppm    PAC-3 = 6 ppm

### PROTECTIVE EQUIPMENT

**Gloves:** Viton/Butyl, Silver Shield®/4H®, Viton and Barrier® (>4-hr breakthrough)

**Coveralls:** Tychem BR, CSM and TK® (>8-hr breakthrough)

**Respirator:** SCBA

### HEALTH EFFECTS

**Eyes:** Irritation, burns and possible eye damage

**Skin:** Irritation and burns

**Inhalation:** Nose, throat and lung irritation, with coughing, and severe shortness of breath (pulmonary edema)

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

**Medical** observation is recommended as symptoms may be delayed.

Common Name: **2-ETHOXYETHANOL**

Synonyms: Cellosolve; Ethylene Glycol Monoethyl Ether

CAS No: 110-80-5

Molecular Formula: C<sub>4</sub>H<sub>10</sub>O<sub>2</sub>

RTK Substance No: 0839

Description: Clear, colorless liquid with a sweet odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>1 - Health</b> <b>2 - Fire</b> <b>0 - Reactivity</b>  <b>DOT#:</b> UN 1171 <b>ERG Guide #:</b> 127 <b>Hazard Class:</b> 3 (Flammable)	<b>2-Ethoxyethanol</b> is a COMBUSTIBLE LIQUID. Use dry chemical, CO <sub>2</sub> , water spray or alcohol-resistant foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool. Vapors may travel to a source of ignition and flash back. Flow or agitation may generate electrostatic charges. <b>2-Ethoxyethanol</b> may form an ignitable vapor/air mixture in closed tanks or containers at temperatures above 111°F (44°C).	<b>2-Ethoxyethanol</b> may react violently with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and form explosive <i>peroxides</i> . <b>2-Ethoxyethanol</b> is not compatible with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); and COPPER.

### SPILL/LEAKS

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in dry sand, earth, or a similar material and place into sealed containers for disposal.

Use only non-sparking tools and equipment, especially when opening and closing containers of

**2-Ethoxyethanol.**

Metal containers involving the transfer of **2-Ethoxyethanol** should be grounded and bonded.

DO NOT wash into sewer.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	2.7 ppm
<b>Flash Point:</b>	105° to 110°F (41° to 43°C)
<b>LEL:</b>	1.7%
<b>UEL:</b>	15.6%
<b>Auto Ignition Temp:</b>	455°F (235°C)
<b>Vapor Density:</b>	3.1 (air = 1)
<b>Vapor Pressure:</b>	3.8 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	0.9 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Freezing Point:</b>	275°F (135°C)
<b>Melting Point:</b>	-130°F (-90°C)
<b>Molecular Weight:</b>	90.1

### EXPOSURE LIMITS

**OSHA:** 200 ppm, 8-hr TWA

**NIOSH:** 0.5 ppm, 10-hr TWA

**ACGIH:** 5 ppm, 8-hr TWA

**IDLH:** 500 ppm

The Protective Action Criteria values are:

PAC-1 = 5 ppm    PAC-2 = 5 ppm    PAC-3 = 500 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Viton/Butyl, SilverShield®/4H® and Viton (>8-hr breakthrough)
<b>Coveralls:</b>	Tychem® BR, CSM and TK (>8-hr breakthrough)
<b>Respirator:</b>	SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, wheezing and shortness of breath

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.  
**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** promptly to a medical facility.



Common Name: **ETHYL ALCOHOL**

Synonyms: Alcohol; Ethanol; Methylcarbinol

CAS No: 64-17-5

Molecular Formula: C<sub>2</sub>H<sub>5</sub>OH

RTK Substance No: 0844

Description: Clear, colorless liquid with a wine-like odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>2 - Health</b></p> <p><b>3 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p><b>DOT#:</b> UN 1170</p> <p><b>ERG Guide #:</b> 127</p> <p><b>Hazard Class:</b> 3 (Flammable)</p>	<p><b>FLAMMABLE LIQUID</b></p> <p>Use dry chemical, CO<sub>2</sub>, water spray or alcohol-resistant foam as extinguishing agents.</p> <p>Solid streams of water may be ineffective.</p> <p><b>POISONOUS GASES ARE PRODUCED IN FIRE.</b></p> <p><b>CONTAINERS MAY EXPLODE IN FIRE.</b></p> <p>Use water spray to keep fire-exposed containers cool.</p> <p>Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source and flashback.</p> <p><b>Ethyl Alcohol</b> may form an ignitable vapor/air mixture in closed tanks or containers.</p>	<p><b>Ethyl Alcohol</b> reacts violently with ACETYL BROMIDE and ACETYL CHLORIDE.</p> <p>Contact with <i>concentrated</i> SULFURIC ACID; POTASSIUM; and HYDROGEN PEROXIDE can cause explosions.</p> <p><b>Ethyl Alcohol</b> will react with PLATINUM BLACK; CALCIUM HYPOCHLORITE; SILVER OXIDE; AMMONIA; NITRIC ACID; MERCURIC NITRATE; SILVER NITRATE; MAGNESIUM PERCHLORATE; and other STRONG OXIDIZERS to cause fire and explosions.</p> <p><b>Ethyl Alcohol</b> reacts violently with ISOCYANATES; MINERAL ACIDS; and CHLOROFORM.</p> <p>Protect from SUNLIGHT.</p>

### SPILL/LEAKS

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in dry sand, earth, or a noncombustible material and place into sealed containers for disposal.

Use only non-sparking tools and equipment, especially when opening and closing containers of **Ethyl Alcohol**.

Keep **Ethyl Alcohol** out of confined spaces, such as sewers, because of the possibility of an explosion.

Metal containers involving the transfer of **Ethyl Alcohol** should be grounded and bonded.

**Ethyl Alcohol** may affect aquatic life.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	84 ppm
<b>Flash Point:</b>	55 °F (13 °C)
<b>LEL:</b>	3%
<b>UEL:</b>	19%
<b>Auto Ignition Temp:</b>	685 °F (363 °C)
<b>Vapor Density:</b>	1.59 (air = 1)
<b>Vapor Pressure:</b>	44 mm Hg at 68 °F (20 °C)
<b>Specific Gravity:</b>	0.79 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	173 °F (78 °C)
<b>Melting Point:</b>	-173 °F (-114 °C)
<b>Ionization Potential:</b>	10.47 eV
<b>Molecular Weight:</b>	46.1

### EXPOSURE LIMITS

**OSHA:** 1,000 ppm, 8-hr TWA

**NIOSH:** 1,000 ppm, 10-hr TWA

**ACGIH:** 1,000 ppm, STEL

**IDLH:** 3,300 ppm

The Protective Action Criteria values are:

PAC-1 = 1,800 ppm    PAC-2 = 3,300 ppm

PAC-3 = 15,000 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl, Neoprene, Silver Shield®/4H®, Viton, Viton/Butyl and Barrier® (>8-hr breakthrough)
<b>Coveralls:</b>	Tychem® CPF 3 (>8-hr breakthrough)
<b>Respirator:</b>	>1,000 ppm - SCBA

### HEALTH EFFECTS

**Eyes:** Irritation

**Skin:** Irritation

**Inhalation:** Nose, throat and lung irritation with coughing and shortness of breath  
Headache, drowsiness, nausea and vomiting, and unconsciousness

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **ETHYL ALUMINUM SESQUICHLORIDE**

Synonyms: Triethyltrichlorodialuminum; Triethylaluminum Sesquichloride

CAS No: 12075-68-2

Molecular Formula:  $C_6H_{15}Al_2Cl_3$

RTK Substance No: 0846

Description: Clear, yellow liquid

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>3 - Fire</b> <b>3W - Reactivity</b> <b>DOT#:</b> UN 3052 <b>ERG Guide #:</b> 135 <b>Hazard Class:</b> 4.2 (Spontaneously combustible)	FLAMMABLE AND REACTIVE LIQUID <b>Ethyl Aluminum Sesquichloride</b> is SPONTANEOUSLY COMBUSTIBLE in AIR and REACTS VIOLENTLY with WATER to form corrosive <i>Hydrogen Chloride</i> and flammable <i>Ethane</i> gases. Use dry chemical or dry graphite as extinguishing agents. DO NOT USE WATER. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Hydrogen Chloride</i> and <i>Aluminum Oxide</i> . CONTAINERS MAY EXPLODE IN FIRE.	<b>Ethyl Aluminum Sesquichloride</b> IGNITES when exposed to AIR or OXYGEN and REACTS VIOLENTLY with WATER to form corrosive <i>Hydrogen Chloride</i> and flammable <i>Ethane</i> gases. <b>Ethyl Aluminum Sesquichloride</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); ALCOHOLS; STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); and CARBON TETRACHLORIDE. Keep <b>Ethyl Aluminum Sesquichloride</b> dry and protect from SHOCK and HEAT.

### SPILL/LEAKS

**Isolation Distance:**

Small Spill: 30 meters (100 feet)

Large Spill: 60 meters (200 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in dry sand, dry earth, or a similar material and place into sealed containers for disposal.

Use only non-sparking tools and equipment, especially when opening and closing containers of **Ethyl Aluminum Sesquichloride**.

DO NOT USE WATER OR WET METHOD.

DO NOT allow **Ethyl Aluminum Sesquichloride** to enter water systems.

### PHYSICAL PROPERTIES

<b>Flash Point:</b>	-4°F (-20°C)
<b>Vapor Density:</b>	8.49 (air = 1)
<b>Vapor Pressure:</b>	0.012 mm Hg at 77°F (25°C)
<b>Specific Gravity:</b>	1.1 (water = 1)
<b>Water Solubility:</b>	Reacts Violently
<b>Boiling Point:</b>	297° to 399°F (147° to 204°C)
<b>Freezing Point:</b>	-4°F (-20°C)
<b>Molecular Weight:</b>	247.5

### EXPOSURE LIMITS

**OSHA:** None

**NIOSH:** 2 mg/m<sup>3</sup>, 10-hr TWA (for *Aluminum Alkyls* measured as *Aluminum*)

**ACGIH:** None

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Silver Shield®/4H® and Barrier® (>4-hr breakthrough for highly toxic chemicals)
<b>Coveralls:</b>	Tychem® Responder® and TK (>8-hr breakthrough for <i>Organo-Metallic compounds</i> )
<b>Respirator:</b>	SCBA

### HEALTH EFFECTS

**Eyes:** Severe irritation and burns

**Skin:** Severe irritation and burns

**Inhalation:** Nose, throat and lung irritation with coughing, wheezing and shortness of breath

Headache, nausea and vomiting

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **ETHYL BENZENE**

Synonyms: EB; Ethylbenzol; Phenylethane

CAS No: 100-41-4

Molecular Formula: C<sub>8</sub>H<sub>10</sub>

RTK Substance No: 0851

Description: Clear, colorless liquid

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>2 - Health</b></p> <p><b>3 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p><b>DOT#:</b> UN 1175</p> <p><b>ERG Guide #:</b> 130</p> <p><b>Hazard Class:</b> 3 (Flammable)</p>	<p>FLAMMABLE LIQUID</p> <p>Use dry chemical, CO<sub>2</sub>, water spray or foam as extinguishing agents.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE.</p> <p>Use water spray to reduce vapors and to keep containers cool.</p> <p>Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source or flash back.</p> <p>Flow or agitation may generate electrostatic charges.</p> <p><b>Ethyl Benzene</b> may form an ignitable vapor/air mixture in closed tanks or containers.</p>	<p><b>Ethyl Benzene</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).</p>

### SPILL/LEAKS

**Isolation Distance:**

**Spill:** 50 meters (150 feet)

**Fire:** 800 meters (1/2 mile)

Absorb liquids in dry sand, earth, or a similar material and place into sealed containers for disposal.

Ground and bond containers when transferring **Ethyl Benzene**.

Use only non-sparking tools and equipment, especially when opening and closing containers of **Ethyl Benzene**.

DO NOT wash into sewer.

**Ethyl Benzene** is toxic to aquatic organisms.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	2.3 ppm
<b>Flash Point:</b>	59° to 70°F (15° to 21°C)
<b>LEL:</b>	0.8%
<b>UEL:</b>	6.7%
<b>Auto Ignition Temp:</b>	810° to 860°F (432° to 460°C)
<b>Vapor Density:</b>	3.7 (water = 1)
<b>Vapor Pressure:</b>	7 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	0.9 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	277°F (136°C)
<b>Melting Point:</b>	-139°F (-95°C)
<b>Ionization Potential:</b>	8.76 eV
<b>Molecular Weight:</b>	106.2

### EXPOSURE LIMITS

**OSHA:** 100 ppm, 8-hr TWA

**NIOSH:** 100 ppm, 10-hr TWA; 125 ppm, STEL

**ACGIH:** 20 ppm, 8-hr TWA

**IDLH:** 800 ppm

The Protective Action Criteria values are:

PAC-1 = 33 ppm    PAC-2 = 1,100 ppm

PAC-3 = 1,800 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Viton/Butyl, Viton and Barrier® (>8-hr breakthrough)
<b>Coveralls:</b>	<b>Use turn out gear or flash protection if ignition/fire is the greatest hazard.</b>
<b>Respirator:</b>	>20 ppm - full facepiece APR with <i>Organic Vapor Cartridges</i> >200 ppm - SCBA

### HEALTH EFFECTS

**Eyes:** Irritation

**Skin:** Irritation (skin absorbable)

**Inhalation:** Nose and throat irritation

Headache, dizziness, lightheadedness, loss of coordination and passing out. Very high levels can cause trouble breathing and even death.

**Chronic:** Cancer (kidney, testes, lung, liver) in animals

### FIRST AID AND DECONTAMINATION

- ▶ Remove the person from exposure.
- ▶ Flush eyes with large amounts of water for at least 15 minutes. Remove contact lenses.
- ▶ Quickly remove contaminated clothing and wash contaminated skin with large amounts of soap and water.
- ▶ Begin artificial respiration if breathing has stopped and CPR if necessary.
- ▶ Transfer promptly to a medical facility.

Common Name: **ETHYL-4,4'-DICHLOROBENZILATE**

Synonyms: Benzeneacetic Acid; Chlorobenzilate

CAS No: 510-15-6

Molecular Formula: C<sub>16</sub>H<sub>14</sub>Cl<sub>2</sub>O<sub>3</sub>

RTK Substance No: 0205

Description: Colorless to pale yellow solid or a thick yellow or brownish liquid

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b> <b>DOT#:</b> UN 2996 (liquid) UN 2761 (solid) <b>ERG Guide #:</b> 151 <b>Hazard Class:</b> 6.1 (Toxic)	<b>Ethyl-4,4'-Dichlorobenzilate</b> may burn and can also be dissolved in a flammable or combustible liquid carrier.  Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents.  <b>POISONOUS GASES ARE PRODUCED IN FIRE.</b>  Use water spray to keep fire-exposed containers cool.	<b>Ethyl-4,4'-Dichlorobenzilate</b> is not compatible with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); STRONG BASES (such as SODIUM HYDROXIDE, POTASSIUM HYDROXIDE) and LIME).

### SPILL/LEAKS

**Isolation Distance:**

Spills (liquid): 50 meters (150 feet)  
 (solid): 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Eliminate all ignition sources.

Dampen solid spill with 60 to 70% *Ethanol* and place in sealed containers for disposal.

Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers for disposal.

Wash all contaminated surfaces with 60 to 70% *Ethanol* and then wash with soap and water.  
 DO NOT wash into sewer.

### PHYSICAL PROPERTIES

**Vapor Pressure:** 2.2 x 10<sup>-6</sup> mm Hg at 68°F (20°C)

**Specific Gravity:** 1.3 (water = 1)

**Water Solubility:** Insoluble

**Boiling Point:** 295° to 316°F (146° to 158°C)

**Melting Point:** 95° to 99°F (35° to 37°C)

**Molecular Weight:** 325.2

### EXPOSURE LIMITS

The Protective Action Criteria values are:

PAC-1 = 8.4 mg/m<sup>3</sup>

PAC-2 = 92 mg/m<sup>3</sup>

PAC-3 = 550 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

**Gloves:** Viton

**Coveralls:** Tyvek®

**Respirator:** >8.4 mg/m<sup>3</sup> – Pressure demand Supplied-air or SCBA

### HEALTH EFFECTS

**Eyes:** Irritation

**Skin:** Irritation with rash or burning feeling

**Inhalation:** Headache, loss of appetite, nausea, vomiting and diarrhea.

**Chronic:** Cancer (liver) in animals

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility

Common Name: **ETHYLENEDIAMINETETRAACETIC ACID**

Synonyms: Edetic Acid; EDTA; Tetrine Acid

CAS No: 60-00-4

 Molecular Formula:  $C_{10}H_{16}N_2O_8$ 

RTK Substance No: 0876

Description: Odorless, colorless or white, crystalline powder

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>1 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 3077 ERG Guide #: 171 Hazard Class: 9 (Miscellaneous Hazardous Material)	Extinguish fire using an agent suitable for type of surrounding fire. <b>Ethylenediaminetetraacetic Acid</b> itself does not burn. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> . Use water spray to keep fire-exposed containers cool.	<b>Ethylenediaminetetraacetic Acid</b> reacts violently with LEAD DIOXIDE. <b>Ethylenediaminetetraacetic Acid</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); COPPER; COPPER ALLOYS; NICKEL; ALUMINUM; AMMONIA; AMINES; ISOCYANATES; and EPICHLOROHYDRIN.

## SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

DO NOT wash into sewer.

**Ethylenediaminetetraacetic Acid** is harmful to aquatic organisms.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Noncombustible
<b>Vapor Pressure:</b>	$2 \times 10^{-12}$ mm Hg at 77°F (25°C)
<b>Specific Gravity:</b>	0.86 (water = 1)
<b>Water Solubility:</b>	Slightly soluble
<b>Melting Point:</b>	Decomposes at 464°F (240°C)
<b>Molecular Weight:</b>	292.3

## EXPOSURE LIMITS

The Protective Action Criteria values are:

 PAC-1 = 125 mg/m<sup>3</sup>

 PAC-2 = 150 mg/m<sup>3</sup>

 PAC-3 = 150 mg/m<sup>3</sup>

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Neoprene
<b>Coveralls:</b>	Tyvek®
<b>Respirator:</b>	>125 mg/m <sup>3</sup> - Supplied air or SCBA

## HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation and skin rash
<b>Inhalation:</b>	Nose and throat irritation with coughing and wheezing

## FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Transfer** promptly to a medical facility.

Common Name: **ETHYLENE DIBROMIDE**

Synonyms: EDB; Ethylene Bromide

CAS No: 106-93-4

 Molecular Formula: C<sub>2</sub>H<sub>4</sub>Br<sub>2</sub>

RTK Substance No: 0877

Description: Colorless, thick liquid with a slightly sweet, pleasant odor

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> <b>DOT#:</b> UN 1605 <b>ERG Guide #:</b> 154 <b>Hazard Class:</b> 6.1 (Poison)	Extinguish fire using an agent suitable for type of surrounding fire. <b>Ethylene Dibromide</b> itself does not burn. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Hydrogen Bromide</i> . Use water spray to keep fire-exposed containers cool.	<b>Ethylene Dibromide</b> may react violently with <i>powdered</i> ALUMINUM, MAGNESIUM and ZINC. <b>Ethylene Dibromide</b> may react with SODIUM; POTASSIUM; CALCIUM; LIQUID AMMONIA; OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); and STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE) to cause fires and explosions. <b>Ethylene Dibromide</b> decomposes on HOT SURFACES to form toxic and corrosive <i>Hydrogen Bromide</i> and <i>Bromine</i> gases.

## SPILL/LEAKS

**Isolation Distance:**

Spill: 30 meters (100 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in dry sand, earth, or a similar material and place into sealed containers for disposal.

Use foam to blanket release and suppress vapors.

**Ethylene Dibromide** may be hazardous to the environment.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Slightly sweet
<b>Flash Point:</b>	Noncombustible
<b>Vapor Density:</b>	6.5 (air = 1)
<b>Vapor Pressure:</b>	12 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	2.2 (water = 1)
<b>Water Solubility:</b>	Very slightly soluble
<b>Boiling Point:</b>	268° to 270°F (131° to 132°C)
<b>Melting Point:</b>	50°F (10°C)
<b>Ionization Potential:</b>	9.45 eV
<b>Molecular Weight:</b>	187.8

## EXPOSURE LIMITS

**OSHA:** 20 ppm, 8-hr TWA; 30 ppm, Ceiling; 50 ppm Peak (5 min.)

**NIOSH:** 0.045, 10-hr TWA; 0.13 ppm, Ceiling

**IDLH:** 100 ppm

The Protective Action Criteria values are:

PAC-1 = 17 ppm PAC-2 = 24 ppm PAC-3 = 46 ppm

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Polyvinyl Alcohol, Silver Shield®/4H®, Viton and Barrier® (>8-hr breakthrough)
<b>Coveralls:</b>	Tychem® BR, TK and CSM (>8-hr breakthrough)
<b>Respirator:</b>	SCBA

## HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, and severe shortness of breath (pulmonary edema)  Headache, dizziness, drowsiness, unconsciousness and coma
<b>Chronic:</b>	Cancer (nasal cavity, circulatory system, mammary gland, and other sites) in animals

## FIRST AID AND DECONTAMINATION

<b>Remove</b>	the person from exposure.
<b>Flush</b>	eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention.
<b>Quickly</b>	remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention.
<b>Begin</b>	artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b>	promptly to a medical facility.
<b>Medical</b>	observation is recommended as symptoms may be delayed.



**Common Name:** ETHYLENE GLYCOL

**Synonyms:** 1,2-Dihydroxyethane; 1,2-Ethanediol; Ethylene Alcohol

**CAS No:** 107-21-1

**Molecular Formula:** C<sub>2</sub>H<sub>6</sub>O<sub>2</sub>

**RTK Substance No:** 0878

**Description:** Clear, colorless, thick liquid

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b>  <b>DOT#:</b> None <b>ERG Guide #:</b> 171 <b>Hazard Class:</b> None	<b>COMBUSTIBLE LIQUID</b> Use dry chemical, CO <sub>2</sub> , water spray or alcohol-resistant foam as extinguishing agents.  <b>POISONOUS GASES ARE PRODUCED IN FIRE.</b> Use water spray to keep fire-exposed containers cool.	<b>Ethylene Glycol</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); ALIPHATIC AMINES; ISOCYANATES; CHLOROSULFONIC ACID; and OLEUM.

### SPILL/LEAKS

**Isolation Distance:**

**Spill:** 50 meters (150 feet)

**Fire:** 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers for disposal.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	62.5 ppm
<b>Flash Point:</b>	232°F (111°C)
<b>LEL:</b>	3.2%
<b>UEL:</b>	15.3%
<b>Auto Ignition Temp:</b>	748°F (398°C)
<b>Vapor Density:</b>	2.14 (air = 1)
<b>Vapor Pressure:</b>	0.05 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.1 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	387°F (197°C)
<b>Freezing Point:</b>	8.6°F (-13°C)
<b>Critical Temp:</b>	833°F (445°C)
<b>Molecular Weight:</b>	62.07

### EXPOSURE LIMITS

**ACGIH:** 39 ppm, Ceiling

The Protective Action Criteria values are:

PAC-1 = 30 ppm

PAC-2 = 40 ppm

PAC-3 = 60 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl, Nitrile, Neoprene, Natural Rubber, Silver Shield®/4H®, Viton, Viton/Butyl and Barrier® (>8-hr breakthrough)
<b>Coveralls:</b>	Tychem® SL, BR, CSM and TK; and Trelchem® HPS and VPS (>8-hr breakthrough)
<b>Respirator:</b>	>39 mg/m <sup>3</sup> - full facepiece APR with <i>Organic vapor</i> and <i>P100 cartridges</i> >39 mg/m <sup>3</sup> in fire conditions - SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose and throat irritation
<b>Chronic:</b>	Headache, nausea, vomiting, dizziness, slurred speech, convulsions, and coma

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses.  
**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** promptly to a medical facility.

Common Name: **ETHYLENEIMINE**

Synonyms: Aminoethylene; Azacyclopropane; Aziridine; Dimethyleneimine

CAS No: 151-56-4

Molecular Formula: C<sub>2</sub>H<sub>5</sub>N

RTK Substance No: 0881

Description: Clear, colorless liquid with an *Ammonia*-like odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>4 - Health</b></p> <p><b>3 - Fire</b></p> <p><b>3 - Reactivity</b></p> <p><b>DOT#:</b> UN 1185</p> <p><b>ERG Guide #:</b> 131</p> <p><b>Hazard Class:</b> 6.1 (Poison)</p>	<p>FLAMMABLE and REACTIVE LIQUID</p> <p>Use dry chemical, water spray or alcohol-resistant foam as extinguishing agents.</p> <p><b>Ethyleneimine</b> can polymerize violently when exposed to ELEVATED TEMPERATURES if not inhibited.</p> <p>The <i>vapors</i> of <b>Ethyleneimine</b> are NOT stabilized and may form polymers in vents or other confined spaces, resulting in fires and explosions.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i>.</p> <p>CONTAINERS MAY EXPLODE IN FIRE.</p> <p>Use water spray to keep fire-exposed containers cool and to disperse vapors.</p> <p>Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source and flashback.</p> <p><b>Ethyleneimine</b> may form an ignitable vapor/air mixture in closed tanks or containers.</p>	<p><b>Ethyleneimine</b> can polymerize violently, if not inhibited, when exposed to ELEVATED TEMPERATURES; OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); and STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC).</p> <p><b>Ethyleneimine</b> reacts with SODIUM HYPOCHLORITE to form explosive <i>1-Chloroazidine</i>.</p> <p>Contact with SILVER and ALUMINUM may result in the formation of explosive compounds.</p> <p>Protect from HEAT, SUNLIGHT, and WATER.</p>

### SPILL/LEAKS

**Isolation Distance:**

Small Spill: 30 meters (100 feet)

Large Spill: 100 meters (300 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in dry sand, earth, or a noncombustible material and place into sealed containers for disposal.

Use only non-sparking tools and equipment.

Ground and bond all metal containers when transferring **Ethyleneimine**.

Keep **Ethyleneimine** out of confined spaces, such as sewers, because of the possibility of an explosion.

DO NOT wash into sewer as **Ethyleneimine** is harmful to aquatic organisms.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	1.5 ppm
<b>Flash Point:</b>	12 °F (-11 °C)
<b>LEL:</b>	3.3%
<b>UEL:</b>	46%
<b>Auto Ignition Temp:</b>	608 °F (320 °C)
<b>Vapor Density:</b>	1.5 (air = 1)
<b>Vapor Pressure:</b>	160 mm Hg at 68 °F (20 °C)
<b>Specific Gravity:</b>	0.83 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	131 ° to 135 °F (55 ° to 57 °C)
<b>Freezing Point:</b>	-98 °F (-72 °C)
<b>Ionization Potential:</b>	9.2 eV
<b>Molecular Weight:</b>	43

### EXPOSURE LIMITS

**OSHA/NIOSH:** Lowest feasible concentration

**ACGIH:** 0.05 ppm, 8-hr TWA; 0.1 ppm, STEL

**IDLH:** 100 ppm

The Protective Action Criteria values are:

PAC-1 = 0.1 ppm    PAC-2 = 4.6 ppm    PAC-3 = 9.9 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl (>8-hr breakthrough)
<b>Coveralls:</b>	Tychem® TK (>8-hr breakthrough)
<b>Respirator:</b>	SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns
<b>Inhalation:</b>	Nose, throat and lung irritation, with coughing, and severe shortness of breath (pulmonary edema)
<b>Chronic:</b>	Cancer (lung and liver) in animals

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **ETHYLENE OXIDE**

Synonyms: Dimethylene Oxide; 1,2-Epoxyethane; ETO; Oxirane

CAS No: 75-21-8

Molecular Formula: C<sub>2</sub>H<sub>4</sub>O

RTK Substance No: 0882

Description: Colorless gas or liquid with an *Ether*-like odor

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>3 - Health</b></p> <p><b>4 - Fire</b></p> <p><b>3 - Reactivity</b></p> <p><b>DOT#:</b> UN 1040</p> <p><b>ERG Guide #:</b> 119P</p> <p><b>Hazard Class:</b> 2.3 (Poisonous gas)</p>	<p><b>FLAMMABLE AND REACTIVE GAS OR LIQUID</b></p> <p>Use dry chemical, CO<sub>2</sub>, water spray, alcohol-resistant foam or other foam as extinguishing agents.</p> <p>Let fire burn if it cannot be stopped.</p> <p><b>Ethylene Oxide</b> must be diluted with 24 parts water to 1 part <b>Ethylene Oxide</b> to stop flammability.</p> <p><b>POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE.</b></p> <p>Use water spray to keep fire-exposed containers cool. Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.</p> <p><b>Ethylene Oxide</b> forms an ignitable vapor/air mixture in closed tanks or containers.</p> <p>Heat or contamination may cause <b>Ethylene Oxide</b> to <i>polymerize</i> (self-react) violently.</p>	<p><b>Ethylene Oxide</b> <i>polymerizes</i> (self-reacts) violently on contact with <b>HEAT</b>; <b>STRONG ACIDS</b> (such as <b>HYDROCHLORIC</b>, <b>SULFURIC</b> and <b>NITRIC</b>); <b>STRONG BASES</b> (such as <b>SODIUM HYDROXIDE</b> and <b>POTASSIUM HYDROXIDE</b>); <b>METAL CHLORIDES</b> (such as <b>FERRIC CHLORIDE</b> and <b>MAGNESIUM CHLORIDE</b>); and <b>METAL OXIDES</b> (such as <b>ALUMINUM OXIDE</b> and <b>COPPER OXIDE</b>).</p> <p><b>Ethylene Oxide</b> is extremely explosive in the presence of <b>Oxidizing Agents</b> (such as <b>PERCHLORATES</b>, <b>PEROXIDES</b>, <b>PERMANGANATES</b>, <b>CHLORATES</b>, <b>NITRATES</b>, <b>CHLORINE</b>, <b>BROMINE</b> and <b>FLUORINE</b>) and <b>AIR</b>.</p> <p><b>Ethylene Oxide</b> is not compatible with <b>AMMONIA</b>; <b>METALS</b> (such as <b>POTASSIUM</b>, <b>SILVER</b> and <b>MERCURY</b>); <b>ALCOHOLS</b>; <b>MERCAPTANS</b>; <b>CYANIDES</b>; <b>AMINES</b>; and <b>HALOGENATED HYDROCARBONS</b> (such as <b>METHYLENE CHLORIDE</b> and <b>TRICHLOROETHYLENE</b>).</p>

## SPILL/LEAKS

**Isolation Distance:**

Small Spill: 30 meters (100 feet)                      Fire: 1,600 meters (1 mile)

Large Spill: 150 meters (500 feet)

Stop flow of gas. If source of leak is a cylinder and the leak cannot be stopped in place, remove the leaking cylinder to a safe place in the open air, and repair leak or allow cylinder to empty.

Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers for disposal.

Use only non-sparking tools and equipment, especially when opening and closing containers of **Ethylene Oxide**.

Keep **Ethylene Oxide** out of confined spaces, such as sewers, because of the possibility of an explosion.

Use water spray to keep containers cool.

Turn leaking cylinder with leak up to prevent escape of gas in the liquid state.

No adverse ecological effects are expected.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	257 to 690 ppm
<b>Flash Point:</b>	-4°F (-20°C)
<b>LEL:</b>	3%
<b>UEL:</b>	100%
<b>Auto Ignition Temp:</b>	804°F (429°C)
<b>Vapor Density:</b>	1.5 (air = 1)
<b>Vapor Pressure:</b>	1,095 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	0.87 (water = 1)
<b>Water Solubility:</b>	Miscible
<b>Boiling Point:</b>	51°F (11°C)
<b>Freezing Point:</b>	-170°F (-112°C)
<b>Ionization Potential:</b>	10.56 eV
<b>Molecular Weight:</b>	44.06

## EXPOSURE LIMITS

**OSHA:** 1 ppm, 8-hr TWA; 5 ppm, 15-min Excursion

**NIOSH:** <0.1 ppm, 10-hr TWA; 5 ppm, 10-min Ceiling

**ACGIH:** 1 ppm, 8-hr TWA

**IDLH:** 800 ppm

The Protective Action Criteria values are:

PAC-1 = 5 ppm    PAC-2 = 45 ppm    PAC-3 = 200 ppm

## HEALTH EFFECTS

<b>Eyes:</b>	Severe irritation and burns
<b>Skin:</b>	Severe irritation and burns. Contact with liquid causes frostbite
<b>Inhalation:</b>	Nose, throat and lung irritation, with coughing, and severe shortness of breath (pulmonary edema)
	Headache, nausea, vomiting, dizziness, twitching, and seizures
<b>Chronic:</b>	Cancer (leukemia) in humans

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl and Silvershield®/4H® (<1-hr breakthrough)
<b>Coveralls:</b>	Tychem® BR, TK and Responder®; and Trelchem® HPS and VPS (>8-hr breakthrough) At 10% of the LEL use turn-out gear or flash protection
<b>Respirator:</b>	SCBA

## FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Immerse** affected part in warm water. Seek medical attention.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

**Medical** observation is recommended as symptoms may be delayed.

# RIGHT TO KNOW

## HAZARDOUS SUBSTANCE FACT SHEET

**Common Name:** FENTHION

**Synonyms:** Baytex; Entex; Lebaycid

**CAS Number:** 55-38-9

**Molecular Formula:** C<sub>10</sub>H<sub>15</sub>O<sub>3</sub>PS<sub>2</sub>

**RTK Number:** 0916

**Description:** Colorless to yellow-brown liquid which usually has a garlic odor. Also available in granular form.

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>Health:</b> 3 <b>Fire:</b> 1 <b>Reactivity:</b> 1 <b>DOT #:</b> UN 3018 UN 2783 <b>ERG #:</b> 152 <b>DOT Hazard:</b> 6.1 (poison)	Extinguish fire using an agent suitable for type of surrounding fire. <b>Fenthion</b> itself does not burn. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Phosphorus and Sulfur Oxides</i> . CONTAINERS MAY EXPLODE IN FIRE when organic solvent is used as a carrier. Use water spray to keep fire-exposed containers cool. Carrier solvents used in commercial formulations may change physical and toxicological properties.	<b>Fenthion</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); and ALKALINE INSECTICIDES.

### SPILLS/LEAKS

**Isolation Distances:**

**Liquid Spill:** 50 meters (150 feet)

**Solid Spill:** 25 meters (75 feet)

**Fire:** 800 meters (1/2 mile)

Evacuate personnel.

Secure and control entrance to the area.

If it is safe to do so, remove potential ignition sources.

Absorb *liquids* in vermiculite, dry sand, earth or a similar material and deposit in sealed containers.

Collect *powdered* material in the most convenient and safe manner and deposit in sealed containers. DO NOT DRY SWEEP.

Do NOT allow this substance to enter waterways, including sewers, as it is very toxic to aquatic life with long-lasting effects.

Ventilate the area of spill or leak after clean-up is complete.

### PHYSICAL PROPERTIES

**Auto-Ignition:** 365 °C (689 °F)

**Flash Point:** 170 °C (338 °F)

**Relative Vapor Density:** 9.6 (air = 1)

**Relative Density:** 1.25 (water = 1)

**Water Solubility:** Insoluble

**Boiling Point:** 87 °C (189 °F)

**Melting Point:** 7.5 °C (43 °F)

**Molecular Weight:** 278.3

### EXPOSURE LIMITS

The following exposure limits are for **Fenthion**:

**ACGIH:** 0.2 mg/m<sup>3</sup>, 8-hour average

**PAC:** PAC-1 = 0.15 mg/m<sup>3</sup>

PAC-2 = 5.9 mg/m<sup>3</sup>

PAC-3 = 35 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

**Gloves:** Nitrile and Neoprene

**Coverall:** Tychem® BR, CSM and TK, or the equivalent

**Respirator:** >0.2 mg/m<sup>3</sup> – supplied-air, full facepiece, pressure-demand or another positive-pressure mode

### ACUTE HEALTH EFFECTS

**Eyes:** Irritation, blurred vision

**Skin:** Irritation

**Inhalation:** Runny nose, cough, headache, dizziness, chest tightness, twitching, loss of coordination, convulsions, coma, death

### FIRST AID AND DECONTAMINATION

Immediately flush eyes with large amounts of water for at least 15 minutes.

Quickly remove contaminated clothing.

Immediately wash contaminated skin with large amounts of soap and water.

Shampoo hair immediately if contaminated.

Remove the person from exposure.

Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.

Transfer promptly to a medical facility.

Medical observation is required for several days as some symptoms may be delayed.

Common Name: **FERRIC AMMONIUM CITRATE**

Synonyms: Ammonium Ferric Citrate; Citric Acid, Ammonium Iron (3+) Salt

CAS No: 1185-57-5

Molecular Formula:  $C_6H_{13}NFeO_{10}$

RTK Substance No: 0918

Description: Yellowish-brown to red or green powder with a faint *Ammonia*-like odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>1 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 3077 ERG Guide #: 171 Hazard Class: 9 (Environmentally Hazardous Material)	Extinguish fire using an agent suitable for type of surrounding fire. <b>Ferric Ammonium Citrate</b> itself does not burn. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> and <i>Ammonia</i> . Use water spray to keep fire-exposed containers cool.	<b>Ferric Ammonium Citrate</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and IODIDES. <b>Ferric Ammonium Citrate</b> may decompose on exposure to LIGHT and MOISTURE.

### SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Collect powdered material in the most convenient and safe manner and place into sealed containers for disposal.

For water spills neutralize with Agricultural Lime, crushed Limestone or Sodium Bicarbonate.

DO NOT wash into sewer.

**Ferric Ammonium Citrate** may be toxic to aquatic life.

### PHYSICAL PROPERTIES

**Odor Threshold:** *Ammonia*-like odor

**Flash Point:** Noncombustible

**Specific Gravity:** 1.8 (water = 1)

**Water Solubility:** Soluble

**pH:** <7 in aqueous solution

**Molecular Weight:** Varies

### EXPOSURE LIMITS

No occupational exposure limits have been established for **Ferric Ammonium Citrate**.

The Protective Action Criteria values are:

PAC-1 = 5.4 mg/m<sup>3</sup>

PAC-2 = 500 mg/m<sup>3</sup>

PAC-3 = 500 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

**Gloves:** Nitrile and Natural Rubber

**Coveralls:** Tyvek®

**Respirator:** >5 mg/m<sup>3</sup> - full facepiece APR with *High efficiency filters*  
>500 mg/m<sup>3</sup> - SCBA

### HEALTH EFFECTS

**Eyes:** Irritation

**Skin:** Irritation

**Inhalation:** Nose, throat and lung irritation with coughing, wheezing and shortness of breath

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Remove** contaminated clothing and wash contaminated skin with soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **FERRIC NITRATE**

Synonyms: Iron(III) Nitrate; Iron Trinitrate

CAS No: 10421-48-4

Molecular Formula: FeN<sub>3</sub>O<sub>9</sub>

RTK Substance No: 0924

Description: Pale violet, green or white, odorless, crystalline solid

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<p><b>2 - Health</b></p> <p><b>0 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p>DOT#: UN 1466</p> <p>ERG Guide #: 140</p> <p>Hazard Class: 5.1 (Oxidizer)</p>	<p><b>Ferric Nitrate</b> is not combustible, but it is a STRONG OXIDIZER that enhances the combustion of other substances.</p> <p>Use water only. DO NOT USE DRY CHEMICAL or CO<sub>2</sub> as extinguishing agents.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> and <i>Nitric Acid</i>.</p>	<p><b>Ferric Nitrate</b> may react with ORGANIC COMPOUNDS; COMBUSTIBLES; REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES); and ALKYL ESTERS to cause fires and explosions.</p> <p><b>Ferric Nitrate</b> is not compatible with METALS (especially pyrophoric metals such as <i>finely divided</i> ALUMINUM and MAGNESIUM); CYANIDE COMPOUNDS; METAL SALTS; STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); ALCOHOLS; HYDRAZINE; PEROXIDES; GLYCIDOL; ETHERS; and ISOPROPYL CHLOROCARBONATE.</p>

**SPILL/LEAKS**

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

Neutralize liquid spills with dry lime, sand or soda ash and place into sealed containers for disposal.

DO NOT wash into sewer.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Nonflammable
<b>Specific Gravity:</b>	1.7 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	Decomposes at <212°F (<100°C)
<b>Melting Point:</b>	117°F (47°C)
<b>Molecular Weight:</b>	242

**EXPOSURE LIMITS**

**NIOSH:** 1 mg/m<sup>3</sup>, 10-hr TWA (as *Iron*)

**ACGIH:** 1 mg/m<sup>3</sup>, 8-hr TWA (as *Iron*)

The Protective Action Criteria values are:

PAC-1 = 13 mg/m<sup>3</sup>; PAC-2 = 140 mg/m<sup>3</sup>;  
PAC-3 = 850 mg/m<sup>3</sup>

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Nitrile and Natural Rubber
<b>Coveralls:</b>	Tyvek®
<b>Respirator:</b>	>1 mg/m <sup>3</sup> - full facepiece APR with High efficiency filter >13 mg/m <sup>3</sup> - Pressure demand supplied air or SCBA

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose and throat irritation with coughing and wheezing Headache, fatigue, dizziness and a blue color to the skin and lips ( <i>methemoglobinemia</i> )

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Remove** contaminated clothing and wash contaminated skin with water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.



Common Name: **FERRIC SULFATE**

Synonyms: Iron Persulfate; Iron (3+) Sulfate

CAS No: 10028-22-5

 Molecular Formula:  $\text{Fe}_2\text{O}_{12}\text{S}_3$ 

RTK Substance No: 0925

Description: Odorless, grayish-white or yellow powder or crystalline, lumpy solid

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 3077 ERG Guide #: 171 Hazard Class: 9 (Miscellaneous Hazardous Material)	Extinguish fire using an agent suitable for type of surrounding fire. <b>Ferric Sulfate</b> itself does not burn. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Sulfur Oxides</i> and <i>Iron Oxides</i> . Use water spray to keep fire-exposed containers cool.	<b>Ferric Sulfate</b> may react violently with STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE). <b>Ferric Sulfate</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE). <b>Ferric Sulfate</b> is hygroscopic and sensitive to light.

**SPILL/LEAKS**
**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

DO NOT wash into sewer.

**Ferric Sulfate** is dangerous to aquatic life.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Nonflammable
<b>Specific Gravity:</b>	3.1 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	Decomposes
<b>Melting Point:</b>	Decomposes at 896°F (480°C)
<b>Molecular Weight:</b>	399.9

**EXPOSURE LIMITS**
**NIOSH:** 1 mg/m<sup>3</sup>, 10-hr TWA (as *Iron*)

**ACGIH:** 1 mg/m<sup>3</sup>, 8-hr TWA (as *Iron*)

The Protective Action Criteria values are:

 PAC-1 = 10.7 mg/m<sup>3</sup>

 PAC-2 = 17.9 mg/m<sup>3</sup>

 PAC-3 = 75 mg/m<sup>3</sup>
**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Nitrile, Neoprene and Natural Rubber
<b>Coveralls:</b>	Tyvek®
<b>Respirator:</b>	>1 mg/m <sup>3</sup> - Supplied air or full-facepiece APR with High efficiency particulate filters >10 mg/m <sup>3</sup> - SCBA

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose and throat irritation with coughing and wheezing.

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **FERROUS SULFATE**

Synonyms: Copperas; Green Vitriol; Iron Monosulfate

CAS No: 7720-78-7

Molecular Formula: FeSO<sub>4</sub>

RTK Substance No: 0931

Description: Greenish, yellow-brown or white, odorless, crystalline (sand-like) powder

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>2 - Health</b></p> <p><b>0 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p><b>DOT#:</b> UN 3077</p> <p><b>ERG Guide #:</b> 171</p> <p><b>Hazard Class:</b> 9 (Miscellaneous Hazardous Material)</p>	<p>Extinguish fire using an agent suitable for type of surrounding fire. <b>Ferrous Sulfate</b> itself does not burn.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Sulfur Oxides</i>.</p> <p>Use water spray to keep fire-exposed containers cool.</p>	<p><b>Ferrous Sulfate</b> may react violently or explosively on contact with ARSENIC TRIOXIDE; SODIUM NITRATE; METHYL ISOCYANOACETATE; and STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE).</p> <p><b>Ferrous Sulfate</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); ALKALI METALS (such as LITHIUM, SODIUM and POTASSIUM); CARBONATES (such as LIME); and GOLD and SILVER SALTS.</p>

### SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

DO NOT wash into sewer.

**Ferrous Sulfate** is harmful to aquatic life in very low concentrations.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Nonflammable
<b>Specific Gravity:</b>	3 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	572°F (300°C)
<b>Melting Point:</b>	147°F (64°C)
<b>Molecular Weight:</b>	151.9

### EXPOSURE LIMITS

**NIOSH:** 1 mg/m<sup>3</sup>, 10-hr TWA (as *Iron salts*)

**ACGIH:** 1 mg/m<sup>3</sup>, 8-hr TWA (as *Iron salts*)

The Protective Action Criteria values are:

PAC-1 = 8.2 mg/m<sup>3</sup>

PAC-2 = 41 mg/m<sup>3</sup>

PAC-3 = 250 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Nitrile, Neoprene and Natural Rubber
<b>Coveralls:</b>	Tyvek®
<b>Respirator:</b>	>1 mg/m <sup>3</sup> - full facepiece APR with High efficiency filters >8 mg/m <sup>3</sup> - SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, wheezing and shortness of breath

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

# RIGHT TO KNOW HAZARDOUS SUBSTANCE FACT SHEET

**Common Name: FONOFOS**

Synonyms: Dyfonate; Difonatul; Difonate  
 CAS Number: 944-22-9  
 Molecular Formula: C<sub>10</sub>H<sub>15</sub>OPS<sub>2</sub>  
 RTK Number: 0945  
 Description: Yellow liquid with a strong odor; also available in granular form

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>Health:</b> 3 <b>Fire:</b> 1 <b>Reactivity:</b> 1 <b>DOT #:</b> UN 3018/UN 2783 <b>ERG #:</b> 152 <b>DOT Hazard:</b> 6.1 (poison)	Extinguish fire using an agent suitable for type of surrounding fire. <b>Fonofos</b> itself does not burn. <b>POISONOUS GASES ARE PRODUCED IN FIRE,</b> including <i>Oxides of Phosphorus</i> and <i>Oxides of Sulfur</i> .  <b>CONTAINERS MAY EXPLODE IN FIRE.</b> Use water spray to keep fire-exposed containers cool.	<b>Fonofos</b> is susceptible to formation of highly toxic and flammable <i>phosphine gas</i> in the presence of strong <b>REDUCING AGENTS</b> such as <i>hydrides</i> .  Partial oxidation by <b>OXIDIZING AGENTS</b> may result in the release of toxic phosphorus oxides.

**SPILLS/LEAKS**

**Isolation Distances:**  
**Liquid Spill:** 50 meters (150 feet)  
**Solid Spill:** 25 meters (75 feet)  
**Fire:** 800 meters (1/2 mile)

Evacuate personnel.  
 Secure and control entrance to the area.  
 If it is safe to do so, remove potential ignition sources.  
 Absorb *liquids* in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.  
 Collect *powdered* material in the most convenient and safe manner and deposit in sealed containers. **DO NOT DRY SWEEP.**  
 Do not allow this substance to enter waterways, including sewers, as it is very toxic to aquatic life with long-lasting effects.  
 Ventilate area of spill or leak after clean-up is complete.

**PHYSICAL PROPERTIES**

**Relative Density:** 1.16 (water = 1)  
**Flash Point:** >94 °C (>201 °F)  
**Molecular Weight:** 246.3  
**Vapor Pressure:** 0.00021 mm Hg at 25 °C (77 °F)  
**Water Solubility:** Very slightly soluble

**EXPOSURE LIMITS**

The following exposure limits are for **Fonofos**:

**NIOSH:** 0.1 mg/m<sup>3</sup>, 10-hour average  
**ACGIH:** 0.1 mg/m<sup>3</sup>, 8-hour average  
**PAC:** PAC-1 = 0.3 mg/m<sup>3</sup>  
           PAC-2 = 1.3 mg/m<sup>3</sup>  
           PAC-3 = 53 mg/m<sup>3</sup>

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Nitrile and Neoprene
<b>Coverall:</b>	Tychem® BR, Responder® and TK or the equivalent
<b>Respirator:</b>	>0.1 mg/m <sup>3</sup> - supplied-air, full facepiece, pressure-demand or another positive-pressure mode

**ACUTE HEALTH EFFECTS**

**Eyes:** Blurred vision  
**Skin:** Irritation  
**Inhalation:** Headache, dizziness, blurred vision, chest tightness, twitching, loss of coordination, convulsions, coma, death

**FIRST AID AND DECONTAMINATION**

Immediately flush eyes with large amounts of water for at least 15 minutes. Quickly remove contaminated clothing. Immediately wash area with large amounts of soap and water.  
 Shampoo hair immediately if contaminated.  
 Remove the person from exposure.  
 Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.  
 Transfer promptly to a medical facility.  
 Medical observation is required for several days as some symptoms may be delayed.

Common Name: **FORMALDEHYDE**

Synonyms: Formalin; Methyl Aldehyde; Methylene Oxide

CAS No: 50-00-0

Molecular Formula: CH<sub>2</sub>O

RTK Substance No: 0946

Description: Colorless gas with a strong odor, usually found in a *Methanol* and water solution

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>4 - Health</b> <b>4 - Fire</b> <b>0 - Reactivity</b>  <b>DOT#:</b> UN 1198 (Solutions, Flammable) UN 2209 (Solutions)  <b>ERG Guide #:</b> 132 <b>Hazard Class:</b> UN 1198 (3, Flammable) UN 2209 (8, Corrosive)	<b>Formaldehyde</b> is a <b>FLAMMABLE GAS</b> or <b>COMBUSTIBLE SOLUTION</b> .  Use dry chemical, CO <sub>2</sub> , water spray or alcohol-resistant foam as extinguishing agents.  Use water spray to reduce vapors.  <b>POISONOUS GASES ARE PRODUCED IN FIRE.</b>  <b>CONTAINERS MAY EXPLODE IN FIRE.</b>  Use water spray to keep fire-exposed containers cool.	<b>Formaldehyde</b> reacts violently with <b>NITROGEN OXIDES; OXIDIZING AGENTS</b> (such as <b>PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE</b> ); mixtures of <b>PERCHLORIC ACID</b> and <b>ANILINE; NITROMETHANE; MAGNESIUM CARBONATE;</b> and <b>HYDROGEN PEROXIDE.</b>  <b>Formaldehyde</b> reacts with <b>PHENOL</b> and <b>HYDROGEN CHLORIDE</b> to form toxic <i>Bis(Chloromethyl) Ether</i> .  <b>Formaldehyde</b> is not compatible with <b>STRONG ACIDS</b> (such as <b>HYDROCHLORIC, SULFURIC and NITRIC</b> ); <b>STRONG BASES</b> (such as <b>SODIUM HYDROXIDE and POTASSIUM HYDROXIDE</b> ); <b>IODINE; IRON; SILVER; ISOCYANATES; AMINES; ANHYDRIDES;</b> and <b>LIQUID OXYGEN.</b>  Pure <b>Formaldehyde</b> may polymerize (self-react).

**SPILL/LEAKS**

**Isolation Distance:**  
 Spill: 50 meters (150 feet)  
 Fire: 800 meters (1/2 mile)  
 Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers for disposal.  
 Stop flow of gas. If source of leak is a cylinder and the leak cannot be stopped in place, remove the leaking cylinder to a safe place in the open air, and repair leak or allow cylinder to empty.  
 Use only non-sparking tools and equipment, especially when opening and closing containers of **Formaldehyde**.  
 Keep **Formaldehyde** out of confined spaces, such as sewers, because of the possibility of an explosion.  
 DO NOT wash into sewer.  
**Formaldehyde** is harmful to aquatic life at low concentrations.

**PHYSICAL PROPERTIES**

**Odor Threshold:** 0.05 to 1 ppm  
**Flash Point:** 140° to 181°F (60° to 83°C) (solutions)  
**LEL:** 7%  
**UEL:** 73%  
**Auto Ignition Temp:** 572°F (300°C) (gas); 806°F (430°C) (solution)  
**Vapor Density:** 1.07 (air = 1) (gas)  
**Vapor Pressure:** 760 mm Hg at 68°F (20°C)  
**Specific Gravity:** 0.8 to 1.1 (water = 1)  
**Water Solubility:** Soluble  
**Boiling Point:** -3°F (-19.4°C)  
**Freezing Point:** -134°F (-92°C)  
**Ionization Potential:** 10.88 eV  
**Molecular Weight:** 30

**EXPOSURE LIMITS**

**OSHA:** 0.75 ppm, 8-hr TWA; 2 ppm, 15-min STEL  
**NIOSH:** 0.016 ppm, 10-hr TWA; 0.1 ppm, 15-min Ceiling  
**ACGIH:** 0.3 ppm, Ceiling  
**IDLH:** 20 ppm

The Protective Action Criteria values are:  
 PAC-1 = 0.9 ppm PAC-2 = 14 ppm PAC-3 = 56 ppm

**PROTECTIVE EQUIPMENT**

**Gloves:** Butyl, Nitrile, Neoprene and Viton (>8-hr breakthrough)  
**Coveralls:** Tychem® BR, Responder® and TK (>8-hr breakthrough)  
**Respirator:** SCBA

**HEALTH EFFECTS**

**Eyes:** Severe irritation, burns and possible damage  
**Skin:** Severe irritation and burns  
**Inhalation:** Nose, mouth, throat and lung irritation, with coughing, and severe shortness of breath (pulmonary edema)  
**Chronic:** Cancer (nasopharynx and leukemia) in humans

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention.  
**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** promptly to a medical facility.  
**Medical** observation is recommended as symptoms may be delayed.

Common Name: **FORMIC ACID**

Synonyms: Aminic Acid; Methanoic Acid

CAS No: 64-18-6

Molecular Formula: CH<sub>2</sub>O<sub>2</sub>

RTK Substance No: 0948

Description: Colorless liquid with a strong, penetrating odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>2 - Fire</b> <b>0 - Reactivity</b> <b>DOT#:</b> UN 1779 <b>ERG Guide #:</b> 153 <b>Hazard Class:</b> 8 (Corrosive)	<b>Formic Acid</b> is a COMBUSTIBLE LIQUID. Use dry chemical, CO <sub>2</sub> , water spray or alcohol-resistant foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE. Use water spray to keep fire-exposed containers cool and to reduce vapors.	<b>Formic Acid</b> reacts violently with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG INORGANIC BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); and STRONG ORGANIC BASES (such as AMINES) causing a fire and explosion hazard. <b>Formic Acid</b> reacts with CHEMICALLY ACTIVE METALS (such as POTASSIUM, SODIUM, MAGNESIUM and ZINC) to form flammable and explosive <i>Hydrogen gas</i> and <i>metal salts</i> . <b>Formic Acid</b> is decomposed by STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) for form poisonous <i>Carbon Monoxide gas</i> and reacts with CYANIDE SALTS to form toxic <i>Hydrogen Cyanide gas</i> .

### SPILL/LEAKS

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Cover with dry lime, sodium bicarbonate or soda ash and place into sealed containers for disposal.

DO NOT wash into sewer.

Dangerous to aquatic life in high concentrations.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	49 ppm
<b>Flash Point:</b>	122° to 156°F (50° to 69°C)
<b>LEL:</b>	18%
<b>UEL:</b>	57%
<b>Auto Ignition Temp:</b>	1,004° to 1,114°F (540° to 601°C)
<b>Vapor Density:</b>	1.6 (air = 1)
<b>Vapor Pressure:</b>	35 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.22 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	213° to 224°F (101° to 107°C)
<b>Melting Point:</b>	47°F (9°C)
<b>Ionization Potential:</b>	11.05 eV
<b>Molecular Weight:</b>	46.02

### EXPOSURE LIMITS

**OSHA:** 5 ppm, 8-hr TWA

**NIOSH:** 5 ppm, 10-hr TWA

**ACGIH:** 5 ppm, 8-hr TWA; 10 ppm, STEL

**IDLH:** 30 ppm

The Protective Action Criteria values are:

PAC-1 = 10 ppm PAC-2 = 10 ppm PAC-3 = 10 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl, Neoprene and Barrier® (>8-hr breakthrough)
<b>Coveralls:</b>	Tychem® BR, Responder® and TK; Trelchem® HPS and VPS (>8-hr breakthrough)
<b>Respirator:</b>	SCBA

### HEALTH EFFECTS

**Eyes:** Severe irritation and burns with possible eye damage

**Skin:** Irritation and burns

**Inhalation:** Nose, throat and lung irritation with coughing, and severe shortness of breath (pulmonary edema)  
Headache, dizziness, nausea and vomiting

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

**Medical** observation is recommended as symptoms may be delayed.

Common Name: **FUEL OILS (Light)**

Synonyms: #2 Heating Oil; Distillate (Light) Diesel Fuels; Fuel Oil No. 2; Diesel Oil No. 2

CAS No: None

Molecular Formula: Varies

RTK Substance No: 2444

 Description: Brown to straw-colored, slightly thick liquids with a distinct *Petroleum* odor

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>1 - Health</b> <b>2 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 1202 ERG Guide #: 128 Hazard Class: 3 (Flammable)	COMBUSTIBLE LIQUIDS Use dry chemical, CO <sub>2</sub> , water fog or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Sulfur Oxides</i> and <i>Nitrogen Oxides</i> . CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool. Vapors may travel to a source of ignition and flash back. <b>Fuel Oils</b> may accumulate static electrical charge of sufficient energy to cause a fire and/or explosion.	<b>Fuel Oils</b> are not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and ALKALI METALS (such as LITHIUM, SODIUM and POTASSIUM).

**SPILL/LEAKS**
**Isolation Distance:**

Small Spill: 60 meters (200 feet)

Large Spill: 330 meters (1,100 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.

 When off-loading bulk **Fuel Oils** for delivery or transfer, static electricity grounding must be completed prior to discharge.

DO NOT wash into sewer.

May affect aquatic life.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	0.7 ppm
<b>Flash Point:</b>	>125°F (>52°C)
<b>LEL:</b>	0.6% to 1.3%
<b>UEL:</b>	4.7% to 7.5%
<b>Auto Ignition Temp:</b>	351° to 624°F (177° to 329°C)
<b>Vapor Density:</b>	>3 (air = 1)
<b>Vapor Pressure:</b>	less than 1 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	0.87 to 0.95 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	340° to 676°F (171° to 358°C)
<b>Molecular Weight:</b>	Varies

**EXPOSURE LIMITS**
**OSHA:** None

**ACGIH:** 100 mg/m<sup>3</sup>, 8-hr TWA

**IDLH:** None

The Protective Action Criteria values are:

 PAC-1 = 100 mg/m<sup>3</sup>    PAC-2 = 500 mg/m<sup>3</sup>

 PAC-3 = 500 mg/m<sup>3</sup>
**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Nitrile, Neoprene and Viton
<b>Coveralls:</b>	Tychem® SL and Responder®; Zytron® 200 and Zytron® 300; and ONESuit® TEC
<b>Respirator:</b>	>100 mg/m <sup>3</sup> - APR with <i>Organic vapor cartridge</i> and <i>P100 prefilters</i> >500 mg/m <sup>3</sup> - SCBA

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation, drying and cracking with redness and swelling
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, wheezing and shortness of breath  Headache, dizziness, blurred vision, and loss of balance and coordination

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.  
**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** to a medical facility.



Common Name: **FURAN**

Synonyms: Divinylene Oxide; Oxole

CAS No: 110-00-9

Molecular Formula: C<sub>4</sub>H<sub>4</sub>O

RTK Substance No: 0952

Description: A clear, colorless liquid with a pleasant odor, which turns brown upon standing in air

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>4 - Fire</b> <b>1 - Reactivity</b> <b>DOT#:</b> UN 2389 <b>ERG Guide #:</b> 128 <b>Hazard Class:</b> 3 (Flammable)	<b>FLAMMABLE LIQUID</b> Use dry chemical, CO <sub>2</sub> , water spray or alcohol-resistant foam as extinguishing agents. Water may not be effective in fighting fires. <b>POISONOUS GASES ARE PRODUCED IN FIRE.</b> <b>CONTAINERS MAY EXPLODE IN FIRE.</b> Use water spray to keep fire-exposed containers cool. Vapors may travel to a source of ignition and flash back. Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.	<b>Furan</b> reacts violently with <b>OXIDIZING AGENTS</b> (such as <b>PERCHLORATES</b> , <b>PEROXIDES</b> , <b>PERMANGANATES</b> , <b>CHLORATES</b> , <b>NITRATES</b> , <b>CHLORINE</b> , <b>BROMINE</b> and <b>FLUORINE</b> ) and <b>STRONG ACIDS</b> (such as <b>HYDROCHLORIC</b> , <b>SULFURIC</b> and <b>NITRIC</b> ). <b>Furan</b> may form explosive <i>Peroxides</i> on exposure to <b>AIR</b> .

### SPILL/LEAKS

**Isolation Distance:**

Small Spills: 50 meters (150 feet)

Large Spills: 300 meters (1,000 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers. **DO NOT** wash into sewer.

Keep **Furan** out of confined spaces, such as sewers, because of the possibility of an explosion.

Volatile in soil and water with minimal degradation.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Pleasant odor
<b>Flash Point:</b>	<32°F (0°C)
<b>LEL:</b>	2.3%
<b>UEL:</b>	14.3%
<b>Vapor Density:</b>	2.3 (air = 1)
<b>Vapor Pressure:</b>	493 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	0.9 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	88°F (31°C)
<b>Melting Point:</b>	-122°F (-85.6°C)
<b>Molecular Weight:</b>	68

### EXPOSURE LIMITS

No occupational exposure limits have been established for **Furan**.

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Polyvinyl Chloride, Polyvinyl Alcohol and Silver Shield®/4H® (>8-hr breakthrough)
<b>Coveralls:</b>	DuPont Tychem® BR, LV, Responder®, and TK; Kappler® Zytron® 300; and Saint-Gobain ONESuit® TEC (>8-hr breakthrough for <i>Tetrahydrofuran</i> )
<b>Respirator:</b>	Supplied air

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing and severe shortness of breath (pulmonary edema)
<b>Chronic:</b>	Cancer (liver) in animals

### FIRST AID AND DECONTAMINATION

<b>Remove</b>	the person from exposure.
<b>Flush</b>	eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention immediately.
<b>Quickly</b>	remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water.
<b>Begin</b>	artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b>	promptly to a medical facility.
<b>Medical</b>	observation is recommended as symptoms may be delayed.

Common Name: **GASOLINE**

Synonyms: Benzin; Motor Fuel; Petrol

CAS No: 86290-81-5

Molecular Formula: C<sub>5</sub>H<sub>12</sub> to C<sub>9</sub>H<sub>20</sub> (Mixture of hydrocarbons which vary by grade)

RTK Substance No: 0957

Description: Clear, colorless to amber-colored liquid with a petroleum odor

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>3 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 1203 ERG Guide #: 128 Hazard Class: 3 (Flammable)	<b>FLAMMABLE LIQUID</b> Use dry chemical, CO <sub>2</sub> , alcohol-resistant foam or other foam extinguishing agents, as water may not be effective in fighting fires. <b>POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE.</b> Use water spray to keep fire-exposed containers cool. Vapors may travel to a source of ignition and flash back. Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source. Flow or agitation may generate electrostatic charges.	<b>Gasoline</b> may react violently with <b>OXIDIZING AGENTS</b> (such as <b>PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE</b> ) and <b>NITRIC ACID</b> .

**SPILL/LEAKS**

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers for disposal.

Keep **Gasoline** out of confined spaces, such as sewers, because of the possibility of an explosion.

Use only non-sparking tools and equipment, especially when opening and closing containers of **Gasoline**.

DO NOT wash into sewer.

**Gasoline** is harmful to aquatic organisms and is a marine pollutant.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	0.25 ppm
<b>Flash Point:</b>	-36°F (-38°C)
<b>LEL:</b>	1.2%
<b>UEL:</b>	7.6%
<b>Auto Ignition Temp:</b>	536° to 853°F (280° to 456°C)
<b>Vapor Density:</b>	3 to 4 (air = 1)
<b>Vapor Pressure:</b>	38 to 300 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	0.73 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	140° to 390°F (60° to 199°C)
<b>Molecular Weight:</b>	72 to 100

**EXPOSURE LIMITS**

**ACGIH:** 300 ppm, 8-hr TWA; 500 ppm, STEL

The Protective Action Criteria values are:

PAC-1 = 200 ppm

PAC-2 = 1,000 ppm

PAC-3 = 4,000 ppm

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Nitrile and Viton (>8-hr breakthrough)
<b>Coveralls:</b>	Tychem® BR, LV, Responder® and TK (>8-hr breakthrough)
<b>Respirator:</b>	>300 ppm - Supplied air or SCBA

**HEALTH EFFECTS**

**Eyes:** Irritation and burns

**Skin:** Irritation and burns

**Inhalation:** Nose, throat and lung irritation with coughing, wheezing and shortness of breath

Headache, nausea, weakness, dizziness, blurred vision, irregular heartbeat, and passing out

**Chronic:** Cancer (liver) in animals

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility

Common Name: **GLUTARALDEHYDE**

Synonyms: 1,3-Diformylpropane; Glutaral; Cidex®; Procide®

CAS No: 111-30-8

Molecular Formula: C<sub>5</sub>H<sub>8</sub>O<sub>2</sub>

RTK Substance No: 0960

Description: Colorless glass-like crystals that are usually in a 2% to 50% water solution

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>2 - Health</b></p> <p><b>0 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p><b>DOT#:</b> UN 2810</p> <p><b>ERG Guide #:</b> 153</p> <p><b>Hazard Class:</b> 6.1 (Poison)</p>	<p>Extinguish fire using an agent suitable for type of surrounding fire. <b>Glutaraldehyde</b> itself does not burn.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE.</p> <p>Use water spray to keep fire-exposed containers cool.</p>	<p><b>Glutaraldehyde</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); AMINES; ALCOHOLS and KETONES.</p>

### SPILL/LEAKS

**Isolation Distance:**

Spill (Small): 30 meters (100 feet)

(Large): 60 meters (200 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in dry sand, earth, or a similar material and place into sealed containers for disposal.

DO NOT wash into sewer.

**Glutaraldehyde** is very toxic to aquatic organisms.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	0.04 ppm
<b>Flash Point:</b>	Nonflammable
<b>Vapor Density:</b>	3.4 (air = 1)
<b>Vapor Pressure:</b>	17 mm Hg at 68°F (20°C); <0.1 mm Hg at 68°F (20°C) for <i>solutions</i>
<b>Specific Gravity:</b>	1.1 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	369° to 372°F (187° to 189°C)
<b>Freezing Point:</b>	<20°F (<-7°C)
<b>Molecular Weight:</b>	100.1

### EXPOSURE LIMITS

**NIOSH:** 0.2 ppm; Ceiling

**ACGIH:** 0.05 ppm; Ceiling

The Protective Action Criteria values are:

PAC-1 = 0.2 ppm    PAC-2 = 1 ppm

PAC-3 = 5 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl, Neoprene, Viton and Barrier® (>8-hr breakthrough)
<b>Coveralls:</b>	Tychem® fabrics (>8-hr breakthrough)
<b>Respirator:</b>	SCBA

### HEALTH EFFECTS

**Eyes:** Irritation and burns

**Skin:** Irritation and burns

**Inhalation:** Nose, throat and lung irritation with coughing and wheezing and shortness of breath

Headache, nausea and vomiting.

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **GLYCIDALDEHYDE**

Synonyms: 2,3-Epoxypropanol; Glycidal

CAS No: 765-34-4

 Molecular Formula: C<sub>3</sub>H<sub>4</sub>O<sub>2</sub>

RTK Substance No: 0961

Description: Colorless liquid with a strong odor

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>3 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 2622 ERG Guide #: 131P Hazard Class: 3 (Flammable)	<b>Glycidaldehyde</b> is a FLAMMABLE LIQUID. Use dry chemical, CO <sub>2</sub> , water spray or alcohol-resistant foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool. Vapors may travel to a source of ignition and flash back. Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.	<b>Glycidaldehyde</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); and REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES).  <b>Glycidaldehyde</b> is an <i>Epoxyde</i> and an <i>Aldehyde</i> . These substances are frequently reactive and can polymerize to give off heat and/or cause violent reactions.

**SPILL/LEAKS**
**Isolation Distance:**

Small Spill: 60 meters (200 feet)

Large Spill: 270 meters (900 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.

 Keep **Glycidaldehyde** out of confined spaces, such as sewers, because of the possibility of an explosion.

DO NOT wash into sewer.

Bioaccumulation is not significant. Biodegrades rapidly.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	Strong odor
<b>Flash Point:</b>	88°F (31°C)
<b>Vapor Density:</b>	2.58 (air = 1)
<b>Vapor Pressure:</b>	27 mm Hg at 77°F (25°C)
<b>Specific Gravity:</b>	1.14 (water = 1)
<b>Water Solubility:</b>	Miscible
<b>Boiling Point:</b>	234° to 235°F (112° to 113°C)
<b>Melting Point:</b>	-80°F (-62°C)
<b>Molecular Weight:</b>	72.1

**EXPOSURE LIMITS**

 No occupational exposure limits have been established for **Glycidaldehyde**.

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Butyl, PVC and Silver Shield®/4H®, (4-hr breakthrough for <i>Aldehydes</i> )
<b>Coveralls:</b>	DuPont Tychem® BR, LV, Responder®, and TK; Kappler® Zytron® 500; and Saint-Gobain ONESuit® TEC (>8-hr breakthrough for <i>Aliphatic Aldehydes</i> )
<b>Respirator:</b>	Supplied air

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns with itching and rash
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing and severe shortness of breath (pulmonary edema)
<b>Chronic:</b>	Cancer (skin) in animals

**FIRST AID AND DECONTAMINATION**

<b>Remove</b> the person from exposure.
<b>Flush</b> eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention immediately.
<b>Quickly</b> remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention.
<b>Begin</b> artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b> to a medical facility.
<b>Medical</b> observation is recommended as symptoms may be delayed.

Common Name: **GLYPHOSATE**

Synonyms: Glycine, N-(Phosphonomethyl)-; Glyphosat; Glyphomax; Roundup®

CAS No: 1071-83-6

Molecular Formula: C<sub>3</sub>H<sub>8</sub>NO<sub>5</sub>P

RTK Substance No: 3139

Description: Odorless, white powder, colorless, crystalline solid or an amber colored liquid

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>2 - Health</b></p> <p><b>0 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p><b>DOT#: UN 3077</b></p> <p><b>ERG Guide #: 171</b></p> <p><b>Hazard Class: 9</b> (Environmentally Hazardous Substance)</p>	<p>Although <i>solid Glyphosate</i> does not burn, it may be dissolved in a liquid carrier that is flammable or combustible.</p> <p>Use dry chemical, CO<sub>2</sub>, water spray or alcohol-resistant foam as extinguishing agents.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> and <i>Phosphorus Oxides</i>.</p> <p>Use water spray to keep fire-exposed containers cool.</p> <p><i>Finely dispersed Glyphosate</i> may form explosive mixtures in air.</p>	<p><b>Glyphosate</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); and STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE).</p> <p><b>Glyphosate</b> may react with IRON, GALVANIZED STEEL and UNLINED STEEL CONTAINERS to produce flammable and explosive <i>Hydrogen gas</i>.</p>

### SPILL/LEAKS

**Isolation Distance:**

**Spill (solid):** 25 meters (75 feet)  
**(liquid):** 50 meters (150 feet)

**Fire:** 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers for disposal.

Moisten *solid* spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

*Finely dispersed Glyphosate* may accumulate static electricity.

DO NOT wash into sewer.

**Glyphosate** is harmful to aquatic life.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Flammable/Combustible in <i>solution</i>
<b>Vapor Pressure:</b>	1.94 x 10 <sup>-7</sup> mm Hg at 113°F (45°C)
<b>Specific Gravity:</b>	1.74 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	Decomposes above 392°F (200°C)
<b>Melting Point:</b>	446°F (230°C)
<b>Molecular Weight:</b>	169.07

### EXPOSURE LIMITS

No occupational exposure limits have been established for **Glyphosate**.

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl and Viton® (>8-hr breakthrough for <i>solid Glyphosate</i> )
<b>Coveralls:</b>	Tyvek® (for <i>solid Glyphosate</i> ) Tychem® BR, CSM, TK; and Trelchem® HPS and VPS (>8-hr breakthrough for <i>solutions</i> containing <b>Glyphosate</b> )
<b>Respirator:</b>	Spills (solid) - full facepiece APR with <i>P100 filter cartridges</i> Spills (liquid) and Fire - SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose and throat irritation Headache, dizziness, nausea, vomiting, diarrhea, abdominal pain, low blood pressure and convulsions
	* <b>Glyphosate</b> DOES NOT inhibit cholinesterase activity

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **HELIUM**

Synonyms: None

CAS No: 7440-59-7

Molecular Formula: He

RTK Substance No: 0972

Description: Colorless, odorless gas or liquid

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>3 (liquid) - Health</b> <b>1 (gas) - Health</b></p> <p><b>0 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p><b>DOT#:</b> UN 1046 (Compressed Gas) UN 1963 (Cryogenic liquid)</p> <p><b>ERG Guide #:</b> 121 (Compressed Gas) 120 (Cryogenic liquid)</p> <p><b>Hazard Class:</b> 2.2 (Non-flammable Gas)</p>	<p>Extinguish fire using an agent suitable for type of surrounding fire. <b>Helium</b> itself does not burn.</p> <p><b>CONTAINERS MAY RUPTURE OR BURST IN FIRE.</b></p> <p>Use water spray to keep fire-exposed containers cool.</p>	<p>Protect from HEAT and SUNLIGHT.</p> <p>Water applied directly to leak may cause ice and a dense fog or cloud.</p>

### SPILL/LEAKS

**Isolation Distance:** 100 meters (330 feet)

No adverse effect to plant life.

### PHYSICAL PROPERTIES

**Odor Threshold:** Odorless  
**Flash Point:** Non-flammable  
**Relative Density:** 0.138 (air = 1)  
**Vapor Pressure:** No information  
**Water Solubility:** Very slightly soluble  
**Boiling Point:** -452°F (-269°C)  
**Melting Point:** -458°F (-272.2°C)

### EXPOSURE LIMITS

**OSHA:** Maintain Oxygen Level above 19.5%

**ACGIH:** Simple Asphyxiant

**IDLH LEVEL:** N/A

### PROTECTIVE EQUIPMENT

**Gloves:** Resistant to tears and cold  
**Coveralls:** Insulating materials  
**Boots:** No information  
**Respirator:** < 19.5% Oxygen - SCBA

### HEALTH EFFECTS

**Eyes:** Contact with liquid - causes frostbite

**Skin:** Contact with liquid - causes frostbite

**Acute:** Headache, dizziness, lightheadedness, passing out, suffocation from lack of Oxygen, and death

**Chronic:** No information

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**For** skin contact, immerse affected part in warm water.

**Transfer** to a medical facility.



Common Name: **HEXACHLOROCYCLOHEXANE (mixed isomers)**

Synonyms: BHC/HCH; 1,2,3,4,5,6-Benzenehexachloride

CAS No: 608-73-1

 Molecular Formula: C<sub>6</sub>H<sub>6</sub>Cl<sub>6</sub>

RTK Substance No: 3334

Description: White, yellowish or brownish flake or crystalline powder with a musty odor

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 2761 ERG Guide #: 151 Hazard Class: 6.1 (Poison)	<b>Hexachlorocyclohexane</b> does not burn, however, it is often dissolved in a liquid carrier which may be flammable or combustible. Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, Including <i>Phosgene, Chlorine</i> and <i>Hydrogen Chloride</i> . Use water spray to keep fire-exposed containers cool.	<b>Hexachlorocyclohexane</b> in contact with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) may result in fires and explosions. <b>Hexachlorocyclohexane</b> is not compatible with ALKALI METALS (such as LITHIUM, SODIUM and POTASSIUM); REDUCING AGENTS; STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); AMINES; AZO and DIAZO COMPOUNDS; NITRIDES (such as AMMONIA and CYANOGEN); and EPOXIDES.

## SPILL/LEAKS

**Isolation Distance:**

Spills: 25 meters (75 feet)

Fires: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and deposit into sealed containers.

DO NOT wash into sewer.

**Hexachlorocyclohexane (mixed isomers)** is toxic to aquatic organisms and bioaccumulates.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Musty odor
<b>Flash Point:</b>	Noncombustible <i>solid</i>
<b>Vapor Density:</b>	1.85 (air = 1)
<b>Vapor Pressure:</b>	0.5 mm Hg at 140°F (60°C)
<b>Specific Gravity:</b>	1.67 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Melting Point:</b>	149°F (65°C)
<b>Molecular Weight:</b>	291

## EXPOSURE LIMITS

**OSHA:** 0.5 mg/m<sup>3</sup>, 8-hr TWA

**NIOSH:** 0.5 mg/m<sup>3</sup>, 10-hr TWA

**ACGIH:** 0.5 mg/m<sup>3</sup>, 8-hr TWA

**IDLH:** 50 mg/m<sup>3</sup>  
 (All of the above are for *gamma-Hexachlorocyclohexane*)

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Nitrile, Polyvinyl Alcohol, Silver Shield®/4H® and Viton (>8-hr breakthrough for <i>Halogen compounds, Benzyllic</i> )
<b>Coveralls:</b>	DuPont Tyvek®
<b>Respirator:</b>	>0.5 mg/m <sup>3</sup> - full facepiece APR with Organic vapor filter and High efficiency prefilters >5 mg/m <sup>3</sup> - Supplied air

## HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, wheezing and shortness of breath  Headache, nausea, vomiting, dizziness, muscle weakness and convulsions
<b>Chronic:</b>	Cancer (liver) in animals

## FIRST AID AND DECONTAMINATION

<b>Remove</b> the person from exposure.
<b>Flush</b> eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
<b>Quickly</b> remove contaminated clothing. Wash contaminated skin with large amounts of soap and water.
<b>Begin</b> artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b> promptly to a medical facility

Common Name: **HEXAMETHYLENE DIISOCYANATE**

Synonyms: HDI; 1,6-Diisocyanatohexane

CAS No: 822-06-0

Molecular Formula: C<sub>8</sub>H<sub>12</sub>N<sub>2</sub>O<sub>2</sub>

RTK Substance No: 0995

Description: Clear, colorless to yellow liquid with a sharp, irritating odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>2 - Health</b></p> <p><b>1 - Fire</b></p> <p><b>1 - Reactivity</b></p> <p><b>DOT#:</b> UN 2281</p> <p><b>ERG Guide #:</b> 156</p> <p><b>Hazard Class:</b> 6.1 (Poison)</p>	<p><b>Hexamethylene Diisocyanate</b> is a COMBUSTIBLE LIQUID.</p> <p>Use dry chemical, CO<sub>2</sub>, water spray or foam as extinguishing agents.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> and <i>Hydrogen Cyanide</i>.</p> <p>Use water spray to keep fire-exposed containers cool.</p> <p>Hazardous polymerization (self reaction) occurs at temperatures above 392°F (200°C).</p>	<p><b>Hexamethylene Diisocyanate</b> may react violently with ALCOHOLS; AMINES; STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); ORGANOTIN; OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); and CARBOXYLIC ACIDS.</p> <p><b>Hexamethylene Diisocyanate</b> reacts with WATER to form <i>Carbon Dioxide</i> and decomposes in WATER to form <i>Amine</i> and <i>Polyureas</i>.</p>

### SPILL/LEAKS

**Isolation Distance:**

Small Spill: 60 meters (200 feet)

Large Spill: 270 meters (900 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.

Rapidly degrades in water.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	0.001 ppm
<b>Flash Point:</b>	284°F (140°C)
<b>LEL:</b>	0.9%
<b>UEL:</b>	9.5%
<b>Auto Ignition:</b>	849°F (454°C)
<b>Vapor Density:</b>	5.81 (air = 1)
<b>Vapor Pressure:</b>	0.05 mm Hg at 77°F (25°C)
<b>Specific Gravity:</b>	1.04 (water = 1)
<b>Water Solubility:</b>	Reacts/Decomposes
<b>Boiling Point:</b>	415°F (213°C)
<b>Molecular Weight:</b>	168.2

### EXPOSURE LIMITS

**NIOSH:** 0.005 ppm, 10-hr TWA; 0.02 ppm, 10-min Ceiling

**ACGIH:** 0.005 ppm, 8-hr TWA

**IDLH:** None

The Protective Action Criteria values are:

PAC-1 = 0.015 ppm PAC-2 = 0.2 ppm PAC-3 = 3.5 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl, Viton/Butyl and Silver Shield®/4H® (>8-hr breakthrough)
<b>Coveralls:</b>	Tychem® fabrics and Zytron® 400 (>8-hr breakthrough)
<b>Respirator:</b>	SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Severe irritation
<b>Skin:</b>	Severe irritation and burns, redness, eczema-like rash
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing and shortness of breath Headache, dizziness, nausea and vomiting

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention immediately.

**Quickly** remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** to a medical facility.

**Medical** observation is recommended as symptoms may be delayed.

Common Name: **HEXAMINE**

Synonyms: Hexamethylenetetramine; Methenamine

CAS No: 100-97-0

Molecular Formula: C<sub>6</sub>H<sub>12</sub>N<sub>4</sub>

RTK Substance No: 0996

Description: Colorless to white, odorless, crystalline powder

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>2 - Health</b></p> <p><b>1 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p><b>DOT#:</b> UN 1328</p> <p><b>ERG Guide #:</b> 133</p> <p><b>Hazard Class:</b> 4.1 (Flammable solid)</p>	<p>COMBUSTIBLE SOLID</p> <p><i>Finely dispersed Hexamine particulate or powdered dust</i> is an explosion hazard.</p> <p>Use dry chemical, water spray, sand, earth or foam as extinguishing agents.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i>.</p> <p>Use water spray to keep fire-exposed containers cool.</p>	<p><b>Hexamine</b> reacts violently with SODIUM PEROXIDE; 1-BROMOPENTABORANE; IODINE; and IODOFORM.</p> <p><b>Hexamine</b> reacts with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) to form toxic and corrosive gases, such as <i>Formaldehyde</i>.</p> <p><b>Hexamine</b> is not compatible with METALS (such as ALUMINUM and ZINC) and STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE).</p>

### SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

Use only non-sparking tools and equipment, especially when opening and closing containers of **Hexamine**.

Keep **Hexamine** out of confined spaces, such as sewers, because of the possibility of an explosion.

DO NOT wash into sewer.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	482°F (250°C)
<b>Auto Ignition Temp:</b>	>700°F (>371°C)
<b>Vapor Density:</b>	4.9 (air = 1)
<b>Vapor Pressure:</b>	4 x 10 <sup>-3</sup> mm Hg at 77°F (25°C)
<b>Specific Gravity:</b>	1.3 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	Sublimes
<b>Melting Point:</b>	505.4°F (263°C)
<b>Ionization Potential:</b>	<8.5 +/- 0.7 eV
<b>Molecular Weight:</b>	140.1

### EXPOSURE LIMITS

The Protective Action Criteria values are:

PAC-1 = 55 mg/m<sup>3</sup>

PAC-2 = 610 mg/m<sup>3</sup>

PAC-3 = 3,600 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl and Neoprene (>8-hr breakthrough)
<b>Coveralls:</b>	Tyvek®
<b>Respirator:</b>	>55 mg/m <sup>3</sup> - SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, wheezing and shortness of breath
	Nausea, vomiting, diarrhea and abdominal pain

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **n-HEXANE**

Synonyms: Hexyl Hydride; normal Hexane

CAS No: 110-54-3

Molecular Formula: C<sub>16</sub>H<sub>14</sub>

RTK Substance No: 1340

Description: Colorless liquid with a *Gasoline*-like odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>2 - Health</b></p> <p><b>3 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p><b>DOT#:</b> UN 1208</p> <p><b>ERG Guide #:</b> 128</p> <p><b>Hazard Class:</b> 3 (Flammable)</p>	<p><b>n-Hexane</b> is a FLAMMABLE LIQUID. DO NOT attempt to extinguish fire unless flow can be stopped. Shut off supply or let burn.</p> <p>Use dry chemical, CO<sub>2</sub>, water spray or alcohol-resistant foam as extinguishing agents.</p> <p>Use water in flooding quantities as fog as solid streams of water may spread fire.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE.</p> <p>Use water spray to keep fire-exposed containers cool and to suppress vapors.</p> <p>Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source or flash back.</p> <p>Flow or agitation may generate electrostatic charges.</p> <p><b>n-Hexane</b> may form an ignitable vapor/air mixture in closed tanks or containers.</p>	<p><b>n-Hexane</b> can react with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, DINITROGEN TETRAOXIDE, CHLORINE, BROMINE and FLUORINE) to cause fires and explosions.</p> <p><b>n-Hexane</b> attacks some PLASTICS, RUBBER and COATINGS.</p>

### SPILL/LEAKS

**Isolation Distance:**

**Spill:** 50 meters (150 feet)

**Fire:** 800 meters (1/2 mile)

Absorb liquids in dry sand, earth, or a similar material and place into sealed containers for disposal.

Ground and bond containers when transferring **n-Hexane**.

Use only non-sparking tools and equipment.

Keep **n-Hexane** out of confined spaces, such as sewers, because of the possibility of an explosion.

DO NOT wash into sewer.

**n-Hexane** is toxic to aquatic organisms.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	65 to 248 ppm
<b>Flash Point:</b>	-7°F (-22°C)
<b>LEL:</b>	1.1%
<b>UEL:</b>	7.5%
<b>Auto Ignition Temp:</b>	437°F (225°C)
<b>Vapor Density:</b>	3 (air = 1)
<b>Vapor Pressure:</b>	124 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	0.7 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	156°F (69°C)
<b>Freezing Point:</b>	-137°F (-94°C)
<b>Ionization Potential:</b>	10.18 eV
<b>Molecular Weight:</b>	86.2

### EXPOSURE LIMITS

**OSHA:** 500 ppm, 8-hr TWA

**NIOSH:** 50 ppm, 10-hr TWA

**ACGIH:** 50 ppm, 8-hr TWA

**IDLH:** 1,100 ppm

The Protective Action Criteria values are:

**PAC-1 = 400 ppm    PAC-2 = 3,300 ppm**

**PAC-3 = 8,600 ppm**

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Nitrile, Polyvinyl Alcohol, Silver Shield®/4H®, Viton, Viton/Butyl, and Barrier® (>8-hr breakthrough)
<b>Coveralls:</b>	Tychem® F, CPF3, BR, CSM and TK; and Trelchem® HPS and VPS (>8-hr breakthrough) <b>Use turn out gear or flash protection if ignition/fire is the greatest hazard.</b>
<b>Respirator:</b>	>50 ppm or fire - SCBA

### HEALTH EFFECTS

**Eyes:** Irritation and burns

**Skin:** Irritation and burns

**Inhalation:** Nose, throat and lung irritation, with coughing, wheezing and shortness of breath

Headache, dizziness, lightheadedness and passing out. Higher levels can cause coma and death.

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **HYDRAZINE**

Synonyms: Diamine; Nitrogen Hydride

CAS No: 302-01-2

Molecular Formula: N<sub>2</sub>H<sub>4</sub>

RTK Substance No: 1006

Description: Colorless, fuming, oily liquid with an *Ammonia*-like odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>4 - Health</b></p> <p><b>4 - Fire</b></p> <p><b>3 - Reactivity</b></p> <p><b>DOT#:</b> UN 2029</p> <p><b>ERG Guide #:</b> 132</p> <p><b>Hazard Class:</b> 8 (Corrosive)</p>	<p><b>Hydrazine</b> is a FLAMMABLE LIQUID that may self-ignite at low temperatures.</p> <p>Use dry chemical, CO<sub>2</sub>, water spray or alcohol-resistant foam as extinguishing agents.</p> <p>Use water spray to disperse vapors.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Ammonia</i> and <i>Nitrogen Oxides</i>.</p> <p>CONTAINERS MAY EXPLODE IN FIRE.</p> <p>Use water spray to keep fire-exposed containers cool.</p> <p><b>Hydrazine</b> may form an ignitable vapor/air mixture in closed tanks or containers.</p> <p>Vapors may travel to a source of ignition and flash back.</p>	<p><b>Hydrazine</b> is extremely reactive and/or explosive in the presence of OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); NITRIC ACID; NITROUS OXIDES; and CHEMICALLY ACTIVE METALS (such as POTASSIUM, SODIUM, MAGNESIUM and ZINC).</p> <p><b>Hydrazine</b> reacts violently with METALS (such as SILVER, MERCURY, NICKEL, TITANIUM and ZINC); METAL OXIDES; and STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC).</p> <p><b>Hydrazine</b> can spontaneously ignite at low temperatures or on contact with POROUS MATERIALS (such as EARTH, WOOD and CLOTH).</p>

### SPILL/LEAKS

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in dry sand or an inert absorbent and place into sealed containers for disposal.

DO NOT use earth or combustible absorbents as fires/explosions may occur.

Keep **Hydrazine** out of confined spaces, such as sewers, because of the possibility of an explosion.

DO NOT wash into sewer.

**Hydrazine** is very toxic to aquatic organisms.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	3.7 ppm
<b>Flash Point:</b>	100°F (38°C)
<b>LEL:</b>	2.9%
<b>UEL:</b>	98%
<b>Auto Ignition Temp:</b>	Varies from 74°F (23°C) to 518°F (270°C)
<b>Vapor Density:</b>	1.1 (air = 1)
<b>Vapor Pressure:</b>	10 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.01 ( water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	236°F (113°C)
<b>Freezing Point:</b>	36°F (2.2°C)
<b>Ionization Potential:</b>	8.93 eV
<b>Molecular Weight:</b>	32.05

### EXPOSURE LIMITS

**OSHA:** 1 ppm, 8-hr TWA

**NIOSH:** 0.03 ppm, 2-hr Ceiling

**ACGIH:** 0.01 ppm, 8-hr TWA

**IDLH:** 50 ppm

The Protective Action Criteria values are:

PAC-1 = 0.1 ppm PAC-2 = 13 ppm PAC-3 = 35 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl, Nitrile, Neoprene and Polyvinyl Chloride (>8-hr breakthrough)
<b>Coveralls:</b>	Tychem® BR, Responder® and TK; and Trelchem® HPS and VPS (>8-hr breakthrough) >10% LEL use turn out gear or flash protection
<b>Respirator:</b>	SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Severe irritation, burns and possible eye damage
<b>Skin:</b>	Severe irritation and burns
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, wheezing and severe shortness of breath (pulmonary edema) Headache, dizziness, seizures and convulsions
<b>Chronic:</b>	Cancer (liver, lung, nasal cavity) in animals

### FIRST AID AND DECONTAMINATION

<b>Remove</b> the person from exposure.
<b>Flush</b> eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention immediately.
<b>Quickly</b> remove contaminated clothing. Immediately wash contaminated skin with large amounts of water. Seek medical attention immediately.
<b>Begin</b> artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b> promptly to a medical facility.
<b>Medical</b> observation is recommended as symptoms may be delayed.



**Common Name: HYDROGEN**

Synonyms: Molecular Hydrogen; Protium

CAS No: 1333-74-0

Molecular Formula: H<sub>2</sub>

RTK Substance No: 1010

Description: Colorless, odorless gas that is lighter than air

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>3 - Health</b></p> <p><b>4 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p><b>DOT#:</b> UN 1049 (Compressed) UN 1966 (Refrigerated Liquid)</p> <p><b>ERG Guide #:</b> 115</p> <p><b>Hazard Class:</b> 2.1 (Flammable gas)</p>	<p><b>Hydrogen</b> is a FLAMMABLE LIQUID and GAS that burns with an almost INVISIBLE FLAME.</p> <p><b>Hydrogen fires</b> can be detected by carefully approaching the area with an outstretched straw broom to make the flame visible.</p> <p>Stop flow of gas or use a dry powder extinguisher to get to the place where the flow of <b>Hydrogen</b> can be shut off. Allow fire to burn out.</p> <p>CONTAINERS MAY EXPLODE IN FIRE.</p> <p>Use water spray to keep fire-exposed containers cool.</p> <p><b>Hydrogen gas</b> is lighter than air and can accumulate in the upper sections of enclosed spaces.</p> <p><b>Hydrogen</b> may form an ignitable vapor/air mixture in closed tanks or containers.</p>	<p><b>Hydrogen</b> is extremely FLAMMABLE and can be ignited by the cylinder valve being opened to AIR and by HEAT, SPARKS and STATIC ELECTRICITY.</p> <p><b>Hydrogen</b> reacts violently and explosively when mixed with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); ACETYLENE; ETHYLENE; and OXYGEN.</p> <p><b>Hydrogen</b> is not compatible with METALS; METAL OXIDES; and METAL SALTS.</p> <p>Protect cylinders from physical damage and do not drag, roll, slide or drop.</p>

### SPILL/LEAKS

**Isolation Distance:**

Spill: 100 meters (330 feet)

Fire: 1,600 meters (1 mile)

Stop flow of gas. If source of leak is a cylinder and the leak cannot be stopped in place, remove the leaking cylinder to a safe place in the open air, and repair leak or allow cylinder to empty.

Use only non-sparking tools and equipment, especially when opening and closing containers of **Hydrogen**.

Metal containers involving the transfer of **Hydrogen** should be grounded and bonded.

Keep **Hydrogen** out of confined spaces, such as sewers, because of the possibility of an explosion.

Conduct air monitoring to determine that Oxygen levels are above 19.5% and that the LEL is not being exceeded.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Flammable gas
<b>LEL:</b>	4%
<b>UEL:</b>	75%
<b>Auto Ignition Temp:</b>	932° to 1,060°F (500° to 571°C)
<b>Vapor Density:</b>	0.069 (air = 1)
<b>Vapor Pressure:</b>	1.24 x 10 <sup>6</sup> mm Hg at 77°F (25°C)
<b>Specific Gravity:</b>	0.07 (water = 1)
<b>Water Solubility:</b>	Very slightly soluble
<b>Boiling Point:</b>	-423°F (-253°C)
<b>Freezing Point:</b>	-434°F (-259°C)
<b>Molecular Weight:</b>	2.02
<b>Critical Temp:</b>	-400°F (-239.9°C)
<b>Expansion Ratio:</b>	1 to 848 (liquid to gas)

### EXPOSURE LIMITS

**Hydrogen** is a simple asphyxiant. Oxygen levels should be 19.5%.

The Protective Action Criteria values are:

PAC-1 = 65,000 ppm    PAC-2 = 230,000 ppm

PAC-3 = 400,000 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Insulated Rubber and Leather
<b>Coveralls:</b>	>10% of the LEL use flash protection or turn out gear
<b>Respirator:</b>	< 19.5% Oxygen - SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Contact with <i>liquefied</i> gas can cause frostbite
<b>Skin:</b>	Contact with <i>liquefied</i> gas can cause frostbite
<b>Inhalation:</b>	Headache, dizziness, weakness, loss of consciousness and death

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention immediately.

**Immerse** affected part in warm water. Seek medical attention.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.



Common Name: **HYDROGEN BROMIDE**

Synonyms: Anhydrous Hydrobromic Acid; Hydrogen Monobromide

CAS No: 10035-10-6

Molecular Formula: HBr

RTK Substance No: 1011

Description: Colorless gas with a strong, irritating odor, which is found as a liquefied compressed gas or in solution

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>3 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b></p> <p><b>DOT#:</b> UN 1048 (Anhydrous) UN 1788 (Solution)</p> <p><b>ERG Guide #:</b> 125 (UN 1048) 154 (UN 1788)</p> <p><b>Hazard Class: 2.3</b> (Poisonous Gas)</p>	<p>Extinguish fire using an agent suitable for type of surrounding fire. <b>Hydrogen Bromide</b> itself does not burn.</p> <p>DO NOT USE WATER directly on <b>Hydrogen Bromide</b> but use water to knock down vapors.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE.</p> <p>Use water spray to keep fire-exposed containers cool. DO NOT get water inside containers.</p>	<p><b>Hydrogen Bromide</b> reacts violently with STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); AMINES; OZONE; OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); and many ORGANIC COMPOUNDS, causing fires and explosions.</p> <p><b>Hydrogen Bromide</b> will react with METALS (such as COPPER, BRASS and ZINC) to release flammable and explosive <i>Hydrogen gas</i>.</p>

### SPILL/LEAKS

**Isolation Distance:**  
Small Spill: 30 meters (100 feet)  
Large Spill: 300 meters (1,000 feet)  
Fire: 800 meters (1/2 mile)

Cover liquid spill with dry lime, sand or soda ash and place into sealed containers for disposal.  
DO NOT wash into sewer.

Stop flow of gas. If source of leak is a cylinder and the leak cannot be stopped in place, remove the leaking cylinder to a safe place in the open air, and repair leak or allow cylinder to empty.

Turn leaking cylinder with leak up to prevent escape of gas in the liquid state.

Neutralize water spills with lime, soda ash or sodium bicarbonate.

**Hydrogen Bromide** is toxic to aquatic life.

### PHYSICAL PROPERTIES

**Odor Threshold:** 2 ppm  
**Flash Point:** Nonflammable  
**Vapor Pressure:** >760 mm Hg at 68°F (20°C)  
**Specific Gravity:** 3.5 (gas), 2.7 (solution)  
**Water Solubility:** Soluble  
**Boiling Point:** -88.2°F (-66.8°C) (gas), 165°F (74°C) (solution)  
**Freezing Point:** -121°F (-85°C) (gas)  
**Critical Temp:** 193.6°F (89.8°C) (gas)  
**Ionization Potential:** 11.62 eV  
**Molecular Weight:** 80.92

### EXPOSURE LIMITS

**OSHA:** 3 ppm, 8-hr TWA  
**NIOSH:** 3 ppm, Ceiling  
**ACGIH:** 2 ppm, Ceiling  
**IDLH:** 30 ppm

The Protective Action Criteria values are:  
PAC-1 = 3.3 ppm PAC-2 = 72.8 ppm PAC-3 = 397 ppm

### PROTECTIVE EQUIPMENT

**Gloves:** Neoprene, Viton and Barrier® (>8-hr breakthrough for *Inorganic Acids*)  
**Coveralls:** Tychem® BR, Responder® and TK® (>8-hr breakthrough)  
**Respirator:** SCBA

### HEALTH EFFECTS

**Eyes:** Severe irritation, burns and possible eye damage  
**Skin:** Severe irritation and burns. Contact with *liquid* may cause frostbite  
**Inhalation:** Nose, throat and lung irritation, with coughing, and severe shortness of breath (pulmonary edema)  
Headache, nausea and vomiting

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention immediately  
**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water. Seek medical attention immediately.  
For contact with *liquid Hydrogen Bromide* immerse affected part in warm water.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary. Transfer promptly to a medical facility.  
**Medical** observation is recommended as symptoms may be delayed.

**Common Name: HYDROGEN CHLORIDE**

Synonyms: Anhydrous Hydrogen Chloride; Muriatic Acid

CAS No: 7647-01-0

Molecular Formula: HCl

RTK Substance No: 1012

Description: Colorless gas with a pungent odor that fumes in air, and is often found as a compressed, liquefied gas or in a water solution

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>0 - Fire</b> <b>1 - Reactivity</b> <b>DOT#:</b> UN 1050 (Anhydrous) UN 1789 (Solution) <b>ERG Guide #:</b> 125 (Anhydrous) 157 (Solution) <b>Hazard Class:</b> 2.3 (Toxic Gas) (Anhydrous) 8 (Corrosive) (Solution)	Extinguish fire using an agent suitable for type of surrounding fire. <b>Hydrogen Chloride</b> itself does not burn. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Chlorine</i> . Use water spray to keep fire-exposed containers cool, but DO NOT get water into containers.	<b>Hydrogen Chloride</b> may react explosively with ALCOHOLS; HYDROGEN CYANIDE; POTASSIUM PERMANGANATE; SODIUM; and TETRASELENIUM TETRANITRIDE, and may ignite on contact with FLUORINE; HEXALITHIUM DISILICIDE; METAL ACETYLIDES and CARBIDES. <b>Hydrogen Chloride</b> reacts with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) to form toxic <i>Chlorine gas</i> and reacts violently with STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE). <b>Hydrogen Chloride</b> will attack many METALS (such as COPPER, BRASS and ZINC) to release flammable and explosive <i>Hydrogen gas</i> . <b>Hydrogen Chloride</b> will react with ALDEHYDES and EPOXIDES to cause violent polymerization (self-reaction).

### SPILL/LEAKS

**Isolation Distance:**

Small Spill: 30 meters (100 feet)

Large Spill: 60 meters (200 feet)

Fire: 800 meters (1/2 mile)

 Cover **Hydrogen Chloride** in *solution* with dry lime, sand or soda ash and place into sealed containers for disposal.

Stop flow of gas. If source of leak is a cylinder and the leak cannot be stopped in place, remove the leaking cylinder to a safe place in the open air, and repair leak or allow cylinder to empty.

DO NOT SPRAY water on leaking cylinder.

Turn leaking cylinder with leak up to prevent escape of gas in liquid state.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	0.255 to 10.06 ppm
<b>Flash Point:</b>	Nonflammable
<b>Vapor Density:</b>	1.3 (air = 1)
<b>Vapor Pressure:</b>	>760 mm Hg at -120°F (-84°C)
<b>Specific Gravity:</b>	1.27 (liquid) (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	-121°F (-85°C)
<b>Freezing Point:</b>	-174°F (-114°C)
<b>Ionization Potential:</b>	12.74 eV
<b>Molecular Weight:</b>	36.47

### EXPOSURE LIMITS

**OSHA:** 5 ppm, Ceiling

**NIOSH:** 5 ppm, Ceiling

**ACGIH:** 2 ppm, Ceiling

**IDLH:** 50 ppm

The Protective Action Criteria values are:

PAC-1 = 1.8 ppm PAC-2 = 22 ppm PAC-3 = 100 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl, Neoprene and Viton (>8-hr breakthrough)
<b>Coveralls:</b>	Tychem® BR, Responder® and TK; ONESuit®TEC; Trelchem® HPS and VPS (>8-hr breakthrough)
<b>Respirator:</b>	>2 ppm - full facepiece APR with <i>Acid gas</i> filters >20 ppm - SCBA

### HEALTH EFFECTS

**Eyes:** Severe irritation, burns and possible eye damage

**Skin:** Severe irritation and burns  
Contact with liquid causes frostbite

**Inhalation:** Nose, throat and lung irritation with coughing and severe shortness of breath (pulmonary edema)

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention immediately.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water. Seek medical attention.

**Immerse** affected part in warm water. Seek medical attention.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

**Medical** observation is recommended as symptoms may be delayed.

Common Name: **HYDROGEN CYANIDE**

Synonyms: Formonitrile; Hydrocyanic Acid; Prussic Acid

CAS No: 74-90-8

Molecular Formula: HCN

RTK Substance No: 1013

Description: Colorless to pale blue liquid below 78°F (26°C), and a colorless gas at higher temperatures, with a distinct bitter almond or stinky sneaker odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>4 - Health</b> <b>4 - Fire</b> <b>1 - Reactivity</b> <b>DOT#:</b> UN 1051 (Anhydrous; Stabilized) <b>ERG Guide #:</b> 117 <b>Hazard Class:</b> 6.1 (Poison)	FLAMMABLE LIQUID and GAS. Stop flow of gas or allow to burn. DO NOT attempt to extinguish fire unless flow can be stopped. Shut off supply or let burn. Use dry chemical, CO <sub>2</sub> , water spray, alcohol-resistant foam or other foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> . CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool and to suppress vapors. Vapors may travel to a source of ignition and flash back. <b>Hydrogen Cyanide</b> may form an ignitable vapor/air mixture in closed tanks or containers.	<i>Anhydrous and Unstabilized Hydrogen Cyanide</i> are severe explosion hazards and can polymerize violently, resulting in fires and explosions. <b>Hydrogen Cyanide</b> can polymerize explosively when exposed to ELEVATED TEMPERATURES (over 122°F or 50°C) and STRONG BASES (such as SODIUM HYDROXIDE, CALCIUM HYDROXIDE, AMMONIA, AMINES and SODIUM CARBONATE). <b>Hydrogen Cyanide</b> reacts violently with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC). <b>Hydrogen Cyanide solutions</b> containing more than 4 to 5% water are less stable than the anhydrous (dry) form and can self react and/or form explosive mixtures in air.

### SPILL/LEAKS

**Isolation Distance:**

Spill (small): 60 meters (200 feet)

Spill (large): 400 meters (1,250 feet)

Fire: 800 meters (1/2 mile)

Stop flow of gas. If source of leak is a cylinder and the leak cannot be stopped in place, remove the leaking cylinder to a safe place in the open air, and repair leak or allow cylinder to empty.

Absorb liquids in dry sand, earth, or a similar material and place into sealed containers for disposal.

Use foam to suppress vapors.

DO NOT wash into sewer.

Bond and ground all containers when transferring **Hydrogen Cyanide** and use only non-sparking tools and equipment.

**Hydrogen Cyanide** is very toxic to aquatic organisms.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	2 to 10 ppm
<b>Flash Point:</b>	0°F (-18°C)
<b>LEL:</b>	5.6%
<b>UEL:</b>	40%
<b>Auto Ignition Temp:</b>	1,000°F (538°C)
<b>Vapor Density:</b>	0.94 (gas) (air = 1)
<b>Vapor Pressure:</b>	630 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	0.7 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	78°F (26°C)
<b>Melting Point:</b>	7°F (-13.3°C)
<b>Ionization Potential:</b>	13.6 eV
<b>Molecular Weight:</b>	27

### EXPOSURE LIMITS

**OSHA:** 10 ppm, 8-hr TWA

**NIOSH:** 4.7 ppm, Ceiling

**ACGIH:** 4.7 ppm, Ceiling

**IDLH:** 50 ppm

The Protective Action Criteria values are:

PAC-1 = 2 ppm    PAC-2 = 7.1ppm    PAC-3 = 15 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Nitrile and Neoprene (>8-hr breakthrough for <i>liquid Hydrogen Cyanide</i> )
<b>Coveralls:</b>	Tychem® TK (>8-hr breakthrough for <i>gaseous and liquid Hydrogen Cyanide</i> )
<b>Respirator:</b>	SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns (skin absorbable)
<b>Inhalation:</b>	Flushing of the face, chest tightness, headache, nausea and vomiting, weakness and shortness of breath

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses, if worn, while rinsing.  
 Quickly remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** to a medical facility.  
**Use** *Amyl Nitrite* capsules if symptoms develop.

Common Name: **HYDROGEN FLUORIDE**

Synonyms: Fluoric Acid; HFA

CAS No: 7664-39-3

Molecular Formula: HF

RTK Substance No: 3759

Description: Colorless, fuming liquid or gas

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>4 - Health</b></p> <p><b>0 - Fire</b></p> <p><b>1 - Reactivity</b></p> <p><b>DOT#:</b> UN 1052</p> <p><b>ERG Guide #:</b> 125</p> <p><b>Hazard Class:</b> 8 (Corrosive)</p>	<p><b>Hydrogen Fluoride</b> is a noncombustible liquid or gas.</p> <p>Extinguish fire using an agent suitable for type of surrounding fire.</p> <p><b>POISONOUS GASES ARE PRODUCED IN FIRE, including Fluorine.</b></p> <p>Use water spray to keep fire exposed containers cool.</p>	<p><b>Hydrogen Fluoride</b> reacts violently with <b>STRONG BASES</b> (such as <b>SODIUM HYDROXIDE</b> and <b>POTASSIUM HYDROXIDE</b>) and many other compounds.</p> <p><b>Hydrogen Fluoride</b> reacts with <b>WATER</b> and <b>STEAM</b> to produce <i>toxic</i> and <i>corrosive gases</i>.</p> <p><b>Hydrogen Fluoride</b> reacts with <b>METALS</b> (such as <b>IRON</b> and <b>STEEL</b>) to produce flammable and explosive <i>Hydrogen gas</i>.</p> <p><b>Hydrogen Fluoride</b> is not compatible with <b>OXIDIZING AGENTS</b> (such as <b>PERCHLORATES, PEROXIDE, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE</b> and <b>FLUORINE</b>); <b>STRONG ACIDS</b> (such as <b>HYDROCHLORIC, SULFURIC</b> and <b>NITRIC</b>); <b>AMINES; METAL SALTS; and SILICON COMPOUNDS.</b></p>

## SPILL/LEAKS

**Isolation Distance:**

Spill: 100 meters (330 feet)

Fire: 1,600 meters (1 mile)

If a gas leak, evacuate area and stop flow of gas. If source of leak is a cylinder and the leak cannot be stopped in place, remove the leaking cylinder to a safe place in the open air, and repair leak or allow cylinder to empty.

If a liquid spill, allow to vaporize and disperse, or cover with sodium carbonate or an equal mixture of soda ash and slaked lime.

Water spray can be used to absorb **Hydrogen Fluoride** vapors escaping from leaking containers of *anhydrous Hydrogen Fluoride*. Use water in flooding quantities.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	0.04 ppm
<b>Flash Point:</b>	Nonflammable
<b>Vapor Density:</b>	0.7 (air = 1)
<b>Vapor Pressure:</b>	760 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	0.99 (water = 1)
<b>Water Solubility:</b>	Miscible
<b>Boiling Point:</b>	67°F (19.4°C)
<b>Freezing Point:</b>	-117.4°F (-83°C)
<b>Ionization Potential:</b>	15.98 eV
<b>Molecular Weight:</b>	20.1

## EXPOSURE LIMITS

**ACGIH:** 0.5 ppm, 8-hr TWA; 2 ppm, Ceiling

**IDLH:** 30 ppm

The Protective Action Criteria values are:

PAC-1 = 1 ppm; PAC-2 = 24 ppm; PAC-3 = 44 ppm

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Barrier® (>8-hr breakthrough)
<b>Coveralls:</b>	Tychem® Responder® and TK; and Trelchem HPS (>8-hr breakthrough)
<b>Respirator:</b>	SCBA

## HEALTH EFFECTS

**Eyes:** Severe irritation, burns and possible eye damage

**Skin:** Irritation and severe burns

**Inhalation:** Nose, throat and lung irritation with coughing, and severe shortness of breath (pulmonary edema)

Headache, dizziness, weakness, and convulsions

## FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention immediately.

**Immediately** flush with large amounts of water. Apply 2.5% *Calcium Gluconate* gel to the affected skin. Seek medical assistance immediately.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

**Medical** observation is recommended as symptoms may be delayed.

Common Name: **HYDROGEN PEROXIDE**

Synonyms: Hydrogen Dioxide

CAS No: 7722-84-1

Molecular Formula: H<sub>2</sub>O<sub>2</sub>

RTK Substance No: 1015

Description: Colorless, odorless liquid. Pure **Hydrogen Peroxide** is unstable and an explosion risk so it is usually in a water solution.

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>0 - Fire</b> <b>3 - Reactivity</b>  <b>DOT#:</b> UN 2015 <b>ERG Guide #:</b> 143 <b>Hazard Class:</b> 5.1 (Oxidizer)	<p><b>Hydrogen Peroxide</b> is not combustible but it is a STRONG OXIDIZER which enhances the combustion of other substances.</p> <p>Flood with water to extinguish fire. DO NOT USE DRY CHEMICAL extinguishing agents.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE.</p> <p>Use water spray to keep fire-exposed containers cool.</p> <p><b>Hydrogen Peroxide</b> may ignite combustibles (wood, paper and oil).</p>	<p>Concentrated solutions of <b>Hydrogen Peroxide</b> can decompose violently if trace impurities are present.</p> <p><b>Hydrogen Peroxide</b> reacts violently with FINELY DIVIDED METALS; REDUCING AGENTS; COMBUSTIBLES; STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); ORGANICS; ALCOHOLS; ETHERS; KETONES; ALDEHYDES; and METALS (such as COPPER, BRASS, IRON, SILVER and ZINC).</p> <p><b>Hydrogen Peroxide</b> is not compatible with AMMONIA and AMMONIA CARBONATES; IODIDES; and SULFITES.</p>

**SPILL/LEAKS**

**Isolation Distance:**

Small Spills: 50 meters (150 feet)

Large Spills: 100 meters (300 feet)

Fire: 800 meters (½ mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.

Keep **Hydrogen Peroxide** out of confined spaces, such as sewers, because of the possibility of an explosion.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	Odorless - Based on a 70 - 90% <b>Hydrogen Peroxide</b> solution
<b>Flash Point:</b>	Not combustible
<b>Vapor Density:</b>	1.2 (air = 1)
<b>Vapor Pressure:</b>	8 mm Hg at 77°F (25°C)
<b>Specific Gravity:</b>	1.46 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	286°F (141°C)
<b>Melting Point:</b>	12°F (-11°C)
<b>Ionization Potential:</b>	10.54 eV
<b>Molecular Weight:</b>	34
<b>pH:</b>	Slightly acidic

**EXPOSURE LIMITS**

**OSHA:** 1 ppm, 8-hr TWA

**NIOSH:** 1 ppm, 10-hr TWA

**ACGIH:** 1 ppm, 8-hr TWA

**IDLH:** 75 ppm

The Protective Action Criteria values are:

PAC-1 = 10 mg/m<sup>3</sup>

PAC-2 = 50 mg/m<sup>3</sup>

PAC-3 = 100 mg/m<sup>3</sup>

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Nitrile, Neoprene, Natural Rubber, Silver Shield®/4H® and Viton (>8-hr breakthrough)
<b>Coveralls:</b>	DuPont Tychem® QC, CPF 2, BR, LV, Responder®, and TK; Kappler Zytron® 200; and Saint-Gobain ONESuit®/TEC or equivalent (>8-hr breakthrough)
<b>Respirator:</b>	>1 ppm - Supplied air

**HEALTH EFFECTS**

**Eyes:** Irritation, burns, eye damage

**Skin:** Irritation, burns, skin rash, redness and blisters

**Inhalation:** Nose and throat irritation, coughing, shortness of breath (pulmonary edema)

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention immediately.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water. Seek medical attention.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** to a medical facility.

**Medical** observation is recommended as symptoms may be delayed.



Common Name: **HYDROGEN SULFIDE**

Synonyms: Dihydrogen Sulfide; Sulfurated Hydrogen; Sewer Gas  
 CAS No: 7783-06-4  
 Molecular Formula: H<sub>2</sub>S  
 RTK Substance No: 1017

Description: Colorless gas with the odor of rotten eggs

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>4 - Health</b> <b>4 - Fire</b> <b>0 - Reactivity</b> <b>DOT#:</b> UN 1053 <b>ERG Guide #:</b> 117 <b>Hazard Class:</b> 2.3 (Poisonous)	<b>FLAMMABLE GAS</b> Stop flow of gas and use water spray, dry chemical or CO <sub>2</sub> to extinguish fire. Use water spray to disperse vapors. <b>POISONOUS GASES ARE PRODUCED IN FIRE</b> , including <i>Sulfur Oxides</i> . <b>CONTAINERS MAY EXPLODE IN FIRE.</b> Use water spray to keep fire-exposed containers cool. Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source. Flow or agitation of <b>Hydrogen Sulfide</b> in <i>liquid</i> form may generate electrostatic charges. <b>Hydrogen Sulfide</b> may form an ignitable vapor/air mixture in closed tanks or containers.	<b>Hydrogen Sulfide</b> reacts violently and/or explosively with <b>OXIDIZING AGENTS</b> (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); METALS; METAL POWDERS; METAL OXIDES; and <b>STRONG NITRIC ACID</b> . <b>Hydrogen Sulfide</b> is not compatible with <b>STRONG BASES</b> (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE). <b>Hydrogen Sulfide</b> may react with rusty iron pipes and some plastics.

**SPILL/LEAKS**

**Isolation Distance:**  
 Small Spill: 30 meters (100 feet)  
 Large Spill: 300 meters (1,000 feet)  
 Fire: 800 meters (1/2 mile)

Stop flow of gas. If source of leak is a cylinder and the leak cannot be stopped in place, remove the leaking cylinder to a safe place in the open air, and repair leak or allow cylinder to empty.  
 Use only non-sparking tools and equipment, especially when opening and closing containers of **Hydrogen Sulfide**.  
 Turn leaking cylinder with leak up to prevent escape of gas in liquid state.  
 Keep **Hydrogen Sulfide** out of confined spaces, such as sewers, because of the possibility of an explosion.  
 DO NOT wash into sewer.  
 For water spills, neutralize with agricultural lime, crushed limestone or sodium bicarbonate.  
**Hydrogen Sulfide** is very toxic to aquatic organisms.

**PHYSICAL PROPERTIES**

**Odor Threshold:** 0.008 to 0.1 ppm (>100 ppm causes olfactory fatigue)

**Flash Point:** Flammable

**LEL:** 4%

**UEL:** 45%

**Auto Ignition Temp:** 500°F (260°C)

**Vapor Density:** 1.18 (air = 1)

**Vapor Pressure:** 14,000 mm Hg at 68°F (20°C)

**Specific Gravity:** 0.99 (water = 1)

**Water Solubility:** Soluble

**Boiling Point:** -76°F (-60°C)

**Freezing Point:** -122°F (-86°C)

**Ionization Potential:** 10.46 eV

**Molecular Weight:** 34.08

**EXPOSURE LIMITS**

**NIOSH:** 10 ppm, 10-min Ceiling  
**ACGIH:** 1 ppm, 8-hr TWA; 5 ppm, STEL  
**IDLH:** 100 ppm

The Protective Action Criteria values are:  
 PAC-1 = 0.51 ppm PAC-2 = 27 ppm PAC-3 = 50

**PROTECTIVE EQUIPMENT**

**Gloves:** *Insulated* Neoprene, Viton and Barrier® (>8-hr breakthrough for *Inorganic gases and vapors*)

**Coveralls:** Tychem® BR, Responder® and TK (>8-hr breakthrough)

**Respirator:** >1 ppm - full facepiece PAPR with cartridges specific for **Hydrogen Sulfide**  
 >10 ppm - SCBA

**HEALTH EFFECTS**

**Eyes:** Irritation  
**Skin:** Contact with liquid causes frostbite  
**Inhalation:** Nose, throat and lung irritation, with coughing, and severe shortness of breath (pulmonary edema)  
 Nausea, dizziness, headache, unconsciousness and even death

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.  
**Immerse** affected part in warm water. Seek medical attention.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** promptly to a medical facility. Medical observation is recommended as symptoms may be delayed.



Common Name: **HYDROQUINONE**

Synonyms: 1,4-Benzenediol; p-Dihydroxybenzene; p-Hydroxyphenol; Quinol

CAS No: 123-31-9

Molecular Formula: C<sub>6</sub>H<sub>6</sub>O<sub>2</sub>

RTK Substance No: 1019

Description: White to light colored, crystalline solid

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b>  <b>DOT#:</b> UN 2662 <b>ERG Guide #:</b> 153 <b>Hazard Class:</b> 6.1 (Poison)	<b>Hydroquinone</b> may burn, but does not readily ignite.  Use dry chemical, CO <sub>2</sub> , water spray or alcohol-resistant foam as extinguishing agents.  POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Phenol</i> .  Use water spray to reduce vapors and to keep containers cool.  <b>Hydroquinone</b> may form an ignitable dust/air mixture in closed tanks or containers.	<b>Hydroquinone</b> reacts violently with SODIUM HYDROXIDE.  <b>Hydroquinone</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG BASES (such as POTASSIUM HYDROXIDE); OXYGEN; and FERRIC SALTS.

## SPILL/LEAKS

**Isolation Distance:**

**Spill:** 25 meters (75 feet)

**Fire:** 800 meters (1/2 mile)

Eliminate all ignition sources.

Moisten *solid* spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

Ventilate and wash area after clean-up is complete.

DO NOT wash into sewer.

## PHYSICAL PROPERTIES

<b>Flash Point:</b>	392°F (165°C)
<b>Auto Ignition Temp:</b>	950°F (510°C)
<b>Vapor Density:</b>	3.8 (air = 1)
<b>Vapor Pressure:</b>	1 mm Hg at 270°F (132°C)
<b>Specific Gravity:</b>	1.3 (water = 1)
<b>Water Solubility:</b>	Soluble (Miscible)
<b>Boiling Point:</b>	547°F (286°C)
<b>Melting Point:</b>	338° to 340°F (170° to 171°C)
<b>Ionization Potential:</b>	7.95 eV
<b>Molecular Weight:</b>	110.1

## EXPOSURE LIMITS

**OSHA:** 2 mg/m<sup>3</sup>, 8-hr TWA

**NIOSH:** 2 mg/m<sup>3</sup>, 15-min Ceiling

**ACGIH:** 1 mg/m<sup>3</sup>, 8-hr TWA

**IDLH:** 50 mg/m<sup>3</sup>

The Protective Action Criteria values are:

PAC-1 = 3 mg/m<sup>3</sup>    PAC-2 = 20 mg/m<sup>3</sup>

PAC-3 = 120 mg/m<sup>3</sup>

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl, Nitrile, Neoprene and Silver Shield®/4H® (>4-hr breakthrough)
<b>Coveralls:</b>	Tychem® BR, CSM and TK (>8-hr breakthrough for <i>Hydroxyl compounds, aromatic</i> )
<b>Respirator:</b>	>1 mg/m <sup>3</sup> - full facepiece APR with <i>P100 cartridges</i> >50 mg/m <sup>3</sup> or fire - SCBA

## HEALTH EFFECTS

**Eyes:** Irritation and burns

**Skin:** Irritation, rash, burning feeling and change in skin color

**Inhalation:** Nose and throat irritation  
Headache, nausea, vomiting, abdominal cramps, dizziness, and muscle twitching

**Chronic:** May affect liver and kidneys

## FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses. Seek medical attention

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **HYDROXYLAMINE SULFATE**

Synonym: Oxammonium Sulfate

CAS No: 10039-54-0

 Molecular Formula:  $H_8N_2SO_6$ 

RTK Substance No: 1020

Description: Colorless to white, crystalline solid or powder

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>1 - Fire</b> <b>3 - Reactivity</b> DOT#: UN 2865 ERG Guide #: 154 Hazard Class: 8 (Corrosive)	COMBUSTIBLE SOLID <b>Hydroxylamine Sulfate</b> is REACTIVE and a DANGEROUS EXPLOSION HAZARD when exposed to HEAT. Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. DO NOT USE WATER directly on <b>Hydroxylamine Sulfate</b> . POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Sulfur Oxides</i> , <i>Sulfuric Acid</i> , and <i>Nitrogen Oxides</i> . CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool.	<b>Hydroxylamine Sulfate</b> may decompose to form extremely unstable <i>Hydroxylamine</i> on exposure to CARBON DIOXIDE; MOIST AIR; and WATER; or in the presence of STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE) and ALKALINE EARTH METALS (such as BERYLLIUM, MAGNESIUM and CALCIUM). <b>Hydroxylamine Sulfate</b> is not compatible with METALS; METAL SALTS; REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES); and OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE). Violent decomposition may occur above 338° (170°C).

## SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Collect powdered material in the most convenient and safe manner and place into sealed containers for disposal.

 Keep **Hydroxylamine Sulfate** out of confined spaces, such as sewers, because of the possibility of an explosion.

DO NOT wash into sewer.

**Hydroxylamine Sulfate** is toxic to aquatic organisms.

## PHYSICAL PROPERTIES

**Vapor Density:** 1.9 (air = 1)

**Specific Gravity:** >1 (water = 1)

**Water Solubility:** Soluble

**Melting Point:** 338°F (170°C)

**Molecular Weight:** 164.1

## EXPOSURE LIMITS

The Protective Action Criteria values are:

 PAC-1 = 10 mg/m<sup>3</sup>

 PAC-2 = 75 mg/m<sup>3</sup>

 PAC-3 = 400 mg/m<sup>3</sup>

## PROTECTIVE EQUIPMENT

**Gloves:** Butyl, Nitrile and Neoprene

**Coveralls:** Tyvek®

**Respirator:** >10 mg/m<sup>3</sup> - SCBA

## HEALTH EFFECTS

**Eyes:** Irritation and burns

**Skin:** Irritation and burns

**Inhalation:** Nose, throat and lung irritation, with coughing, and severe shortness of breath (Pulmonary edema)

Methemoglobinemia with headache, fatigue and blue color to the skin and lips

## FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention immediately

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention immediately.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

**Medical** observation is recommended as symptoms may be delayed.

Common Name: **IODINE**

Synonyms: Diatomic Iodine

CAS No: 7553-56-2

Molecular Formula: I<sub>2</sub>

RTK Substance No: 1026

Description: Purple to black, crystalline solid with a sharp, strong odor

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> <b>DOT#:</b> UN 3085 <b>ERG Guide #:</b> 140 <b>Hazard Class:</b> 5.1 (Oxidizer)	<p><b>Iodine</b> is not combustible, but it is a STRONG OXIDIZER that enhances the combustion of other substances.</p> <p>Use water only. DO NOT USE CHEMICAL or CO<sub>2</sub> as extinguishing agents.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Hydrogen Iodide</i> and other <i>Iodine compounds</i>.</p> <p><b>Iodine</b> may ignite combustibles (wood, paper and oil).</p>	<p><b>Iodine</b> reacts violently or explosively with ACETYLENE; ACETALDEHYDE; METAL AZIDES; METAL HYDRIDES; and METAL CARBIDES.</p> <p><b>Iodine</b> forms explosive or shock-sensitive compounds when mixed with REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES) and <i>liquid AMMONIA</i>.</p> <p><b>Iodine</b> will ignite POWDERED METALS (such as ANTIMONY, MAGNESIUM and ZINC) in the presence of WATER.</p> <p><b>Iodine</b> is not compatible with COMBUSTIBLES; STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); HALOGENS (such as CHLORINE, BROMINE and CHLORINE TRIFLUORIDE); and ETHANOL.</p>

### SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

DO NOT wash into sewer.

**Iodine** may be hazardous in the environment; especially to fish.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Sharp, strong odor
<b>Flash Point:</b>	Noncombustible
<b>Vapor Density:</b>	8.8 (air = 1)
<b>Vapor Pressure:</b>	0.3 mm Hg at 77°F (25°C)
<b>Specific Gravity:</b>	4.93 (water = 1)
<b>Water Solubility:</b>	Slightly soluble
<b>Boiling Point:</b>	365°F (185°C)
<b>Melting Point:</b>	236°F (113°C)
<b>Ionization Potential:</b>	9.31 eV
<b>Molecular Weight:</b>	253.8

### EXPOSURE LIMITS

**OSHA:** 0.1 ppm, Ceiling

**NIOSH:** 0.1 ppm, Ceiling

**ACGIH:** 0.01 ppm, 8-hr TWA; 0.1 ppm, STEL

**IDLH:** 2 ppm

The Protective Action Criteria values are:

PAC-1 = 0.1 ppm; PAC-2 = 0.5 ppm; PAC-3 = 5 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl, Nitrile, Neoprene and Viton (>8-hr breakthrough)
<b>Coveralls:</b>	Tychem® BR, Responder® and TK (8-hr breakthrough)
<b>Respirator:</b>	> 0.01ppm SCBA

### HEALTH EFFECTS

**Eyes:** Irritation and burns

**Skin:** Irritation and burns

**Inhalation:** Nose, throat and lung irritation with coughing and severe shortness of breath (pulmonary edema)

Headache, nausea, vomiting, diarrhea and abdominal pain

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

**Medical** observation is recommended as symptoms may be delayed.

Common Name: **ISOAMYL ALCOHOL**

Synonyms: Isopentyl Alcohol; Isobutylcarbinol

CAS No: 123-51-3

 Molecular Formula: C<sub>5</sub>H<sub>12</sub>O

RTK Substance No: 1039

 Description: Colorless liquid with a strong *Alcohol*-like odor

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>1 - Health</b> <b>2 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 1105 ERG Guide #: 129 Hazard Class: 3 (Flammable liquid)	<b>Isoamyl Alcohol</b> is a COMBUSTIBLE LIQUID. Use dry chemical, CO <sub>2</sub> , water spray or alcohol-resistant foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool. Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.	<b>Isoamyl Alcohol</b> reacts violently with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES); and HYDROGEN TRISULFIDE to cause an explosion hazard. <b>Isoamyl Alcohol</b> is not compatible with ACID CHLORIDES; ACID ANHYDRIDES; ALIPHATIC AMINES; CAUSTICS; ISOCYANATES; and STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC).

## SPILL/LEAKS

## Isolation Distance:

Small Spill: 50 meters (160 feet)

Large Spill: 300 meters (1,000 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.

DO NOT wash into sewer.

Dangerous to aquatic life in high concentrations.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	0.042 ppm
<b>Flash Point:</b>	109°F (43°C)
<b>LEL:</b>	1.2%
<b>UEL:</b>	9%
<b>Auto Ignition Temp:</b>	662°F (350°C)
<b>Vapor Density:</b>	3.04 (air = 1)
<b>Vapor Pressure:</b>	2.1 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	0.82 (water = 1)
<b>Water Solubility:</b>	Slightly soluble
<b>Boiling Point:</b>	270°F (132°C)
<b>Molecular Weight:</b>	88.2

## EXPOSURE LIMITS

<b>OSHA:</b>	100 ppm, 8-hr TWA
<b>NIOSH:</b>	100 ppm, 10-hr TWA; 125 ppm, 15-min STEL
<b>ACGIH:</b>	100 ppm, 8-hr TWA; 125 ppm, 15-min STEL
<b>IDLH:</b>	500 ppm

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl, Neoprene and Viton (>8-hr breakthrough)
<b>Coveralls:</b>	DuPont Tychem® CPF 2, SL, CPF 4, CSM, and Responder®; Kappler® Zytron® 500; and Saint-Gobain ONESuit® TEC (>8-hr breakthrough)
<b>Respirator:</b>	>100 ppm - APR with Organic vapor cartridge or Supplied air >500 ppm - SCBA

## HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation, burns, drying and cracking
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, wheezing and/or shortness of breath Headache, nausea, vomiting, dizziness and passing out

## FIRST AID AND DECONTAMINATION

<b>Remove</b> the person from exposure.
<b>Flush</b> eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn, while rinsing.
<b>Quickly</b> remove contaminated clothing and wash contaminated skin with large amounts of soap and water.
<b>Begin</b> artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b> to a medical facility.

Common Name: **ISOBUTANE**

Synonyms: 1,1-Dimethylethane; Trimethylmethane

CAS No: 75-28-5

 Molecular Formula: C<sub>4</sub>H<sub>10</sub>

RTK Substance No: 1040

Description: Colorless gas or liquid under pressure with a faint gasoline odor

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>0 - Health</b> <b>4 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 1969 ERG Guide #: 115 Hazard Class: 2.1 (Flammable gas)	FLAMMABLE GAS Stop flow of gas or let fire burn itself out. POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE. Use water spray to disperse gas, keep fire-exposed cylinders cool, and to protect individuals attempting to stop leak. Vapors may travel to a source of ignition and flash back. Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.	<b>Isobutane</b> reacts with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); ACETYLENE; NITROGEN OXIDES; and mixtures of NICKEL CARBONYL and OXYGEN causing fire and explosions.

## SPILL/LEAKS

**Isolation Distance:**

Small Spills: 100 meters (330 feet)

Large Spills: 800 meters (1/2 mile)

Fire: 1,600 meters (1 mile)

 Before entering a confined space where **Isobutane** is present, check to make sure sufficient *Oxygen* (19.5%) exists.

 Keep **Isobutane** out of confined spaces, such as sewers, because of the possibility of an explosion.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Gasoline odor
<b>Flash Point:</b>	-117°F (-83°C)
<b>LEL:</b>	1.8%
<b>UEL:</b>	8.4%
<b>Auto Ignition Temp:</b>	860°F (460°C)
<b>Vapor Density:</b>	2 (air = 1)
<b>Vapor Pressure:</b>	2,611 mm Hg at 77°F (25°C)
<b>Water Solubility:</b>	Slightly soluble
<b>Boiling Point:</b>	11°F (-11.7°C)
<b>Ionization Potential:</b>	10.74 eV
<b>Molecular Weight:</b>	58.1

## EXPOSURE LIMITS

**OSHA:** None

**NIOSH:** 800 ppm, 10-hr TWA

**ACGIH:** 1,000 ppm, 8-hr TWA (as *Aliphatic hydrocarbon gases*)

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Insulated Neoprene or Rubber
<b>Coveralls:</b>	Clothes designed to prevent freezing of body tissues
<b>Respirator:</b>	>800 ppm - Supplied air

## HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns Contact with the liquid can cause frostbite.
<b>Inhalation:</b>	Nose and throat irritation with coughing and wheezing Dizziness, irregular heartbeat, convulsions, loss of consciousness, coma and death

## FIRST AID AND DECONTAMINATION

<b>Remove</b> the person from exposure.
<b>Flush</b> eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
<b>Immerse</b> affected part in warm water. Seek medical attention.
<b>Begin</b> artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b> to a medical facility.

Common Name: **ISOBUTYL ISOBUTYRATE**

Synonyms: 2-Methylpropyl Isobutyrate

CAS No: 97-85-8

 Molecular Formula: C<sub>8</sub>H<sub>16</sub>O<sub>2</sub>

RTK Substance No: 1047

Description: Colorless, clear liquid with a fruity odor

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>0 - Health</b> <b>3 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 2528 ERG Guide #: 130 Hazard Class: 3 (Flammable)	<b>Isobutyl Isobutyrate</b> is a <b>FLAMMABLE LIQUID</b> and a <b>DANGEROUS FIRE HAZARD</b> . Use alcohol-resistant foam extinguishers in a fire. Water may not be effective in fighting fires or may spread fire. POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool. Vapors may travel to a source of ignition and flash back. Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.	<b>Isobutyl Isobutyrate</b> is not compatible with <b>OXIDIZING AGENTS</b> (such as <b>PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE</b> ) and <b>STRONG BASES</b> (such as <b>SODIUM HYDROXIDE and POTASSIUM HYDROXIDE</b> ).

**SPILL/LEAKS**
**Isolation Distance:**

Small Spills: 50 meters (150 feet)

Large Spills: 300 meters (1,000 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.

This chemical floats on water.

DO NOT let this chemical enter the environment.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	Fruity odor
<b>Flash Point:</b>	101°F (38°C)
<b>LEL:</b>	0.96%
<b>UEL:</b>	7.59%
<b>Vapor Density:</b>	4.97 (air = 1)
<b>Vapor Pressure:</b>	10 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	0.9 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	291° to 304°F (144° to 151°C)
<b>Melting Point:</b>	-112°F (-81°C)
<b>Molecular Weight:</b>	144.2

**EXPOSURE LIMITS**

 No occupational exposure limits have been established for **Isobutyl Isobutyrate**.

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Silver Shield®/4H® (>8-hr breakthrough)
<b>Coveralls:</b>	DuPont Tychem® CPF 3, CPF 4, BR and LV, Responder® and TK, or equivalent, for <i>liquid organics</i> (>8-hr breakthrough)
<b>Boots:</b>	No information
<b>Respirator:</b>	Pressure demand supplied air for high exposure

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Headache and dizziness

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Remove** contaminated clothing and wash contaminated skin with soap and water.

**Transfer** to a medical facility.



Common Name: **ISOOCTYL ALCOHOL**

Synonyms: 6-Methyl-1-Heptanol; Oxooctyl Alcohol

CAS No: 26952-21-6

Molecular Formula: C<sub>8</sub>H<sub>18</sub>O

RTK Substance No: 1063

Description: Clear, colorless liquid with a faint, pleasant odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>3 - Health</b></p> <p><b>2 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p><b>DOT#:</b> None</p> <p><b>ERG Guide #:</b> None</p> <p><b>Hazard Class:</b> None</p>	<p>COMBUSTIBLE LIQUID</p> <p>Use dry chemical, CO<sub>2</sub>, or alcohol-resistant foam, as water may not be effective in fighting fires.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE.</p> <p>Use water spray to keep fire-exposed containers cool.</p>	<p><b>Isooctyl Alcohol</b> may react with <i>concentrated</i> SULFURIC ACID; SODIUM PEROXIDE; HYDROGEN PEROXIDE; and OXIDIZING AGENTS (such as PERCHLORATES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) to cause explosions.</p> <p><b>Isooctyl Alcohol</b> is not compatible with STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); AMINES; ISOCYANATES; and BORANES.</p>

### SPILL/LEAKS

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers for disposal.

Keep **Isooctyl Alcohol** out of confined spaces, such as sewers, because of the possibility of an explosion.

DO NOT wash into sewer.

**Isooctyl Alcohol** is toxic to waterfowl.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	0.14 ppm
<b>Flash Point:</b>	180°F (82°C)
<b>LEL:</b>	0.9%
<b>UEL:</b>	5.7%
<b>Auto Ignition Temp:</b>	530°F (277°C)
<b>Vapor Density:</b>	4.5 (air = 1)
<b>Vapor Pressure:</b>	0.4 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	0.83 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	365°F (185°C)
<b>Freezing Point:</b>	<-105°F (<-76°C)
<b>Molecular Weight:</b>	130.2

### EXPOSURE LIMITS

**NIOSH:** 50 ppm, 10-hr TWA

**ACGIH:** 50 ppm, 8-hr TWA

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl, Neoprene, Viton, and Barrier® (>8-hr breakthrough)
<b>Coveralls:</b>	Tychem® CPF 3, CPF 4, and Responder® (>8-hr breakthrough for <i>Hydroxyl compounds</i> )
<b>Respirator:</b>	>50 ppm - Supplied air or SCBA

### HEALTH EFFECTS

**Eyes:** Irritation and burns

**Skin:** Irritation and burns

**Inhalation:** Nose, throat and lung irritation with coughing, and severe shortness of breath (pulmonary edema)

Headache, dizziness, lightheadedness, confusion, irregular heartbeat and passing out

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

**Medical** observation is recommended as symptoms may be delayed.



Common Name: **ISOPENTANE**

Synonyms: Ethyldimethylmethane; Isoamyl Hydride; 1,1,2-Trimethylethane

CAS No: 78-78-4

Molecular Formula: C<sub>5</sub>H<sub>12</sub>

RTK Substance No: 1064

Description: Colorless liquid with an alcohol or gasoline-like odor

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>1 - Health</b> <b>4 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 1265 ERG Guide #: 128 Hazard Class: 3 (Flammable)	<b>FLAMMABLE LIQUID</b> Use dry chemical, CO <sub>2</sub> , alcohol-resistant foam or other foam extinguishing agents, as water may not be effective in fighting fires. <b>POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE.</b> Use water spray to keep fire-exposed containers cool and to reduce vapors. Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source. Flow or agitation may generate electrostatic charges.	<b>Isopentane</b> reacts violently with <b>OXIDIZING AGENTS</b> (such as <b>PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE</b> and <b>FLUORINE</b> ).

**SPILL/LEAKS**

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers for disposal.

Use only non-sparking tools and equipment, especially when opening and closing containers of **Isopentane**.

Keep **Isopentane** out of confined spaces, such as sewers, because of the possibility of an explosion.

DO NOT wash into sewer.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	Alcohol or Gasoline-like odor
<b>Flash Point:</b>	<-60°F (<-51°C)
<b>LEL:</b>	1.4%
<b>UEL:</b>	7.6%
<b>Auto Ignition Temp:</b>	788°F (420°C)
<b>Vapor Density:</b>	2.5 (air = 1)
<b>Vapor Pressure:</b>	595 mm Hg at 70°F (21°C)
<b>Specific Gravity:</b>	0.62 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	82°F (28°C)
<b>Melting Point:</b>	-256°F (-124°C)
<b>Ionization Potential:</b>	10.2 eV
<b>Molecular Weight:</b>	72.2

**EXPOSURE LIMITS**

**OSHA:** 1,000 ppm, 8-hr TWA

**NIOSH:** 120 ppm, 10-hr TWA; 610 ppm, 15-min Ceiling

**ACGIH:** 600 ppm, 8-hr TWA

**IDLH:** 1,500 ppm

The Protective Action Criteria values are:

PAC-1 = 610 ppm      PAC-3 = 20,000 ppm

PAC-2 = 610 ppm

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Nitrile, Silver Shield®/4H®, Viton and Barrier® (>8-hr breakthrough for <i>n-Pentane</i> )
<b>Coveralls:</b>	Tychem® F, BR, LV, Responder®, and TK; Zytron® 300; ONESuit®TEC; and Trelchem® HPS and VPS (>8-hr breakthrough for <i>Hydrocarbons, aliphatic, saturated</i> )
<b>Respirator:</b>	>120 ppm - Supplied air >610 ppm - SCBA

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, wheezing and shortness of breath  Headache, nausea, dizziness, lightheadedness, and passing out

**FIRST AID AND DECONTAMINATION**

<b>Remove</b> the person from exposure.
<b>Flush</b> eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.
<b>Quickly</b> remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention.
<b>Begin</b> artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b> promptly to a medical facility.

Common Name: **ISOPRENE**

Synonyms: beta-Methylbivinyll; 2-Methylbutadiene

CAS No: 78-79-5

 Molecular Formula: C<sub>5</sub>H<sub>8</sub>

RTK Substance No: 1069

Description: Colorless, volatile liquid with a mild odor

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>4 - Fire</b> <b>2 - Reactivity</b> DOT#: UN 1218 ERG Guide #: 130P Hazard Class: 3 (Flammable)	FLAMMABLE AND REACTIVE LIQUID Use dry chemical, CO <sub>2</sub> , alcohol-resistant foam or other foam as extinguishing agents, as water may not be effective in fighting fires. POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool. Vapors may travel to a source of ignition and flash back. Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.	<b>Isoprene</b> can easily form EXPLOSIVE PEROXIDES and can polymerize (uncontrolled reaction) with heating or on contact with many materials, resulting in fires, explosions, and container rupture. <b>Isoprene</b> reacts violently with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES), OXYGEN; ALKALI METALS (such as POTASSIUM); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE), AMMONIA; CHLORINATED SOLVENTS; ALCOHOLS, ACID CHLORIDES; ACID ANHYDRIDES; AMINES; ETHERS; and PHENOLS.

## SPILL/LEAKS

**Isolation Distance:**

Small Spill: 60 meters (200 feet)

Large Spill: 270 meters (900 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.

 Keep **Isoprene** out of confined spaces, such as sewers, because of the possibility of an explosion.

This substance is harmful to aquatic organisms.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	0.005 ppm
<b>Flash Point:</b>	-65°F (-54°C)
<b>LEL:</b>	2%
<b>UEL:</b>	9%
<b>Auto Ignition Temp:</b>	428°F (220°C)
<b>Vapor Density:</b>	2.4 (air = 1)
<b>Vapor Pressure:</b>	550 mm Hg at 77°F (25°C)
<b>Specific Gravity:</b>	0.68 (water = 1)
<b>Water Solubility:</b>	Slightly soluble
<b>Boiling Point:</b>	93°F (34°C)
<b>Melting Point:</b>	-231°F (-146°C)
<b>Ionization Potential:</b>	8.85+/- 0.02
<b>Molecular Weight:</b>	68.1

## EXPOSURE LIMITS

 No occupational exposure limits have been established for **Isoprene**.

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Viton (6.2-hr breakthrough)
<b>Coveralls:</b>	DuPont Tychem® Responder®; Kappler® Zytron® 500; and Saint-Gobain ONESuit® TEC (>3-hr breakthrough for <i>Hydrocarbons, Polyenes</i> )
<b>Respirator:</b>	Supplied air

## HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing and wheezing Headache, dizziness, lightheadedness and passing out
<b>Chronic:</b>	Cancer (liver, lung, mammary gland) in animals

## FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.  
**Remove** contaminated clothing and wash contaminated skin with soap and water.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** promptly to a medical facility.

**Common Name: ISOPROPYL ALCOHOL**

Synonyms: Isopropanol; Methyl Carbinol; 2-Propanol

CAS No: 67-63-0

Molecular Formula: C<sub>3</sub>H<sub>8</sub>O

RTK Substance No: 1076

Description: Colorless liquid with a sharp, musty odor

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<p><b>1 - Health</b></p> <p><b>3 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p><b>DOT#:</b> UN 1219</p> <p><b>ERG Guide #:</b> 129</p> <p><b>Hazard Class:</b> 3 (Flammable)</p>	<p><b>FLAMMABLE LIQUID</b></p> <p>Use dry chemical, CO<sub>2</sub>, water spray or alcohol-resistant foam as extinguishing agents.</p> <p>Water may not be effective in fighting fires.</p> <p><b>POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE.</b></p> <p>Use water spray to keep fire-exposed containers cool.</p> <p>Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.</p> <p><b>Isopropyl Alcohol</b> may form an ignitable vapor/air mixture in closed tanks or containers.</p>	<p><b>Isopropyl Alcohol</b> can react with AIR and OXYGEN over time to form unstable <i>peroxides</i> that can explode.</p> <p><b>Isopropyl Alcohol</b> forms explosive mixtures, when heated, with ALUMINUM.</p> <p><b>Isopropyl Alcohol</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); ACID ANHYDRIDES; ALKALI METALS (such as LITHIUM, SODIUM and POTASSIUM); ALKALINE EARTH METALS (such as BERYLLIUM, MAGNESIUM and CALCIUM); ETHYLENE OXIDE; PHOSGENE; CROTONALDEHYDE; and ISOCYANATES.</p>

**SPILL/LEAKS**

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in dry sand, earth, or a noncombustible material and place into sealed containers for disposal.

Use nonsparking tools and equipment.

Metal containers involving the transfer of **Isopropyl Alcohol** should be grounded and bonded.

Keep **Isopropyl Alcohol** out of confined spaces, such as sewers, because of the possibility of an explosion.

DO NOT wash into sewer.

**Isopropyl Alcohol** is dangerous to aquatic life at high concentrations.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	22 ppm
<b>Flash Point:</b>	53 ° to 57 °F (12 ° to 14 °C) (88% <b>Isopropyl Alcohol</b> )
<b>LEL:</b>	2%
<b>UEL:</b>	12.7%
<b>Auto Ignition Temp:</b>	750 °F (339 °C)
<b>Vapor Density:</b>	2.1 (air = 1)
<b>Vapor Pressure:</b>	33 mm Hg at 68 °F (20 °C)
<b>Specific Gravity:</b>	0.8 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	181 °F (83 °C)
<b>Freezing Point:</b>	-127 °F (-88 °C)
<b>Critical Temp:</b>	455 °F (235 °C)
<b>Ionization Potential:</b>	10.1 eV
<b>Molecular Weight:</b>	60.1

**EXPOSURE LIMITS**

**OSHA:** 400 ppm, 8-hr TWA

**NIOSH:** 400 ppm, 10-hr TWA; 500 ppm Ceiling

**ACGIH:** 200 ppm, 8-hr TWA; 400 ppm STEL

**IDLH:** 2,000 ppm

The Protective Action Criteria values are:

PAC-1 = 400 ppm    PAC-2 = 2,000 ppm

PAC-3 = 12,000 ppm

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Butyl, Nitrile, Neoprene, Silver Shield®/4H®, Viton and Barrier® (>8-hr breakthrough)
<b>Coveralls:</b>	Tychem® F, C3, BR, CSM and TK (>8-hr breakthrough) <b>Use turn out gear or flash protection if ignition/fire is the greatest hazard!</b>
<b>Respirator:</b>	>200 ppm - full facepiece APR with <i>Organic Vapor Cartridges</i> >2,000 ppm - SCBA

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns
<b>Inhalation:</b>	Nose and throat irritation with coughing and wheezing  Headache, dizziness, confusion, loss of coordination, unconsciousness, and death

**FIRST AID AND DECONTAMINATION**

<b>Remove</b> the person from exposure.
<b>Flush</b> eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
<b>Quickly</b> remove contaminated clothing and wash contaminated skin with large amounts of soap and water.
<b>Begin</b> artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b> promptly to a medical facility.

Common Name: **KEROSENE**

Synonyms: Fuel Oil #1; Jet Fuel (Aviation Kerosene); Range Oil

CAS No: 8008-20-6

Molecular Formula: Varies

RTK Substance No: 1091

Description: Colorless to yellowish, oily liquid with a strong odor

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<p><b>2 - Health</b></p> <p><b>2 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p><b>DOT#:</b> UN 1223</p> <p><b>ERG Guide #:</b> 128</p> <p><b>Hazard Class:</b> 3 (Flammable)</p>	<p>COMBUSTIBLE</p> <p>Use dry chemical, CO<sub>2</sub>, water spray or foam as extinguishing agents.</p> <p>Water may not be effective in fighting fires.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE.</p> <p>CONTAINERS MAY EXPLODE IN FIRE.</p> <p>Use water spray to keep fire-exposed containers cool.</p> <p>Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.</p> <p>Flow or agitation may generate electrostatic charges.</p> <p><b>Kerosene</b> may form an ignitable vapor/air mixture in closed tanks or containers.</p>	<p><b>Kerosene</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and NITRIC ACID.</p>

**SPILL/LEAKS**

**Isolation Distance:**

**Spill:** 50 meters (150 feet)

**Fire:** 800 meters (1/2 mile)

Absorb liquids in dry sand, earth, or a similar material and place into sealed containers for disposal.

Use only non-sparking tools and equipment.

DO NOT wash into sewer.

**Kerosene** is dangerous to aquatic life at high concentrations.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	0.1 ppm
<b>Flash Point:</b>	100° to 162°F (38° to 72°C)
<b>LEL:</b>	0.7%
<b>UEL:</b>	5%
<b>Auto Ignition Temp:</b>	351° to 624°F (177° to 329°C)
<b>Vapor Density:</b>	4.5 (air = 1)
<b>Vapor Pressure:</b>	2 to 5 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	0.81 to 0.95 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	304° to 574°F (151° to 301°C)
<b>Freezing Point:</b>	-30°F (-34°C)
<b>Molecular Weight:</b>	170 (approximately)

**EXPOSURE LIMITS**

**OSHA:** None

**NIOSH:** 100 mg/m<sup>3</sup>, 10-hr TWA

**ACGIH:** 200 mg/m<sup>3</sup>, 8-hr TWA

The Protective Action Criteria values are:

PAC-1 = 290 mg/m<sup>3</sup> PAC-2 = 1,100 mg/m<sup>3</sup>

PAC-3 = 4,100 mg/m<sup>3</sup>

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Nitrile, Viton, Viton/Butyl, Barrier® (>8-hr breakthrough)
<b>Coveralls:</b>	DuPont Tychem® F, BR, CSM and TK (>8-hr breakthrough) <b>Use turnout gear or flash protection if ignition/fire is the greatest hazard.</b>
<b>Respirator:</b>	>100 mg/m <sup>3</sup> - full-facepiece APR with <i>Organic vapor cartridge</i> >290 mg/m <sup>3</sup> or fire - SCBA

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose and throat irritation with coughing and wheezing
	Headache, dizziness, nausea and vomiting, weakness, restlessness, disorientation and drowsiness
	Convulsions and coma may follow very high exposure

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.



Common Name: **KETENE**

Synonyms: Carbomethene; Ethenone; Keten

CAS No: 463-51-4

Molecular Formula: CH<sub>2</sub>=CO

RTK Substance No: 1092

Description: Colorless gas with a sharp, irritating odor

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>3 - Fire</b> <b>1 - Reactivity</b> DOT#: None ERG Guide #: 131 Hazard Class: None	FLAMMABLE GAS <b>Ketene</b> can POLYMERIZE resulting in uncontrolled reactions. These reactions may be explosive. Use dry chemical or CO <sub>2</sub> as extinguishing agents. USE WATER carefully as <b>Ketene</b> reacts with WATER. POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool. Vapors may travel to a source of ignition and flash back. <b>Ketene</b> may form an ignitable vapor/air mixture in closed tanks or containers.	<b>Ketene</b> can readily polymerize and may react violently with many ORGANIC COMPOUNDS. <b>Ketene</b> reacts with WATER to form <i>Acetic Acid</i> and decomposes in ALCOHOLS and AMMONIA. <b>Ketene</b> reacts with HYDROGEN PEROXIDE to form explosive <i>Diacetyl Peroxide</i> . <b>Ketene</b> can not be stored or shipped.

## SPILL/LEAKS

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Stop flow of gas. If source of leak is a cylinder and the leak cannot be stopped in place, remove the leaking cylinder to a safe place in the open air, and repair leak or allow cylinder to empty.

Use only non-sparking tools and equipment.

Metal containers involving the transfer of **Ketene** should be grounded and bonded.

Keep **Ketene** out of confined spaces, such as sewers, because of the possibility of an explosion.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Sharp, penetrating odor
<b>Flash Point:</b>	Flammable Gas
<b>Vapor Density:</b>	1.45 (air = 1)
<b>Vapor Pressure:</b>	1.04 x 10 <sup>4</sup> mm Hg at 77°F (25°C)
<b>Water Solubility:</b>	Reacts
<b>Boiling Point:</b>	-69°F (-56°C)
<b>Freezing Point:</b>	-238°F (-150°C)
<b>Ionization Potential:</b>	9.61 eV
<b>Molecular Weight:</b>	42

## EXPOSURE LIMITS

**OSHA:** 0.5 ppm, 8-hr TWA

**NIOSH:** 0.5 ppm, 10-hr TWA; 1.5 ppm, 15-min STEL

**ACGIH:** 0.5 ppm, 8-hr TWA; 1.5 ppm, 15-min STEL

**IDLH:** 5 ppm

The Protective Action Criteria values are:

PAC-1 = 0.0057ppm; PAC-2 = 0.063 ppm; PAC-3 = 0.2 ppm

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Silver Shield®/4H® and Barrier® (>4-hr breakthrough)
<b>Coveralls:</b>	Tychem® F, C3, BR, CSM and TK (>8-hr breakthrough) <b>Use turn out gear or flash protection if ignition/fire is the greatest hazard!</b>
<b>Respirator:</b>	>0.5 ppm - SCBA

## HEALTH EFFECTS

**Eyes:** Irritation

**Skin:** Irritation

**Inhalation:** Nose, throat and lung irritation, with coughing, and severe shortness of breath (pulmonary edema)

## FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Transfer** promptly to a medical facility.

**Medical** observation is recommended as symptoms may be delayed.



Common Name: **LEAD**

Synonym: Metallic Lead

CAS No: 7439-92-1

Molecular Formula: Pb<sub>2</sub>

RTK Substance No: 1096

Description: Heavy, soft, silvery-gray metal

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<p><b>4 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b></p> <p><b>DOT#:</b> UN 3077</p> <p><b>ERG Guide #:</b> 171</p> <p><b>Hazard Class:</b> 9 (Environmentally Hazardous Substance)</p>	<p>Extinguish fire using an agent suitable for type of surrounding fire. <b>Lead</b> itself does not burn.</p> <p>POISONOUS FUMES ARE PRODUCED IN FIRE, including <i>Lead Oxides</i>.</p> <p>Use water spray to keep fire-exposed containers cool.</p>	<p><b>Lead</b> reacts violently with HYDROGEN PEROXIDE; AMMONIUM NITRATE; ZIRCONIUM; SODIUM AZIDE; SODIUM ACETYLIDE; and CHLORINE TRIFLUORIDE.</p> <p><b>Lead</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC).</p>

**SPILL/LEAKS**

**Isolation Distance:** 10 to 25 meters  
(30 to 80 feet)

Use a HEPA-filter vacuum for clean-up.

Toxic to aquatic organisms.

Hazardous to the environment and persists in the environment.

DO NOT wash into sewer.

**PHYSICAL PROPERTIES**

**Odor Threshold:** No odor

**Flash Point:** Not combustible

**LEL:** N/A

**UEL:** N/A

**Specific Gravity:** **11.35 at 68°F (20°C)**

**Vapor Pressure:** 0 mm Hg at 68°F (20°C)

**Water Solubility:** Insoluble

**Boiling Point:** 3,164°F (1,740°C)

**Melting Point:** 621.5°F (327.5°C)

**EXPOSURE LIMITS**

**OSHA:** 0.05 mg/m<sup>3</sup>, 8-hr TWA

**NIOSH:** 0.05 mg/m<sup>3</sup>, 10-hr TWA

**ACGIH:** 0.05 mg/m<sup>3</sup>, 8-hr TWA

**IDLH LEVEL:** 100 mg/m<sup>3</sup>

**PAC LEVELS:** PAC-1 = 0.15 mg/m<sup>3</sup>; PAC-2 = 120 mg/m<sup>3</sup>; PAC-3 = 700 mg/m<sup>3</sup>

**PROTECTIVE EQUIPMENT**

**Gloves:** Nitrile, Latex, Rubber

**Coveralls:** DuPont Tyvek®

**Boots:** Latex, Butyl, Neoprene

**Respirator:** ≤0.5 mg/m<sup>3</sup> - N100  
 <2.5 mg/m<sup>3</sup> - full facepiece APR with High Efficiency filters  
 ≤50 mg/m<sup>3</sup> - full facepiece powered APR with High Efficiency filters  
 ≤100 mg/m<sup>3</sup> - Pressure-demand supplied-air  
 >100 mg/m<sup>3</sup> - Pressure-demand SCBA

**HEALTH EFFECTS**

**Eyes:** Irritation

**Skin:** No Information

**Acute:** Headache, irritability, upset stomach, and weakness

**Chronic:** *Lead* may cause lung, brain, stomach, and kidney cancer in humans.  
 Metallic taste, colic, muscle cramps  
 Damage to the nervous system

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Remove** contaminated clothing and wash contaminated skin with soap and water.

**Transfer** to a medical facility.

Common Name: **LEAD ACETATE**

Synonyms: Dibasic Lead Acetate; Lead Diacetate; Salt of Saturn; Sugar of Lead

CAS No: 301-04-2

Molecular Formula: C<sub>4</sub>H<sub>6</sub>O<sub>4</sub>Pb

RTK Substance No: 1097

Description: White to gray-colored flakes, crystalline powder or solid

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<p><b>3 - Health</b></p> <p><b>0 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p><b>DOT#:</b> UN 1616</p> <p><b>ERG Guide #:</b> 151</p> <p><b>Hazard Class:</b> 6.1 (Poison)</p>	<p>Extinguish fire using an agent suitable for type of surrounding fire. <b>Lead Acetate</b> itself does not burn.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Lead Oxides</i> and <i>Acetic Acid</i>.</p> <p>Use water spray to keep fire-exposed containers cool.</p>	<p>Reacts violently with BROMATES; PHOSPHATES; CARBONATES; and PHENOLS.</p> <p><b>Lead Acetate</b> is not compatible with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); AMMONIA; AMINES; CRESOLS; ISOCYANATES, CHLORAL HYDRATE; SULFIDES; SALICYLIC ACID; TANNIN; CITRATES; EPICHLOROHYDRIN; SULFITES; RESORCINOL; and TARTRATES.</p> <p>Keep away from COMBUSTIBLES.</p>

**SPILL/LEAKS**

**Isolation Distance:** 25 to 50 meters  
(80 to 160 feet)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up.

Toxic to aquatic organisms.

Hazardous to the environment and persists in the environment.

DO NOT wash into sewer.

**PHYSICAL PROPERTIES**

**Odor Threshold:** Odor of *Acetic Acid*

**Flash Point:** Not combustible

**LEL:** N/A

**UEL:** N/A

**Relative Density:** 3.3 (water = 1)

**Water Solubility:** Soluble

**pH:** 5.5 - 6.5

**Melting Point:** 167°F (75°C)

**EXPOSURE LIMITS**

**OSHA:** 0.05 mg/m<sup>3</sup>, 8-hr TWA (as *Lead*)

**NIOSH:** 0.05 mg/m<sup>3</sup>, 10-hr TWA (as *Lead*)

**ACGIH:** 0.05 mg/m<sup>3</sup>, 8-hr TWA (as *Lead*)

**IDLH LEVEL:** 100 mg/m<sup>3</sup> (as *Lead*)

**PAC LEVELS:** PAC-1 = 5 mg/m<sup>3</sup>; PAC-2 = 55 mg/m<sup>3</sup>; PAC-3 = 330 mg/m<sup>3</sup>

**PROTECTIVE EQUIPMENT**

**Gloves:** Nitrile, Latex, Rubber

**Coveralls:** DuPont Tyvek®

**Boots:** Latex, Butyl, Neoprene

**Respirator:** ≤0.5 mg/m<sup>3</sup> - N100  
 ≤2.5 mg/m<sup>3</sup> - full facepiece APR with High Efficiency filters  
 ≤50 mg/m<sup>3</sup> - full facepiece powered APR with High Efficiency filters  
 ≤100 mg/m<sup>3</sup> - Pressure-demand supplied-air  
 >100 mg/m<sup>3</sup> - Pressure-demand SCBA

**HEALTH EFFECTS**

**Eyes:** Irritation

**Skin:** No Information

**Acute:** Headache, irritability, upset stomach, and weakness

**Chronic:** Cancer - Inorganic *Lead* compounds may cause lung, brain, stomach, and kidney cancer in humans.

Other effects may include: metallic taste, colic, weight loss, muscle cramps and damage to the nervous system

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Remove** contaminated clothing and wash contaminated skin with water.

**Transfer** to a medical facility.

Common Name: **LEAD ARSENATE**

Synonyms: Acid Lead Arsenate

CAS No: 7784-40-9

 Molecular Formula:  $PbHAsO_4$ 

RTK Substance No: 1098

Description: Odorless, heavy white powder

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>4 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 1617 ERG Guide #: 151 Hazard Class: 6.1 (Poison)	Extinguish fire using an agent suitable for type of surrounding fire. <b>Lead Arsenate</b> itself does not burn.  POISONOUS GASES ARE PRODUCED IN FIRE including <i>Lead Oxides</i> and <i>Arsenic Oxides</i> .  Use water spray to keep fire-exposed containers cool.	<b>Lead Arsenate</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); BROMINE AZIDE; STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); ALKALI; and SULFIDES.  <i>Inorganic Arsenic</i> can react with HYDROGEN to release highly toxic <i>Arsine gas</i> .  Keep water solutions containing <i>Arsenic compounds</i> away from ACTIVE METALS (such as IRON, ALUMINUM, and ZINC) as highly toxic <i>Arsenic compounds</i> such as <i>Arsine gas</i> may be released.

**SPILL/LEAKS**
**Isolation Distance:** 25 to 50 meters  
(80 to 160 feet)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up.

**Lead Arsenate** is a marine pollutant and is harmful to aquatic organisms.

DO NOT wash into sewer.

**PHYSICAL PROPERTIES**

**Odor Threshold:** Odorless  
**Flash Point:** Non-combustible  
**Vapor Density:** 5.79 (water =1)  
**Water Solubility:** Insoluble  
**Melting Point:** 536°F (280°C) (decomposes)

**EXPOSURE LIMITS**

**OSHA:** 0.01 mg/m<sup>3</sup>, 8-hr TWA (as *Arsenic*)  
**NIOSH:** 0.002 mg/m<sup>3</sup>, 15 minutes (as *Arsenic*)  
**ACGIH:** 0.01 mg/m<sup>3</sup>, 8-hr TWA (as *Arsenic*)  
**IDLH LEVEL:** 5 mg/m<sup>3</sup> (as *Arsenic*)  
**PAC LEVELS:** PAC-1 = 7 mg/m<sup>3</sup>; PAC-2 = 77 mg/m<sup>3</sup>; PAC-3 = 460 mg/m<sup>3</sup>

**PROTECTIVE EQUIPMENT**

**Gloves:** Nitrile, Latex, Rubber  
**Coveralls:** DuPont Tyvek® and Tychem®, Polycoat; QC, CPF-1, SL and CPF-2  
**Boots:** Butyl, Neoprene  
**Respirator:** >0.002 mg/m<sup>3</sup> - APR with High Efficiency filters  
 ≥0.1 mg/m<sup>3</sup> - PAPR with High Efficiency filters or Pressure-demand supplied-air  
 >5 mg/m<sup>3</sup> - Pressure-demand SCBA

**HEALTH EFFECTS**

**Eyes:** Irritation and burns  
**Skin:** Irritation and burns  
**Acute:** Nose and throat irritation  
 Headache, irritability, upset stomach, and weakness  
**Chronic:** *Inorganic Lead* compounds may cause lung, brain, stomach, and kidney cancer in humans.  
*Inorganic Arsenic compounds* cause skin and lung cancer in humans.  
 Metallic taste, colic, muscle cramps  
 Damage to the nervous system

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.  
**Remove** contaminated clothing and wash contaminated skin with soap and water.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** to a medical facility.

Common Name: **LEAD ARSENITE**

Synonyms: Lead Metaarsenite

CAS No: 10031-13-7

Molecular Formula:  $As_2O_4Pb$

RTK Substance No: 1099

Description: White powder

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>3 - Health</b></p> <p><b>0 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p>DOT#: UN 1618</p> <p>ERG Guide #: 151</p> <p>Hazard Class: 6.1 (Poison)</p>	<p>Extinguish fire using an agent suitable for type of surrounding fire. <b>Lead Arsenite</b> itself does not burn.</p> <p>POISONOUS FUMES ARE PRODUCED IN FIRE, including <i>Lead Oxides</i> and <i>Arsenic Oxides</i>.</p> <p>Use water spray to keep fire-exposed containers cool.</p>	<p><b>Lead Arsenite</b> will react violently with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC).</p> <p><b>Lead Arsenite</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).</p> <p><i>Inorganic Arsenic</i> can react with HYDROGEN to release highly toxic <i>Arsine gas</i>.</p> <p>Keep water solutions containing <i>Arsenic compounds</i> away from ACTIVE METALS (such as IRON, ALUMINUM, and ZINC) as highly toxic <i>Arsenic compounds</i> Such as <i>Arsine gas</i> may be released.</p>

### SPILL/LEAKS

**Isolation Distance:** 25 to 50 meters  
(80 to 160 feet)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up.

Toxic to aquatic organisms.

Hazardous to the environment and persists in the environment.

DO NOT wash into sewer.

### PHYSICAL PROPERTIES

**Odor Threshold:** Odorless

**Flash Point:** Non-combustible

**LEL:** N/A

**UEL:** N/A

**Relative Density:** 5.85 (water = 1)

**Water Solubility:** Insoluble

### EXPOSURE LIMITS

**OSHA:** 0.01 mg/m<sup>3</sup>, 8-hr TWA (as *Arsenic*)

**NIOSH:** 0.002 mg/m<sup>3</sup>, 15 minutes (as *Arsenic*)

**ACGIH:** 0.01 mg/m<sup>3</sup>, 8-hr TWA (as *Arsenic*)

**IDLH LEVEL:** 5 mg/m<sup>3</sup> (as *Arsenic*)

**PAC LEVELS:** PAC-1 = 4.2 mg/m<sup>3</sup>; PAC-2 = 47 mg/m<sup>3</sup>; PAC-3 = 280 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

**Gloves:** Nitrile, Latex, Rubber

**Coveralls:** DuPont Tyvek®, Tychem® Polycoat, QC, CPF-1, SL and CPF-2

**Boots:** Butyl, Neoprene

**Respirator:** >0.002 mg/m<sup>3</sup> - APR with High Efficiency filters  
 ≥0.1 mg/m<sup>3</sup> - PAPR with High Efficiency filters or Pressure-demand supplied-air  
 >5 mg/m<sup>3</sup> - Pressure-demand SCBA

### HEALTH EFFECTS

**Eyes:** Irritation and burns

**Skin:** Irritation and burns

**Acute:** Nose and throat irritation  
Headache, irritability, upset stomach, and weakness

**Chronic:** *Inorganic Lead* compounds may cause lung, brain, stomach, and kidney cancer in humans.  
*Inorganic Arsenic* compounds cause skin and lung cancer in humans.  
Metallic taste, colic, and muscle cramps.  
Damage to the nervous system.

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Remove** contaminated clothing and wash contaminated skin with water.

**Transfer** to a medical facility.

Common Name: **LEAD CHLORIDE**

Synonyms: Lead (II) Chloride; Lead Dichloride

CAS No: 7758-95-4

Molecular Formula: PbCl<sub>2</sub>

RTK Substance No: 1101

Description: White crystalline powder

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b>  DOT#: UN 2291 ERG Guide #: 151 Hazard Class: 6.1 (Poison)	Extinguish fire using an agent suitable for type of surrounding fire. <b>Lead Chloride</b> itself does not burn.  POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Lead Oxides</i> and <i>Hydrogen Chloride</i> .  CONTAINERS MAY EXPLODE IN FIRE.  Use water spray to keep fire-exposed containers cool.	<b>Lead Chloride</b> is not compatible with CALCIUM; OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); and STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC).

### SPILL/LEAKS

**Isolation Distance:** 25 to 50 meters (80 to 160 feet)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up.

Toxic to aquatic organisms.

Hazardous to the environment and persists in the environment.

DO NOT wash into sewer.

### PHYSICAL PROPERTIES

**Odor Threshold:** Odorless

**Flash Point:** Not combustible

**Vapor Density:** 9.6 (air = 1)

**Vapor Pressure:** 1 mm Hg at 1,017°F (547°C)

**Water Solubility:** Slightly soluble

**Boiling Point:** 1,742°F (950°C)

**Melting Point:** 934°F (501°C)

**Specific Gravity:** 5.85 (water = 1)

### EXPOSURE LIMITS

**OSHA:** 0.05 mg/m<sup>3</sup>, 8-hr TWA (as *Lead*)

**NIOSH:** 0.05 mg/m<sup>3</sup>, 10-hr TWA (as *Lead*)

**ACGIH:** 0.05 mg/m<sup>3</sup>, 8-hr TWA (as *Lead*)

**IDLH LEVEL:** 100 mg/m<sup>3</sup> (as *Lead*)  
50 ppm (as *Hydrogen Chloride*)

**PAC LEVELS:** PAC-1 = 0.2 mg/m<sup>3</sup>; PAC-2 = 160 mg/m<sup>3</sup>; PAC-3 = 940 mg/m<sup>3</sup>  
PAC-1 = 1.8 ppm; PAC-2 = 22 ppm;  
PAC-3 = 100 ppm (as *Hydrogen Chloride*)

### PROTECTIVE EQUIPMENT

**Gloves:** Butyl, Neoprene and Viton (>8-hr breakthrough)

**Coveralls:** DuPont Tychem® BR, Responder® and TK; ONESuit®TEC; Trelchem® HPS and VPS (>8-hr breakthrough)

**Boots:** Butyl, Neoprene

**Respirator:** ≤0.5 mg/m<sup>3</sup> - N100 (as *Lead*)  
≤2.5 mg/m<sup>3</sup> (as *Lead*) or >2 ppm but ≤50 ppm (as *Hydrogen Chloride*)- full facepiece APR with High Efficiency prefilters and *Acid* gas cartridges  
≤50 mg/m<sup>3</sup> (as *Lead*) - full facepiece powered APR with High Efficiency filters  
≤100 mg/m<sup>3</sup> (as *Lead*) – Pressure-demand supplied-air  
>100 mg/m<sup>3</sup> (as *Lead*) or >50 ppm (as *Hydrogen Chloride*) – Pressure-demand SCBA

### HEALTH EFFECTS

**Eyes:** Irritation

**Skin:** No Information

**Acute:** Headache, irritability, upset stomach, and weakness

**Chronic:** Inorganic *Lead* compounds may cause lung, brain, stomach and kidney cancer in humans. Metallic taste, colic, muscle cramps  
Damage to the nervous system

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Remove** contaminated clothing and wash contaminated skin with water.

**Transfer** to a medical facility.



Common Name: **LEAD CHROMATE**

Synonyms: Chrome Yellow; Paris Yellow; Chrome Green

CAS No: 7758-97-6

 Molecular Formula:  $PbCrO_4$ 

RTK Substance No: 1102

Description: Odorless, yellow to orange, sand-like powder.

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>4 - Health</b> <b>0 - Fire</b> <b>1 - Reactivity</b>  DOT#: UN 3288 ERG Guide #: 151 Hazard Class: 6.1 (Toxic)	Extinguish fire using an agent suitable for type of surrounding fire. <b>Lead Chromate</b> itself does not burn.  POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Lead Oxides</i> and <i>Chromium Oxides</i> .  CONTAINERS MAY EXPLODE IN FIRE.  Use water spray to keep fire-exposed containers cool.  <b>Lead Chromate</b> may ignite combustibles (wood, paper and oil).	<b>Lead Chromate</b> reacts violently with AZO DYES, FERRIC FERROCYANIDE and DINITRONAPHTHALENE.  <b>Lead Chromate</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); HYDRAZINE; SULFUR; TANTALUM; STRONG REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM, and their HYDRIDES); COMBUSTIBLES; and ORGANIC MATERIALS.

### SPILL/LEAKS

**Isolation Distance:** 25 to 50 meters  
     (80 to 160 feet)  
 Moisten spilled material first or use a HEPA-filter vacuum for clean-up.  
 Toxic to aquatic organisms.  
 Hazardous to the environment and persists in the environment.  
 DO NOT wash into sewer.

### PHYSICAL PROPERTIES

**Odor Threshold:** Odorless  
**Flash Point:** Noncombustible  
**Vapor Pressure:** No Information  
**Specific Gravity:** 6.3  
**Water Solubility:** **Insoluble**  
**Melting Point:** 1,551°F (844°C)

### EXPOSURE LIMITS

**OSHA:** 0.005 mg/m<sup>3</sup>, 8-hr TWA (as *Chromium*)  
**NIOSH:** 0.0002 mg/m<sup>3</sup>, 8-hr TWA (as *Chromium*)  
**ACGIH:** 0.01 mg/m<sup>3</sup>, 8-hr TWA (as *Chromium*)  
**IDLH LEVEL:** 15 mg/m<sup>3</sup> (as *Chromium*)  
  
**PAC LEVELS:** PAC-1 = 0.036 mg/m<sup>3</sup>; PAC-2 = 16 mg/m<sup>3</sup>; PAC-3 = 97 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

**Gloves:** Rubber  
**Coveralls:** DuPont Tyvek®  
**Boots:** Butyl, Neoprene  
**Respirator:** >0.0002 mg/m<sup>3</sup> - full facepiece powered APR with High efficiency filters or pressure-demand supplied-air  
                   >0.01 mg/m<sup>3</sup> - Pressure-demand SCBA

### HEALTH EFFECTS

**Eyes:** Irritation and burns  
**Skin:** Irritation. Prolonged contact may cause blisters and deep ulcers  
**Acute:** Headache, irritability, upset stomach, and weakness  
**Chronic:** *Chromium VI* compounds have been shown to cause lung cancer in humans and have been shown to cause oral and stomach cancer in animals.  
  
*Inorganic Lead compounds* may cause lung, brain, stomach and kidney cancer in humans. Metallic taste, colic and muscle cramps  
 Damage to the nervous system, and skin allergy

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.  
**Remove** contaminated clothing and wash contaminated skin with soap and water.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** to a medical facility.



Common Name: **LEAD CYANIDE**

Synonyms: Pigment Yellow

CAS No: 592-05-2

Molecular Formula:  $Pb(CN)_2$

RTK Substance No: 1103

Description: White to yellowish powder

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>3 - Health</b></p> <p><b>0 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p>DOT#: UN 1620</p> <p>ERG Guide #: 151</p> <p>Hazard Class: 6.1 (Poison)</p>	<p>Extinguish fire using an agent suitable for type of surrounding fire. <b>Lead Cyanide</b> itself does not burn.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Lead Oxides, Cyanides and Nitrogen Oxides</i>.</p> <p>Use water spray to keep fire-exposed containers cool. DO NOT USE WATER SPRAY on material itself.</p>	<p><b>Lead Cyanide</b> reacts violently with MAGNESIUM.</p> <p><b>Lead Cyanide</b> is decomposed by STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) and WATER to form toxic and flammable <i>Hydrogen Cyanide gas</i>.</p> <p><b>Lead Cyanide</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE), METAL CHLORATES; and METALS.</p>

### SPILL/LEAKS

**Isolation Distance:** 25 to 50 meters (80 to 160 feet)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up.

Toxic to aquatic organisms.

Hazardous to the environment and persists in the environment.

DO NOT wash into sewer.

### PHYSICAL PROPERTIES

**Odor Threshold:** No information

**Flash Point:** Non-combustible

**LEL:** N/A

**UEL:** N/A

**Vapor Density:** No information

**Vapor Pressure:** No information

**Water Solubility:** Slightly soluble

**Boiling Point:** No information

### EXPOSURE LIMITS

**OSHA:** 0.05 mg/m<sup>3</sup>, 8-hr TWA (as *Lead*)  
5 mg/m<sup>3</sup>, 8-hr TWA (as *Cyanide*)

**NIOSH:** 0.05 mg/m<sup>3</sup>, 10-hr TWA (as *Lead*)  
5 mg/m<sup>3</sup>, 10-min STEL (as *Cyanide*)

**ACGIH:** 0.05 mg/m<sup>3</sup>, 8-hr TWA (as *Lead*)  
5 mg/m<sup>3</sup>, TLV-Ceiling (as *Cyanide*)

**IDLH LEVEL:** 100 mg/m<sup>3</sup> (as *Lead*)  
25 mg/m<sup>3</sup> (as *Cyanide*)

**PAC LEVELS:** PAC-1 = 0.15 mg/m<sup>3</sup>; PAC-2 = 120 mg/m<sup>3</sup>;  
PAC-3 = 700 mg/m<sup>3</sup> (as *Lead*)  
PAC-1 = 6 mg/m<sup>3</sup>; PAC-2 = 8.3 mg/m<sup>3</sup>;  
PAC-3 = 50 mg/m<sup>3</sup> (as *Cyanide*)

### PROTECTIVE EQUIPMENT

**Gloves:** Nitrile, Latex, Rubber

**Coveralls:** DuPont Tyvek®, DuPont Tychem® Polycoat, QC, CPF-1, SL and CPF-2

**Boots:** Butyl, Neoprene

**Respirator:** ≤0.5 mg/m<sup>3</sup> - N100 (as *Lead*)  
≤2.5 mg/m<sup>3</sup> (as *Lead*) - full facepiece APR with High Efficiency filters  
≤50 mg/m<sup>3</sup> (as *Lead*) - full facepiece powered APR with High Efficiency filters  
≤100 mg/m<sup>3</sup> (as *Lead*) or >5 but ≤25 mg/m<sup>3</sup> (as *Cyanide*) – Pressure-demand supplied-air  
>100 mg/m<sup>3</sup> (as *Lead*) or >25 mg/m<sup>3</sup> (as *Cyanide*) – Pressure-demand SCBA

### HEALTH EFFECTS

**Eyes:** No Information

**Skin:** No Information

**Acute:** Headache, irritability, and upset stomach, and weakness. High exposure to *Cyanide* can cause DEATH, sometimes without warning

**Chronic:** Inorganic Lead compounds may cause lung, brain, stomach, and kidney cancer in humans.  
Metallic taste, colic, muscle cramps  
Damage to the nervous system

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Remove** contaminated clothing and wash contaminated skin with soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** to a medical facility.

**Use** Use US FDA approved standard cyanide antidotal kit or Cyanokit if symptoms of cyanide poisoning develop. Do NOT use *Amyl Nitrite* with smoke inhalation exposures.

Common Name: **LEAD DIOXIDE**

Synonyms: Lead Brown; Lead Peroxide

CAS No: 1309-60-0

Molecular Formula: PbO<sub>2</sub>

RTK Substance No: 1104

Description: Odorless, brown crystals or powder

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>3 - Health</b></p> <p><b>0 - Fire</b></p> <p><b>1 - Reactivity</b></p> <p><b>DOT#:</b> UN 1872</p> <p><b>ERG Guide #:</b> 141</p> <p><b>Hazard Class:</b> 5.1 (Oxidizer)</p>	<p><b>Lead Dioxide</b> itself does not burn.</p> <p>Flood fire with water. DO NOT USE CO<sub>2</sub>, dry chemicals or halogenated extinguishing agents.</p> <p>POISONOUS FUMES ARE PRODUCED IN FIRE, including <i>Lead Oxides</i>.</p> <p>CONTAINERS MAY EXPLODE IN FIRE.</p> <p>Use water spray to keep fire-exposed containers cool.</p>	<p><b>Lead Dioxide</b> is a STRONG OXIDIZER which may react with ORGANICS, COMBUSTIBLES or REDUCING AGENTS to produce enough heat to cause a fire.</p> <p><b>Lead Dioxide</b> is not compatible with FINELY POWDERED METALS; METAL CARBIDES; SULFUR COMPOUNDS; POTASSIUM; SODIUM; PHOSPHORUS; MAGNESIUM; CHLORINE TRIFLUORIDE; ZINC; NITROGEN; CESIUM ACETYLIDE; HYDROXYLAMINE; HYDROGEN PEROXIDE; HALOGENS; STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); and AMINES.</p>

### SPILL/LEAKS

**Isolation Distance:** 10 to 25 meters (30 to 80 feet)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up.

Toxic to aquatic organisms.

Hazardous to the environment and persists in the environment.

DO NOT wash into sewer.

### PHYSICAL PROPERTIES

**Odor Threshold:** Odorless

**Flash Point:** Noncombustible

**Relative Density:** 9.38 g/cm<sup>3</sup>

**Water Solubility:** Insoluble

**Vapor Density:** 8.2 (air = 1)

**Melting Point:** Decomposes at 554°F (290°C)

### EXPOSURE LIMITS

**OSHA:** 0.05 mg/m<sup>3</sup>, 8-hr TWA (as *Lead*)

**NIOSH:** 0.05 mg/m<sup>3</sup>, 10-hr TWA (as *Lead*)

**ACGIH:** 0.05 mg/m<sup>3</sup>, 8-hr TWA (as *Lead*)

**IDLH LEVEL:** 100 mg/m<sup>3</sup> (as *Lead*)

**PAC LEVELS:** PAC-1 = 0.17 mg/m<sup>3</sup>; PAC-2 = 140 mg/m<sup>3</sup>; PAC-3 = 810 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

**Gloves:** Nitrile, Latex, Rubber

**Coveralls:** DuPont Tyvek® and Tychem® Polycoat, QC, CPF-1, SL and CPF-2

**Boots:** Butyl, Neoprene

**Respirator:** ≤0.5 mg/m<sup>3</sup> - N100  
 ≤2.5 mg/m<sup>3</sup> - full facepiece APR with High Efficiency filters  
 ≤50 mg/m<sup>3</sup> - full facepiece powered APR with High Efficiency filters  
 ≤100 mg/m<sup>3</sup> - Pressure-demand supplied-air  
 >100 mg/m<sup>3</sup> - Pressure-demand SCBA

### HEALTH EFFECTS

**Eyes:** Irritation

**Skin:** Irritation

**Acute:** Headache, irritability, upset stomach, and weakness

**Chronic:** *Inorganic Lead compounds* may cause lung, brain, stomach, and kidney cancer in humans.

Metallic taste, colic and muscle cramps.

Damage to the nervous system.

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Remove** contaminated clothing and wash contaminated skin with soap and water.

**Transfer** to a medical facility.

Common Name: **LEAD FLUOBORATE**

Synonyms: Lead Boron Fluoride

CAS No: 13814-96-5

Molecular Formula:  $Pb(BF_4)_2$

RTK Substance No: 1105

Description: A crystalline powder mostly used in a water solution

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>3 - Health</b></p> <p><b>0 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p><b>DOT#:</b> UN 2291</p> <p><b>ERG Guide #:</b> 151</p> <p><b>Hazard Class:</b> 6.1 (Poison)</p>	<p>Use dry chemical, CO<sub>2</sub> or foam as extinguishing agents. <b>Lead Fluoborate</b> itself does not burn.</p> <p>DO NOT USE water stream directly on material itself.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Lead Oxides, Boron Oxides, Fluorine</i> and <i>Hydrogen Fluoride</i>.</p> <p>CONTAINERS MAY EXPLODE IN FIRE</p> <p>Use water spray to keep fire-exposed containers cool.</p>	<p>Liquid solutions of <b>Lead Fluoborate</b>, in contact with METALS, may generate explosive <i>Hydrogen gas</i>.</p> <p><b>Lead Fluoborate</b> is not compatible with CYANIDES; CALCIUM CARBIDE; WATER-REACTIVE MATERIALS; SULFITES; STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); and STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE).</p>

## SPILL/LEAKS

**Isolation Distance:** 25 to 50 meters (80 to 160 feet)

Moisten powdered material first or use a HEPA-filter vacuum for clean-up.

For liquid spills, contain spill with earth, sand, etc. Neutralize with an alkali such as *Sodium Carbonate*. Mop or pump into a container. Keep out of sewers. Toxic to aquatic organisms.

Hazardous to the environment and persists in the environment.

## PHYSICAL PROPERTIES

**Odor Threshold:** Relatively no odor

**Flash Point:** Noncombustible

**Specific Gravity:** 1.70 – 1.75 (liquid)

**Boiling Point:** >212°F (100°C) (liquid)

**Water Solubility:** Soluble

**Melting Point:** Less than <-32°F (0°C)

**pH:** Acidic (0 to 0.5) (liquid)

## EXPOSURE LIMITS

**OSHA:** 0.05 mg/m<sup>3</sup>, 8-hr TWA (as *Lead*)

**NIOSH:** 0.05 mg/m<sup>3</sup>, 10-hr TWA (as *Lead*)

**ACGIH:** 0.05 mg/m<sup>3</sup>, 8-hr TWA (as *Lead*)  
0.5 ppm, 8-hr TWA (as *Hydrogen Fluoride*)

**IDLH LEVEL:** 100 mg/m<sup>3</sup> (as *Lead*)  
30 ppm (as *Hydrogen Fluoride*)

**PAC LEVELS:** PAC-1 = 0.28 mg/m<sup>3</sup>; PAC-2 = 220 mg/m<sup>3</sup>; PAC-3 = 1,300 mg/m<sup>3</sup>  
PAC-1 = 1 ppm; PAC-2 = 24 ppm;  
PAC-3 = 44 ppm (as *Hydrogen Fluoride*)

## PROTECTIVE EQUIPMENT

**Gloves:** Laminate, Nitrile or Natural Rubber

**Coveralls:** DuPont Tyvek® (solid) and Tychem® Responder® and TK or RF for *Hydrogen Fluoride* (HF)

**Boots:** Neoprene

**Respirator:** ≤0.5 mg/m<sup>3</sup> - N100 (as *Lead*)  
≤2.5 mg/m<sup>3</sup> (as *Lead*) - full facepiece APR with High Efficiency filters  
≤50 mg/m<sup>3</sup> (as *Lead*) or >0.5 ppm but ≤ 30 ppm (as HF) - full facepiece powered APR with High Efficiency prefilters and cartridge specific for HF  
≤100 mg/m<sup>3</sup> (as *Lead*) – Pressure-demand supplied-air  
>100 mg/m<sup>3</sup> (as *Lead*) or >30 ppm (as HF) – Pressure-demand SCBA

## HEALTH EFFECTS

**Eyes:** Irritation, burns

**Skin:** Irritation, burns

**Acute:** Headache, irritability, upset stomach and weakness

**Chronic:** *Inorganic Lead compounds* may cause lung, brain, stomach and kidney cancer in humans.  
Metallic taste, colic, muscle cramps  
Damage to the nervous system

## FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Remove** contaminated clothing and wash contaminated skin with water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** to a medical facility.

Common Name: **LEAD FLUORIDE**

Synonyms: Lead Difluoride

CAS No: 7783-46-2

Molecular Formula: PbF<sub>2</sub>

RTK Substance No: 1106

Description: Odorless white powder or a beige or gray crystalline solid

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> <b>DOT#:</b> UN 3077 <b>ERG Guide #:</b> 154 <b>Hazard Class:</b> 9 (Miscellaneous Hazardous Material)	Use dry chemical, CO <sub>2</sub> , alcohol-resistant foam or water spray as extinguishing agents. <b>Lead Fluoride</b> itself does not burn.  POISONOUS FUMES ARE PRODUCED IN FIRE, including <i>Hydrogen Fluoride</i> and <i>Lead Oxides</i> .  CONTAINERS MAY EXPLODE IN FIRE.  Use water spray to keep fire-exposed containers cool.  DO NOT get water inside containers.	<b>Lead Fluoride</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); POTASSIUM; and CALCIUM CARBIDE.  Contact with METALS may produce flammable and explosive <i>Hydrogen gas</i> .

### SPILL/LEAKS

**Isolation Distance:** 25 to 50 meters (80 to 160 feet)  
 Moisten spilled material first or use a HEPA-filter vacuum for clean-up.  
 Toxic to aquatic organisms.  
 Hazardous to the environment and persists in the environment.  
 DO NOT wash into sewer.

### PHYSICAL PROPERTIES

**Odor Threshold:** Odorless  
**Flash Point:** Non-combustible  
**Density:** 8.45 g/cm<sup>3</sup>  
**Boiling Point:** 2,359°F (1,293°C)  
**Water Solubility:** Slightly soluble  
**Melting Point:** 1,515°F (824°C)

### EXPOSURE LIMITS

**OSHA:** 0.05 mg/m<sup>3</sup>, 8-hr TWA (as *Lead*)  
**NIOSH:** 0.05 mg/m<sup>3</sup>, 10-hr TWA (as *Lead*)  
**ACGIH:** 0.05 mg/m<sup>3</sup>, 8-hr TWA (as *Lead*)  
 0.5 ppm, 8-hr TWA (as *Hydrogen Fluoride*)  
  
**IDLH LEVEL:** 100 mg/m<sup>3</sup> (as *Lead*)  
 30 ppm (as *Hydrogen Fluoride*)  
  
**PAC LEVELS:** PAC-1 = 0.18 mg/m<sup>3</sup>; PAC-2 = 140 mg/m<sup>3</sup>; PAC-3 = 830 mg/m<sup>3</sup>  
 PAC-1 = 1 ppm; PAC-2 = 24 ppm;  
 PAC-3 = 44 ppm (as *Hydrogen Fluoride*)

### PROTECTIVE EQUIPMENT

**Gloves:** Laminate, Nitrile or Natural Rubber  
**Coveralls:** DuPont Tyvek® (solid) and Tychem® Responder® and TK or RF for *Hydrogen Fluoride* (HF)  
**Boots:** Neoprene  
**Respirator:** ≤0.5 mg/m<sup>3</sup> - N100 (as *Lead*)  
 ≤2.5 mg/m<sup>3</sup> (as *Lead*) - full facepiece APR with High Efficiency filters  
 ≤50 mg/m<sup>3</sup> (as *Lead*) or >0.5 ppm but ≤ 30 ppm (as HF) - full facepiece powered APR with High Efficiency prefilters and cartridge specific for HF  
 ≤100 mg/m<sup>3</sup> (as *Lead*) – Pressure-demand supplied-air  
 >100 mg/m<sup>3</sup> (as *Lead*) or >30 ppm (as HF) – Pressure-demand SCBA

### HEALTH EFFECTS

**Eyes:** Irritation and burns  
**Skin:** Irritation and burns  
**Acute:** Headache, irritability, upset stomach, and weakness  
**Chronic:** *Inorganic Lead* compounds may cause lung, brain, stomach and kidney cancer in humans.  
 Metallic taste, colic, and muscle cramps  
 Damage to the nervous system

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.  
**Remove** contaminated clothing and wash contaminated skin with soap and water.  
**Transfer** to a medical facility.

Common Name: **LEAD IODIDE**

Synonyms: Lead II Iodide

CAS No: 10101-63-0

Molecular Formula:  $PbI_2$

RTK Substance No: 1107

Description: Bright yellow powder

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b>  <b>DOT ID #:</b> UN 3077 <b>ERG Guide #:</b> 171 <b>Hazard Class:</b> 9 (Environmentally Hazardous Material)	Use dry chemical, CO <sub>2</sub> or water spray as extinguishing agents. <b>Lead iodide</b> itself does not burn. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Lead Oxides</i> . CONTAINERS MAY EXPLODE IN FIRE Use water spray to keep fire-exposed containers cool.	<b>Lead iodide</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).

**SPILL/LEAKS**

**Isolation Distance:** 10 to 25 meters  
(30 to 80 feet)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up.

Toxic to aquatic organisms.

Hazardous to the environment and persists in the environment.

DO NOT wash into sewer.

**PHYSICAL PROPERTIES**

**Odor Threshold:** Odorless  
**Flash Point:** Not combustible  
**LEL:** N/A  
**UEL:** N/A  
**Specific Gravity:** 6.16 (water = 1)  
**Vapor Pressure:** No information  
**Water Solubility:** Very slightly soluble in boiling water  
**Melting Point:** 756°F (402°C)

**EXPOSURE LIMITS**

**OSHA:** 0.05 mg/m<sup>3</sup>, 8-hr TWA (as *Lead*)  
**NIOSH:** 0.05 mg/m<sup>3</sup>, 10-hr TWA (as *Lead*)  
**ACGIH:** 0.05 mg/m<sup>3</sup>, 8-hr TWA (as *Lead*)  
**IDLH LEVEL:** 100 mg/m<sup>3</sup> (as *Lead*)  
**PAC LEVELS:** PAC-1 = 0.33 mg/m<sup>3</sup>; PAC-2 = 270 mg/m<sup>3</sup>; PAC-3 = 1,600 mg/m<sup>3</sup>

**PROTECTIVE EQUIPMENT**

**Gloves:** Nitrile, Latex, Rubber  
**Coverall:** DuPont Tyvek®  
**Boot:** Latex, Butyl, Neoprene  
**Respirator:** ≤0.5 mg/m<sup>3</sup> - N100 (as *Lead*)  
 ≤2.5 mg/m<sup>3</sup> (as *Lead*) - full facepiece APR with High Efficiency filters  
 ≤50 mg/m<sup>3</sup> (as *Lead*) - full facepiece powered APR with High Efficiency filters  
 ≤100 mg/m<sup>3</sup> (as *Lead*) – Pressure-demand supplied-air  
 >100 mg/m<sup>3</sup> (as *Lead*) – Pressure-demand SCBA

**HEALTH EFFECTS**

**Eyes:** Irritation  
**Skin:** No information  
**Acute:** Headache, irritability, upset stomach, and weakness.  
**Chronic:** Inorganic *Lead* compounds may cause lung, brain, stomach and kidney cancer in humans.  
 Metallic taste, colic, muscle cramps Damage to the nervous system

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes.  
 Remove contact lenses if worn.  
**Remove** contaminated clothing and wash contaminated skin with soap and water.  
**Transfer** to a medical facility.



Common Name: **LEAD NITRATE**

Synonyms: Lead Dinitrate; Plumbous Nitrate

CAS No: 10099-74-8

Molecular Formula:  $Pb(NO_3)_2$

RTK Substance No: 1108

Description: White or colorless, sand-like solid

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b>  DOT#: UN 1469 ERG Guide #: 141 Hazard Class: 5.1 (Oxidizer)	USE WATER ONLY. DO NOT USE Chemical or CO <sub>2</sub> extinguishing agents.  POISONOUS FUMES ARE PRODUCED IN FIRE, including <i>Lead Oxides</i> and <i>Nitrogen Oxides</i> .  Use water spray to keep fire-exposed containers cool.  <b>Lead Nitrate</b> may ignite combustibles.	<b>Lead Nitrate</b> reacts with HYDROGEN PEROXIDE; REDUCING AGENTS; POWDERED CARBON; LEAD HYPOPHOSPHITE; AMMONIUM THIOCYANATE; POTASSIUM ACETATE; and POWDERED METALS.  <b>Lead Nitrate</b> is a STRONG OXIDIZER which may ignite ORGANICS and COMBUSTIBLE MATERIALS.

**SPILL/LEAKS**

**Isolation Distance:** 25 to 50 meters (80 to 160 feet)  
 Moisten spilled material first or use a HEPA-filter vacuum for clean-up.  
 Toxic to aquatic organisms.  
 Hazardous to the environment and persists in the environment.  
 DO NOT wash into sewer.

**PHYSICAL PROPERTIES**

**Odor Threshold:** No information  
**Flash Point:** 554°F (290°C)  
**LEL:** N/A  
**UEL:** N/A  
**Vapor Density:** 11.0 (air = 1)  
**Water Solubility:** Soluble  
**pH:** 3 to 4  
**Melting Point:** 878°F (470°C)

**EXPOSURE LIMITS**

**OSHA:** 0.05 mg/m<sup>3</sup>, 8-hr TWA (as *Lead*)  
**NIOSH:** 0.05 mg/m<sup>3</sup>, 10-hr TWA (as *Lead*)  
**ACGIH:** 0.05 mg/m<sup>3</sup>, 8-hr TWA (as *Lead*)  
**IDLH LEVEL:** 100 mg/m<sup>3</sup> (as *Lead*)  
**PAC LEVELS:** PAC-1 = 0.24 mg/m<sup>3</sup>; PAC-2 = 180 mg/m<sup>3</sup>; PAC-3 = 1,100 mg/m<sup>3</sup>

**PROTECTIVE EQUIPMENT**

**Gloves:** Nitrile, Latex, Rubber  
**Coveralls:** DuPont Tyvek®  
**Boots:** Latex, Butyl, Neoprene  
**Respirator:** ≤0.5 mg/m<sup>3</sup> - N100 (as *Lead*)  
 ≤2.5 mg/m<sup>3</sup> (as *Lead*) - full facepiece APR with High Efficiency filters  
 ≤50 mg/m<sup>3</sup> (as *Lead*) - full facepiece powered APR with High Efficiency filters  
 ≤100 mg/m<sup>3</sup> (as *Lead*) – Pressure-demand supplied-air  
 >100 mg/m<sup>3</sup> (as *Lead*) – Pressure-demand SCBA

**HEALTH EFFECTS**

**Eyes:** Irritation  
**Skin:** Irritation  
**Acute:** Headache, irritability, upset stomach, and weakness  
**Chronic:** *Inorganic Lead compounds* may cause lung, brain, stomach, and kidney cancer in humans. May be a teratogen in humans.  
 Metallic taste, colic, muscle cramps  
 Damage to the nervous system

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.  
**Remove** contaminated clothing and wash contaminated skin with water.  
**Transfer** to a medical facility.



**COMMON NAME: LEAD PHOSPHATE**

Synonyms: Lead Orthophosphate; Plumbous Phosphate; Trilead Phosphate;  
Perlex Paste

CAS No: 7446-27-7

Molecular Formula:  $Pb_3P_2O_8$

RTK Substance No: 1110

Description: White or colorless powder

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>3 - Health</b></p> <p><b>0 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p><b>DOT#:</b> UN 2291</p> <p><b>ERG Guide #:</b> 151</p> <p><b>Hazard Class:</b> 6.1 (Poison)</p>	<p>Use dry chemical, CO<sub>2</sub> or water spray as extinguishing agents. <b>Lead Phosphate</b> itself does not burn.</p> <p><b>POISONOUS GASES ARE PRODUCED IN FIRE,</b> including <i>Lead Oxides</i> and <i>Phosphorus Oxides</i>.</p> <p>Use water spray to keep fire-exposed containers cool.</p>	<p><b>Lead Phosphate</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); and CHEMICALLY ACTIVE METALS (such as POTASSIUM, SODIUM, MAGNESIUM and ZINC).</p>

### SPILL/LEAKS

**Isolation Distance:** 25 to 50 meters  
(80 to 160 feet)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up.

Toxic to aquatic organisms.

Hazardous to the environment and persists in the environment.

DO NOT wash into sewer.

### PHYSICAL PROPERTIES

**Odor Threshold:** N/A

**Flash Point:** Not combustible

**Water Solubility:** Insoluble

**Melting Point:** 1,857°F (1,014°C)

### EXPOSURE LIMITS

**OSHA:** 0.05 mg/m<sup>3</sup>, 8-hr TWA (as *Lead*)

**NIOSH:** 0.05 mg/m<sup>3</sup>, 10-hr TWA (as *Lead*)

**ACGIH:** 0.05 mg/m<sup>3</sup>, 8-hr TWA (as *Lead*)

**IDLH LEVEL:** 100 mg/m<sup>3</sup> (as *Lead*)

**PAC LEVELS:** PAC-1 = 0.2 mg/m<sup>3</sup>; PAC-2 = 150 mg/m<sup>3</sup>; PAC-3 = 910 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

**Gloves:** Nitrile, Latex, Rubber

**Coveralls:** DuPont Tyvek®

**Boots:** Latex, Butyl, Neoprene

**Respirator:** ≤0.5 mg/m<sup>3</sup> - N100 (as *Lead*)  
 ≤2.5 mg/m<sup>3</sup> (as *Lead*) - full facepiece APR with High Efficiency filters  
 ≤50 mg/m<sup>3</sup> (as *Lead*) - full facepiece powered APR with High Efficiency filters  
 ≤100 mg/m<sup>3</sup> (as *Lead*) – Pressure-demand supplied-air  
 >100 mg/m<sup>3</sup> (as *Lead*) – Pressure-demand SCBA

### HEALTH EFFECTS

**Eyes:** Irritation

**Skin:** No Information

**Acute:** Headache, irritability, upset stomach, and weakness

**Chronic:** Inorganic *Lead* compounds may cause lung, brain, stomach and kidney cancer in humans.

Metallic taste, colic, muscle cramps Damage to the nervous system

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention immediately.

**Remove** contaminated clothing. Wash contaminated skin with soap and water.

**Transfer** to a medical facility.

Common Name: **LEAD STEARATE**

Synonyms: Stearic Acid, Lead Salt  
 CAS No: 7428-48-0  
 Molecular Formula: Pb (C<sub>18</sub>H<sub>35</sub>O<sub>2</sub>)<sub>2</sub>  
 RTK Substance No: 1111  
 Description: White powder

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 3077 ERG Guide #: 171 Hazard Class: 9 (Miscellaneous Hazardous Material)	Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. POISONOUS FUMES ARE PRODUCED IN FIRE, including <i>Lead Oxides</i> . Use water spray to keep fire-exposed containers cool.	<b>Lead Stearate</b> is not compatible with POTASSIUM; STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); and OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).

**SPILL/LEAKS**

**Isolation Distance:** 25 to 50 meters (80 to 160 feet)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up.  
 Toxic to aquatic organisms.  
 Hazardous to the environment and persists in the environment.  
 DO NOT wash into sewer.

**PHYSICAL PROPERTIES**

**Odor Threshold:** Slightly fatty odor  
**Flash Point:** >450°F (232°C)  
**LEL:** N/A  
**UEL:** N/A  
**Vapor Pressure:** 1 mm Hg at 1,783°F (973°C)  
**Relative Vapor Density:** 26.7 (calculated) (air = 1)  
**Specific Gravity:** 1.3 to 1.4  
**Water Solubility:** Very slightly soluble  
**Melting Point:** 240°F (116°C)

**EXPOSURE LIMITS**

**OSHA:** 0.05 mg/m<sup>3</sup>, 8-hr TWA (as *Lead*)  
**NIOSH:** 0.05 mg/m<sup>3</sup>, 10-hr TWA (as *Lead*)  
**ACGIH:** 0.05 mg/m<sup>3</sup>, 8-hr TWA (as *Lead*)  
**IDLH LEVEL:** 100 mg/m<sup>3</sup> (as *Lead*)

**PROTECTIVE EQUIPMENT**

**Gloves:** Nitrile, Latex, Rubber  
**Coveralls:** DuPont Tyvek®  
**Boots:** Latex, Butyl, Neoprene  
**Respirator:** ≤0.5 mg/m<sup>3</sup> - N100 (as *Lead*)  
 ≤2.5 mg/m<sup>3</sup> (as *Lead*) - full facepiece APR with High Efficiency filters  
 ≤50 mg/m<sup>3</sup> (as *Lead*) - full facepiece powered APR with High Efficiency filters  
 ≤100 mg/m<sup>3</sup> (as *Lead*) – Pressure-demand supplied-air  
 >100 mg/m<sup>3</sup> (as *Lead*) – Pressure-demand SCBA

**HEALTH EFFECTS**

**Eyes:** No Information  
**Skin:** No Information  
**Acute:** Headache, irritability, upset stomach, and weakness  
**Chronic:** *Inorganic Lead compounds* may cause lung, brain, stomach, and kidney cancer in humans.  
 Metallic taste, colic, muscle cramps  
 Damage to the nervous system

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.  
**Remove** contaminated clothing and wash contaminated skin with soap and water.  
**Transfer** to a medical facility.

Common Name: **LEAD SUBACETATE**

Synonyms: Basic Lead Acetate; BLA

CAS No: 1335-32-6

Molecular Formula: C<sub>4</sub>H<sub>10</sub>O<sub>8</sub>Pb<sub>3</sub>

RTK Substance No: 2999

Description: White, heavy powder

**HAZARD DATA**

<b>Hazard Rating</b>	<b>Firefighting</b>	<b>Reactivity</b>
<b>3 - Health</b> <b>0 - Fire</b> <b>1 - Reactivity</b> <b>DOT#:</b> UN 1616 <b>ERG Guide #:</b> 151 <b>Hazard Class:</b> 6.1 (Poison)	Extinguish fire using an agent suitable for type of surrounding fire. <b>Lead Subacetate</b> itself does not burn.  POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Lead Oxides</i> and <i>Acetic Acid</i> .  Use water spray to keep fire-exposed containers cool.	<b>Lead Subacetate</b> is not compatible with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); AMMONIA; AMINES; CRESOLS; ISOCYANATES; CHLORAL HYDRATE; SULFIDES; SALICYLIC ACID; TANNIN; CITRATES; EPICHLOROHYDRIN; SULFITES; RESORCINOL; and TARTRATES.

**SPILL/LEAKS**

**Isolation Distance:** 25 to 50 meters  
(80 to 160 feet)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up.

Toxic to aquatic organisms.

Hazardous to the environment and persists in the environment.

**PHYSICAL PROPERTIES**

**Odor Threshold:** Odorless  
**Flash Point:** Not combustible  
**LEL:** N/A  
**UEL:** N/A  
**Vapor Density:** No Information  
**Vapor Pressure:** No Information  
**Water Solubility:** Slightly soluble  
**Boiling Point:** Decomposes at 392°F (200°C)  
**Melting Point:** 167°F (75°C)

**EXPOSURE LIMITS**

**ACGIH:** 0.05 mg/m<sup>3</sup>, 8-hr TWA (as *Lead*)  
**OSHA:** 0.05 mg/m<sup>3</sup>, 10-hr TWA (as *Lead*)  
**NIOSH:** 0.05 mg/m<sup>3</sup>, 8-hr TWA (as *Lead*)  
**IDLH LEVEL:** 100 mg/m<sup>3</sup> (as *Lead*)

**PROTECTIVE EQUIPMENT**

**Gloves:** Nitrile, Latex, Rubber  
**Coveralls:** DuPont Tyvek®  
**Boots:** Latex, Butyl, Neoprene  
**Respirator:** <0.5 mg/m<sup>3</sup> - N100  
 >0.5 mg/m<sup>3</sup> - full facepiece APR with High Efficiency filters  
 >50 mg/m<sup>3</sup> but <100 mg/m<sup>3</sup> Supplied Air

**HEALTH EFFECTS**

**Eyes:** Irritation  
**Skin:** No Information  
**Acute:** Headache, irritability, upset stomach and weakens  
**Chronic:** Inorganic *Lead* compounds may cause lung, brain, stomach and kidney cancer in humans.  
 Metallic taste, colic, muscle cramps  
 Damage to the nervous system

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.  
**Remove** contaminated clothing and wash contaminated skin with soap and water.  
**Transfer** to a medical facility.

Common Name: **LEAD SULFIDE**

Synonyms: Plumbous Sulfide; Galena

CAS No: 1314-87-0

Molecular Formula: PbS

RTK Substance No: 1113

Description: Silvery metallic, crystalline material or a black powder

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> <b>DOT#:</b> UN 3077 <b>ERG Guide #:</b> 171 <b>Hazard Class:</b> 9 (Miscellaneous Hazardous Material)	Extinguish fire using an agent suitable for type of surrounding fire. <b>Lead Sulfide</b> itself does not burn. DO NOT USE water jet, use water spray or fog. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Lead Oxides</i> and <i>Sulfur Oxides</i> . CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool.	<b>Lead Sulfide</b> is incompatible with HYDROGEN PEROXIDE and IODINE CHLORIDE.

**SPILL/LEAKS**

**Isolation Distance:** 25 to 50 meters (80 to 160 feet)  
 Moisten spilled material first or use a HEPA-filter vacuum for clean-up.  
 Toxic to aquatic organisms.  
 Hazardous to the environment and persists in the environment.  
 DO NOT wash into sewer.

**PHYSICAL PROPERTIES**

**Odor Threshold:** No information  
**Flash Point:** Noncombustible  
**Vapor Pressure:** 1 mm Hg at 1,565°F (852°C)  
**Specific Gravity:** 7.5 (air = 1)  
**Boiling Point:** 2,338°F (1,281°C)  
**Water Solubility:** Insoluble  
**Melting Point:** 2,037°F (1,114°C)

**EXPOSURE LIMITS**

**OSHA:** 0.05 mg/m<sup>3</sup>, 8-hr TWA (as *Lead*)  
**NIOSH:** 0.05 mg/m<sup>3</sup>, 10-hr TWA (as *Lead*)  
**ACGIH:** 0.05 mg/m<sup>3</sup>, 8-hr TWA (as *Lead*)  
**IDLH LEVEL:** 100 mg/m<sup>3</sup> (as *Lead*)  
**PAC LEVELS:** PAC-1 = 0.17 mg/m<sup>3</sup>;  
 PAC-2 = 140 mg/m<sup>3</sup>;  
 PAC-3 = 810 mg/m<sup>3</sup>

**PROTECTIVE EQUIPMENT**

**Gloves:** Nitrile, Latex, Rubber  
**Coveralls:** DuPont Tyvek®  
**Boots:** Latex, Butyl, Neoprene  
**Respirator:** ≤0.5 mg/m<sup>3</sup> - N100  
 ≤2.5 mg/m<sup>3</sup> - full facepiece APR with High Efficiency filters  
 ≤50 mg/m<sup>3</sup> - full facepiece powered APR with High Efficiency filters  
 ≤100 mg/m<sup>3</sup> - Pressure-demand supplied-air  
 >100 mg/m<sup>3</sup> - Pressure-demand SCBA

**HEALTH EFFECTS**

**Eyes:** No information  
**Skin:** No information  
**Acute:** Headache, irritability, upset stomach, and weakness  
**Chronic:** *Inorganic Lead* compounds may cause lung, brain, stomach and kidney cancer in humans.  
 Metallic taste, colic, and muscle cramps  
 Damage to the nervous system

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.  
**Remove** contaminated clothing and wash contaminated skin with soap and water.  
**Transfer** to a medical facility.

Common Name: **LEAD SULPHATE**

Synonyms: Lead Monosulfate; Fast White

CAS No: 7446-14-2

Molecular Formula: PbSO<sub>4</sub>

RTK Substance No: 1114

Description: Odorless, white, crystalline powder

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b>  DOT#: UN 1794 ERG Guide #: 154 Hazard Class: 8 (Corrosive)	Extinguish fire using an agent suitable for type of surrounding fire. <b>Lead Sulphate</b> itself does not burn.  POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Lead Oxides</i> and <i>Sulfur Oxides</i> .  Use water spray to keep fire-exposed containers cool.	<b>Lead Sulphate</b> react with METALS (such as POTASSIUM, MAGNESIUM and ALUMINUM) and STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE).

## SPILL/LEAKS

**Isolation Distance:** 25 to 50 meters (80 to 160 feet)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up.

Toxic to aquatic organisms.

Hazardous to the environment and persists in the environment.

DO NOT wash into sewer.

## PHYSICAL PROPERTIES

**Odor Threshold:** Odorless

**Flash Point:** Nonflammable

**LEL:** N/A

**UEL:** N/A

**Specific Gravity:** 6.2

**Water Solubility:** Slightly soluble

**Melting Point:** 2,138°F (1,170°C)

## EXPOSURE LIMITS

**OSHA:** 0.05 mg/m<sup>3</sup>, 8-hr TWA (as *Lead*)

**NIOSH:** 0.05 mg/m<sup>3</sup>, 10-hr TWA (as *Lead*)

**ACGIH:** 0.05 mg/m<sup>3</sup>, 8-hr TWA (as *Lead*)

**IDLH LEVEL:** 100 mg/m<sup>3</sup> (as *Lead*)

**PAC LEVELS:** PAC-1 = 0.22 mg/m<sup>3</sup>;  
                   PAC-2 = 170 mg/m<sup>3</sup>;  
                   PAC-3 = 1,000 mg/m<sup>3</sup>

## PROTECTIVE EQUIPMENT

**Gloves:** Nitrile, Latex, Rubber

**Coveralls:** DuPont *Tyvek*®

**Boots:** Latex, Butyl, Neoprene

**Respirator:** ≤0.5 mg/m<sup>3</sup> - N100  
                   ≤2.5 mg/m<sup>3</sup> - full facepiece APR with High Efficiency filters  
                   ≤50 mg/m<sup>3</sup> - full facepiece powered APR with High Efficiency filters  
                   ≤100 mg/m<sup>3</sup> - Pressure-demand supplied-air  
                   >100 mg/m<sup>3</sup> - Pressure-demand SCBA

## HEALTH EFFECTS

**Eyes:** Severe irritation and burns

**Skin:** Irritation, burns, rash, pigment changes

**Acute:** Headache, irritability, upset stomach, and weakness

**Chronic:** *Inorganic Lead compounds* may cause lung, brain, stomach, and kidney cancer in humans.  
 Metallic taste, colic, and muscle cramps.  
 Damage to the nervous system

## FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention immediately.

**Transfer** to a medical facility.

Common Name: **LEAD THIOCYANATE**

Synonyms: Lead Dithiocyanate; Lead Sulfocyanate

CAS No: 592-87-0

Molecular Formula:  $Pb(SCN)_2$

RTK Substance No: 1115

Description: White to yellow crystalline powder

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>3 - Health</b></p> <p><b>0 - Fire</b></p> <p><b>1 - Reactivity</b></p> <p><b>DOT#:</b> UN 2291</p> <p><b>ERG Guide #:</b> 151</p> <p><b>Hazard Class:</b> 6.1 (Poison)</p>	<p>Extinguish fire using an agent suitable for type of surrounding fire. <b>Lead Thiocyanate</b> itself does not burn.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Lead Oxides, Sulfur Dioxides, Nitrogen Oxides</i> and <i>Cyanides</i>.</p> <p>Use water spray to keep fire-exposed containers cool.</p>	<p><b>Lead Thiocyanate</b> may react explosively with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).</p> <p><b>Lead Thiocyanate</b> is not compatible with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); STRONG REDUCING AGENTS (such as SODIUM, MAGNESIUM, and ALUMINUM); METAL HYDRIDES; and FINELY POWDERED METALS.</p>

### SPILL/LEAKS

**Isolation Distance:** 25 to 50 meters  
(80 to 160 feet)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up.

Toxic to aquatic organisms.

Hazardous to the environment and persists in the environment.

DO NOT wash into sewer.

### PHYSICAL PROPERTIES

**Odor Threshold:** Odorless

**Flash Point:** Not combustible

**LEL:** N/A

**UEL:** N/A

**Specific Gravity:** **3.82 at 68°F (20°C)**

**Melting Point:** **374°F (190°C) Decomposes**

**Water Solubility:** Slightly soluble

### EXPOSURE LIMITS

**OSHA:** 0.05 mg/m<sup>3</sup>, 8-hr TWA (as *Lead*)

**NIOSH:** 0.05 mg/m<sup>3</sup>, 10-hr TWA (as *Lead*)

**ACGIH:** 0.05 mg/m<sup>3</sup>, 8-hr TWA (as *Lead*)

**IDLH LEVEL:** 100 mg/m<sup>3</sup> (as *Lead*)

### PROTECTIVE EQUIPMENT

**Gloves:** Nitrile, Latex, Rubber

**Coveralls:** DuPont Tyvek®

**Boots:** Latex, Butyl, Neoprene

**Respirator:**

- ≤0.5 mg/m<sup>3</sup> - N100
- ≤2.5 mg/m<sup>3</sup> - full facepiece APR with High Efficiency filters
- ≤50 mg/m<sup>3</sup> - full facepiece powered APR with High Efficiency filters
- ≤100 mg/m<sup>3</sup> - Pressure-demand supplied-air
- >100 mg/m<sup>3</sup> - Pressure-demand SCBA

### HEALTH EFFECTS

**Eyes:** Irritation

**Skin:** No Information

**Acute:** Headache, irritability, upset stomach, and weakness

**Chronic:** Inorganic *Lead* compounds may cause lung, brain, stomach, and kidney cancer in humans.

Metallic taste, colic, muscle cramps

Damage to the nervous system

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Remove** contaminated clothing. Wash contaminated skin with soap and water.

**Transfer** to a medical facility.



Common Name: **LIQUEFIED PETROLEUM GAS**

Synonyms: Autogas; Bottled Gas; L.P.G.; Liquefied Hydrocarbon Gas

CAS No: 68476-85-7

Molecular Formula: C<sub>3</sub>H<sub>8</sub>/C<sub>3</sub>H<sub>6</sub>/C<sub>4</sub>H<sub>10</sub>/C<sub>4</sub>H<sub>8</sub>

RTK Substance No: 1118

Description: Colorless, odorless gas when pure, commonly used and shipped as a liquefied, compressed gas with an odorant (*Methyl Mercaptan*)

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>4 - Fire</b> <b>0 - Reactivity</b> <b>DOT#:</b> UN 1075 <b>ERG Guide #:</b> 115 <b>Hazard Class:</b> 2 (Flammable gas)	<b>FLAMMABLE GAS</b> Stop flow of gas (the gas cloud is invisible) or allow to burn. <b>POISONOUS GASES ARE PRODUCED IN FIRE.</b> <b>CONTAINERS MAY EXPLODE IN FIRE.</b> Use water spray to keep fire-exposed containers cool. Vapors may travel to a source of ignition and flash back or cause a fire or explosion far from the source. Flow, agitation, low humidity and other factors may generate electrostatic charges resulting in fire and/or explosion. <b>Liquefied Petroleum Gas</b> may form an ignitable vapor/air mixture in closed tanks or containers.	<b>Liquefied Petroleum Gas</b> is not compatible with <b>OXIDIZING AGENTS</b> (such as <b>PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE</b> ).

### SPILL/LEAKS

**Isolation Distance:**

Spill: 100 meters (330 feet)

Fire: 1,600 meters (1 mile)

Stop flow of gas. If source of leak is a cylinder and the leak cannot be stopped in place, remove the leaking cylinder to a safe place in the open air, and repair leak or allow cylinder to empty.

Conduct air monitoring to determine that *Oxygen* levels are above 19.5% and the Lower Explosive Limit (LEL) is not being exceeded.

Use only non-sparking tools and equipment, especially when opening and closing containers of **Liquefied Petroleum Gas**.

Keep **Liquefied Petroleum Gas** out of confined spaces, such as sewers, because of the possibility of an explosion.

Turn leaking cylinder with leak up to prevent escape of gas in liquid state.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless when pure
<b>Flash Point:</b>	-155°F (-104°C) <i>Propane</i> ; -105°F (-76°C) <i>Butane</i>
<b>LEL:</b>	1.9% to 2.1%
<b>UEL:</b>	8.5% to 9.5%
<b>Auto Ignition Temp:</b>	761° to 871°F (405° to 466°C)
<b>Vapor Density:</b>	1.4 (air = 1)
<b>Vapor Pressure:</b>	>760 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	0.51 to 0.58 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	>-44°F (-42°C)
<b>Ionization Potential:</b>	10.95 eV
<b>Molecular Weight:</b>	42 to 58

### EXPOSURE LIMITS

**OSHA:** 1,000 ppm, 8-hr TWA

**NIOSH:** 1,000 ppm, 10-hr TWA

**ACGIH:** 1,000 ppm, 8-hr TWA

**IDLH:** 2,000 ppm

The Protective Action Criteria values are:

PAC-1 = 2,000 ppm    PAC-2 = 2,000 ppm

PAC-3 = 2,000 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	<i>Insulated Nitrile</i> (>8-hr breakthrough for <i>Propane</i> )
<b>Coveralls:</b>	<b>Use turn out gear or flash protection if ignition/fire is the greatest hazard!</b> <i>Tychem® Responder®</i> (>8-hr breakthrough for <i>Propane</i> )
<b>Respirator:</b>	>1,000 ppm or <19.5% <i>Oxygen</i> - SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Contact with liquid or gas causes frostbite
<b>Skin:</b>	Contact with liquid or gas causes frostbite
<b>Inhalation:</b>	Headache, dizziness, weakness, nausea, vomiting, loss of coordination and judgment, coma and death

### FIRST AID AND DECONTAMINATION

<b>Remove</b>	the person from exposure.
<b>Flush</b>	eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.
<b>Immerse</b>	affected part in warm water. Seek medical attention.
<b>Begin</b>	artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b>	promptly to a medical facility.

Common Name: **LITHIUM**

Synonym: None

CAS No: 7439-93-2

Molecular Formula: Li

RTK Substance No: 1119

Description: Soft, silver to grayish-white (or yellow if exposed to air), odorless metal, crystalline mass or powder

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>2 - Fire</b> <b>2-W - Reactivity</b> DOT#: UN 1415 ERG Guide #: 138 Hazard Class: 4.3 (Water Reactive/ Dangerous when wet)	Lithium is a COMBUSTIBLE SOLID which is WATER REACTIVE and the powder or dust may SPONTANEOUSLY IGNITE in AIR. Use a Class D, dry sand, Met-L-X powder, graphite, or Lith-X powder as extinguishing agents. DO NOT USE WATER, foam, CO <sub>2</sub> , or halogenated extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Lithium Dioxide</i> and <i>Lithium Hydroxide</i> . CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool. DO NOT get water inside containers. FIRE MAY RESTART AFTER IT HAS BEEN EXTINGUISHED.	Finely divided Lithium particles, powder or dust may IGNITE SPONTANEOUSLY in AIR. Lithium reacts violently with MOISTURE, WATER or STEAM to produce heat and flammable and explosive Hydrogen gas and toxic Lithium Hydroxide. Lithium reacts violently with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); COMBUSTIBLES; HALOGENATED HYDROCARBONS; ALCOHOLS; METALS; METAL ALLOYS; METAL SALTS; STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); REDUCING AGENTS (such as SODIUM, ALUMINUM and their HYDRIDES) and many other substances.

**SPILL/LEAKS**
**Isolation Distance:**

Spills: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Collect powdered material in the most convenient and safe manner and deposit in sealed containers.

DO NOT USE WATER OR WET METHOD.

DO NOT wash into sewer.

Keep Lithium out of confined spaces, such as sewers, because of the possibility of an explosion.

**EXPOSURE LIMITS**

No occupational exposure limits have been established for Lithium.

**HEALTH EFFECTS**
**Eyes:** Severe irritation and burns

**Skin:** Severe irritation and burns

**Inhalation:** Nose, throat and lung irritation with coughing and severe shortness of breath (pulmonary edema)

Headache, muscle weakness, confusion and seizures

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	354°F (179°C)
<b>Auto Ignition Temp:</b>	354°F (179°C)
<b>Vapor Pressure:</b>	1 mm Hg at 1,333°F (723°C)
<b>Specific Gravity:</b>	0.53 (water = 1)
<b>Water Solubility:</b>	Reactive
<b>Boiling Point:</b>	2,448°F (1,342°C)
<b>Melting Point:</b>	357°F (181°C)
<b>Molecular Weight:</b>	6.94

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Butyl, Nitrile, Neoprene, and Silver Shield®/4H®
<b>Coveralls:</b>	DuPont Tyvek®
<b>Respirator:</b>	Low levels - APR with High efficiency filter

**FIRST AID AND DECONTAMINATION**
**Remove** the person from exposure.

**Quickly** brush off excess chemical from the face. Immediately flush with large amounts of water for at least 60 minutes, lifting upper and lower lids. Remove contact lenses, if worn, while flushing. DO NOT INTERRUPT FLUSHING. Seek medical attention immediately.

**Quickly** remove contaminated clothing. Immediately blot or brush off excess chemical and wash gently with large amounts of water for at least 60 minutes. DO NOT INTERRUPT WASHING. Seek medical attention immediately.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** to a medical facility.

**Medical** observation is recommended as symptoms may be delayed.

Common Name: **LITHIUM CARBONATE**

Synonyms: Dilithium Carbonate; Carbolith

CAS No: 554-13-2

Molecular Formula:  $\text{Li}_2\text{CO}_3$

RTK Substance No: 1124

Description: White, light, odorless powder

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>1 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> <b>DOT#:</b> None <b>ERG Guide #:</b> None <b>Hazard Class:</b> None	Use dry chemical, $\text{CO}_2$ , water spray or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE including <i>Lithium Oxides</i> . Use water spray to keep fire-exposed containers cool. May ignite combustibles (wood, paper and oil).	<b>Lithium Carbonate</b> reacts violently with FLUORINE. <b>Lithium Carbonate</b> is not compatible with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); REDUCING AGENTS; COMBUSTIBLES; ORGANICS; OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); and CALCIUM HYDROXIDE.

### SPILL/LEAKS

**Isolation Distance:**

Spills: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Collect powdered material in the most convenient and safe manner and deposit in sealed containers.

Can harm the aquatic environment.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Noncombustible
<b>Vapor Pressure:</b>	0 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	2.1 (water = 1)
<b>Water Solubility:</b>	Slightly soluble
<b>Boiling Point:</b>	2,390°F (1,310°C)
<b>Melting Point:</b>	1,144°F (618°C)
<b>pH:</b>	11.2
<b>Molecular Weight:</b>	73.89

### EXPOSURE LIMITS

No occupational exposure limits have been established.

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Rubber
<b>Coveralls:</b>	DuPont Tychem® Polycoat, QC, CPF 1, SL and CPF 2 or equivalent for <i>dry pharmaceutical chemicals</i>
<b>Respirator:</b>	APR with High efficiency filters, or Supplied air

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation, itching and rash
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing and shortness of breath (pulmonary edema) Headache, muscle twitching, confusion and seizures

### FIRST AID AND DECONTAMINATION

<b>Remove</b>	the person from exposure.
<b>Flush</b>	eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
<b>Quickly</b>	remove contaminated clothing and wash contaminated skin with large amounts of soap and water.
<b>Begin</b>	artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b>	to a medical facility.
<b>Medical</b>	observation is recommended as symptoms may be delayed.

Common Name: **LITHIUM CHROMATE**

Synonyms: Dilithium Chromate; Chromium Lithium Oxide

CAS No: 14307-35-8

Molecular Formula:  $\text{Li}_2\text{CrO}_4$

RTK Substance No: 1125

Description: Yellow, odorless powder

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>4 - Health</b></p> <p><b>0 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p><b>DOT#:</b> UN 3077</p> <p><b>ERG Guide #:</b> 171</p> <p><b>Hazard Class:</b> 5.1 (Oxidizer)</p>	<p>Extinguish fire using an agent suitable for type of surrounding fire. <b>Lithium Chromate</b> itself does not burn.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Lithium Oxides and Chromium Oxides</i>.</p> <p>Use water spray to keep fire-exposed containers cool.</p> <p><b>Lithium Chromate</b> may ignite combustibles (wood, paper and oil).</p>	<p><b>Lithium Chromate</b> is an OXIDIZER which can react with ORGANICS; COMBUSTIBLES; REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES); and STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC).</p> <p>Mixtures of <i>Chromate</i> and ZIRCONIUM can be explosive.</p>

### SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and deposit into sealed containers.

DO NOT wash into sewer.

May be detrimental to aquatic life.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Nonflammable
<b>Vapor Density:</b>	5.72 (air = 1)
<b>Specific Gravity:</b>	2.2 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Melting Point:</b>	166°F (75°C)
<b>Molecular Weight:</b>	130

### EXPOSURE LIMITS

**OSHA:** 0.005 mg/m<sup>3</sup>, 8-hr TWA

**NIOSH:** 0.001 mg/m<sup>3</sup>, 10-hr TWA

**ACGIH:** 0.05 mg/m<sup>3</sup>, 8-hr TWA

**IDLH:** 15 mg/m<sup>3</sup> (as *Chromates*)

All of the above are for *hexavalent Chromium (Cr VI)*

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Neoprene and Natural Rubber
<b>Coveralls:</b>	DuPont Tyvek®
<b>Respirator:</b>	>0.001 mg/m <sup>3</sup> - APR with High efficiency filters >0.01 mg/m <sup>3</sup> - Supplied air

### HEALTH EFFECTS

**Eyes:** Severe irritation and burns

**Skin:** Severe irritation and burns

**Inhalation:** Nose, throat and lung irritation with coughing and wheezing

Nausea, muscle cramps and convulsions

**Chronic:** *Hexavalent Chromium or Chromium VI compounds* cause lung cancer in humans

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention immediately.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water. Seek medical attention immediately.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **LITHIUM HYPOCHLORITE**

Synonyms: Lithium Chloride Oxide; Lithium Oxchloride

CAS No: 13840-33-0

Molecular Formula: LiOCl

RTK Substance No: 1129

Description: White, granular solid or tablet with a *Chlorine* odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>3 - Health</b></p> <p><b>0 - Fire</b></p> <p><b>2 - Reactivity</b></p> <p><b>DOT#:</b> UN 1471</p> <p><b>ERG Guide #:</b> 140</p> <p><b>Hazard Class:</b> 5.1 (Oxidizer)</p>	<p><b>Lithium Hypochlorite</b> is REACTIVE and a DANGEROUS EXPLOSION HAZARD.</p> <p><b>Lithium Hypochlorite</b> is not combustible but is a STRONG OXIDIZER which enhances the combustion of other substances.</p> <p>Use water in flooding quantities only. DO NOT USE CHEMICAL or CO<sub>2</sub> as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Lithium Oxides</i> and <i>Chlorine</i>. CONTAINERS MAY EXPLODE IN FIRE.</p> <p>Use water spray to keep fire-exposed containers cool.</p> <p><b>Lithium Hypochlorite</b> may ignite combustibles (wood, paper and oil).</p>	<p><b>Lithium Hypochlorite</b> decomposes in WATER and HEAT, and reacts with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC), to form toxic <i>Chlorine gas</i>.</p> <p><b>Lithium Hypochlorite</b> reacts explosively with HYDROCARBONS (such as FUELS and GASOLINE).</p> <p><b>Lithium Hypochlorite</b> reacts with AMMONIA and UREA to produce flammable and explosive <i>Nitrogen Trichloride</i>.</p> <p><b>Lithium Hypochlorite</b> is not compatible with METALS and COMBUSTIBLES.</p>

### SPILL/LEAKS

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Collect powdered material in the most convenient and safe manner and place into sealed containers for disposal.

DO NOT USE WATER OR WET METHOD.

DO NOT wash into sewer.

**Lithium Hypochlorite** is highly toxic to fish and the aquatic environment.

### PHYSICAL PROPERTIES

**Odor Threshold:** *Chlorine* odor

**Flash Point:** Noncombustible

**Specific Gravity:** 0.9 to 1 (water = 1)

**Water Solubility:** Soluble

**Melting Point:** Decomposes at 275°F (135°C)

**Molecular Weight:** 58.4

### EXPOSURE LIMITS

No occupational exposure limits have been established for **Lithium Hypochlorite**.

### PROTECTIVE EQUIPMENT

**Gloves:** Nitrile, Natural Rubber and Polyethylene

**Coveralls:** Tyvek®

**Respirator:** Supplied air or SCBA

### HEALTH EFFECTS

**Eyes:** Irritation and burns

**Skin:** Irritation and burns

**Inhalation:** Nose, throat and lung irritation with coughing, wheezing and shortness of breath

Headache, muscle twitching, confusion and seizures

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **LITHIUM NITRATE**

Synonyms: Nitric Acid, Lithium Salt

CAS No: 7790-69-4

Molecular Formula: LiNO<sub>3</sub>

RTK Substance No: 1130

Description: Colorless or white, crystalline powder or granule

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>2 - Health</b></p> <p><b>0 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p><b>DOT#:</b> UN 2722</p> <p><b>ERG Guide #:</b> 140</p> <p><b>Hazard Class:</b> 5.1 (Oxidizer)</p>	<p><b>Lithium Nitrate</b> is not combustible but is a <b>STRONG OXIDIZER</b> which enhances the combustion of other substances.</p> <p>May explode with <b>HEAT, SHOCK, FRICTION</b> or <b>IMPACT</b>.</p> <p>Use water only. <b>DO NOT USE CHEMICAL</b> or <b>CO<sub>2</sub></b> extinguishing agents.</p> <p><b>POISONOUS GASES ARE PRODUCED IN FIRE</b>, including <i>Nitrogen Oxides</i>.</p> <p><b>CONTAINERS MAY EXPLODE IN FIRE</b>.</p> <p>Use water spray to keep fire-exposed containers cool.</p> <p><b>Lithium Nitrate</b> may ignite combustibles (wood, paper and oil).</p>	<p><b>Lithium Nitrate</b> reacts violently or explosively with <b>REDUCING AGENTS</b> (such as <b>LITHIUM, SODIUM, ALUMINUM</b> and <b>PHOSPHORUS</b>) and <b>OXIDIZING AGENTS</b> (such as <b>PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE</b> and <b>FLUORINE</b>).</p> <p><b>Lithium Nitrate</b> reacts with <b>COMBUSTIBLES</b> and <b>ORGANIC MATERIALS</b> to cause fires and explosions. Mixtures of <b>Lithium Nitrate</b> with <b>ALKYL ESTERS</b> form explosive <b>ALKYL NITRATES</b>.</p> <p><b>Lithium Nitrate</b> is not compatible with <b>STRONG ACIDS</b> (such as <b>HYDROCHLORIC, SULFURIC</b> and <b>NITRIC</b>); <b>CYANIDE COMPOUNDS</b>; <b>HYPOPHOSPHITES</b>; and <b>TIN CHLORIDE</b>.</p>

### SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first for clean-up and place into sealed containers for disposal.

DO NOT wash into sewer.

Use only non-sparking tools and equipment, especially when opening and closing containers of **Lithium Nitrate**.

### PHYSICAL PROPERTIES

<b>Flash Point:</b>	Nonflammable
<b>Specific Gravity:</b>	2.5 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	1,112°F (600°C)
<b>Melting Point:</b>	491°F (255°C)
<b>Molecular Weight:</b>	68.9
<b>pH:</b>	7

### EXPOSURE LIMITS

No occupational exposure limits have been established for **Lithium Nitrate**.

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Nitrile and Natural Rubber
<b>Coveralls:</b>	Tyvek®
<b>Respirator:</b>	Supplied air or SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, wheezing and shortness of breath
	Headache, muscle twitching, confusion and seizures

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.



Common Name: **MAGNESIUM**

Synonyms: None

CAS No: 7439-95-4

Molecular Formula: Mg

RTK Substance No: 1136

Description: Light, silvery-white metal which can be in the form of a gray powder, thin sheet or chip

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>1 - Health</b> <b>1 - Fire</b> <b>1 - Reactivity</b>  <b>DOT#:</b> UN 1869 UN 1418 (powder) <b>ERG Guide #:</b> 138 <b>Hazard Class:</b> 4.1 and 4.3 UN 1869 (Flammable) UN 1418 (Water Reactive)	<b>Magnesium</b> POWDER, SHEETS and CHIPS MAY SPONTANEOUSLY IGNITE on contact with AIR or MOISTURE.  Use Class D fire extinguishers or dry sand, clay, graphite, or limestone to fight fires.  DO NOT USE WATER, CO <sub>2</sub> , foam or halogenated extinguishing agents.  POISONOUS GASES ARE PRODUCED IN FIRE.  FIRE MAY RESTART AFTER IT HAS BEEN EXTINGUISHED.	<i>Finely divided Magnesium</i> reacts with WATER, MOISTURE, STEAM and ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) to release flammable and explosive <i>Hydrogen gas</i> .  <i>Finely divided Magnesium</i> ignites on contact with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and AMMONIA; and reacts vigorously or explosively (and may form explosive compounds) with ACETYLENIC COMPOUNDS (such as ACETYLENE and ETHYLENE OXIDE); HALOCARBONS (such as CHLOROFORM and CHLOROMETHANE); AMMONIA NITRATE; CARBONATES; ARSENIC; METAL OXIDES; METAL SULFATES; OXYGEN; METAL CYANIDES; PHOSPHATES, and many other substances.  <b>Magnesium</b> is AIR and MOISTURE sensitive.

**SPILL/LEAKS**
**Isolation Distance:**

Spills: 25 meters (75 feet)

Fires: 800 meters (1/2 mile)

Collect powdered material in the most convenient and safe manner, or use a HEPA-filter vacuum, and deposit in sealed containers.

DO NOT wash into sewer.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Flammable powder
<b>Auto Ignition Temp:</b>	883°F (473°C)
<b>Vapor Density:</b>	1.7 (air = 1)
<b>Vapor Pressure:</b>	1 mm Hg at 1,149°F (621°C)
<b>Specific Gravity:</b>	1.74 (water = 1)
<b>Water Solubility:</b>	Insoluble, Reactive
<b>Boiling Point:</b>	2,012°F (1,100°C)
<b>Molecular Weight:</b>	24.3

**EXPOSURE LIMITS**
**OSHA:** 15 mg/m<sup>3</sup>, 8-hr TWA

**NIOSH:** None

**ACGIH:** 10 mg/m<sup>3</sup>, 8-hr TWA

**IDLH:** 750 mg/m<sup>3</sup>

 All of the above are for *Magnesium Oxide*
**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Nitrile and Natural Rubber
<b>Coveralls:</b>	DuPont Tyvek®
<b>Respirator:</b>	>10 mg/m <sup>3</sup> - APR with High efficiency filter >100 mg/m <sup>3</sup> - Supplied air

**HEALTH EFFECTS**
**Eyes:** Irritation

**Skin:** Irritation

**Inhalation:** Nose, throat and lung irritation with coughing and difficulty in breathing  
 Headache, fever and chills, chest tightness

**FIRST AID AND DECONTAMINATION**
**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Remove** contaminated clothing and wash contaminated skin with soap and water.

**Transfer** to a medical facility.

Common Name: **MAGNESIUM NITRATE**

Synonyms: Magnesium Dinitrate; Nitromagnesite

CAS No: 10377-60-3

Molecular Formula:  $MgN_2O_6$

RTK Substance No: 1143

Description: Odorless, colorless or white, crystalline solid

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>2 - Health</b></p> <p><b>0 - Fire</b></p> <p><b>1 - Reactivity</b></p> <p><b>DOT#:</b> UN 1474</p> <p><b>ERG Guide #:</b> 140</p> <p><b>Hazard Class:</b> 5.1 (Oxidizer)</p>	<p><b>Magnesium Nitrate</b> is not combustible, but it is a <b>STRONG OXIDIZER</b> that enhances the combustion of other substances.</p> <p>Flood with water.</p> <p><b>POISONOUS GASES ARE PRODUCED IN FIRE</b>, including <i>Nitrogen Oxides</i> and <i>Magnesium Oxides</i>.</p> <p>Use water spray to keep fire-exposed containers cool.</p> <p><b>Magnesium Nitrate</b> may ignite combustibles (wood, paper and oil).</p> <p>May be sensitive to impact when contaminated with <i>Organic Material</i>.</p>	<p><b>Magnesium Nitrate</b> may react violently with <b>COMBUSTIBLES</b>; <b>ORGANIC MATERIALS</b>; <b>OXIDIZING AGENTS</b> (such as <b>PERCHLORATES</b>, <b>PEROXIDES</b>, <b>PERMANGANATES</b>, <b>CHLORATES</b>, <b>NITRATES</b>, <b>CHLORINE</b>, <b>BROMINE</b> and <b>FLUORINE</b>); <b>REDUCING AGENTS</b> (such as <b>LITHIUM</b>, <b>SODIUM</b>, <b>ALUMINUM</b> and their <b>HYDRIDES</b>); and <b>DIMETHYLFORMAMIDE</b>, causing fires and explosions.</p> <p><b>Magnesium Nitrate</b> is not compatible with <b>STRONG ACIDS</b> (such as <b>HYDROCHLORIC</b>, <b>SULFURIC</b> and <b>NITRIC</b>); <b>METAL POWDERS</b>; <b>CYANIDES</b>; <b>TIN CHLORIDE</b>; <b>NITRILES</b>; and <b>PHOSPHORUS COMPOUNDS</b>.</p> <p>Protect from <b>HEAT</b>, <b>SPARKS</b>, <b>SHOCK</b> and <b>FRICTION</b>.</p>

### SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Noncombustible
<b>Vapor Pressure:</b>	0.5 mm Hg at 77°F (25°C)
<b>Specific Gravity:</b>	1.46 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	626°F (330°C) (Decomposes)
<b>Melting Point:</b>	192°F (89°C)
<b>Molecular Weight:</b>	148.3

### EXPOSURE LIMITS

No occupational exposure limits have been established for **Magnesium Nitrate**.

The Protective Action Criteria values are:

PAC-1 = 30 mg/m<sup>3</sup>

PAC-2 = 50 mg/m<sup>3</sup>

PAC-3 = 250 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Nitrile and Natural Rubber
<b>Coveralls:</b>	Tyvek®
<b>Respirator:</b>	Full facepiece APR with <i>P100 filters</i> >30 mg/m <sup>3</sup> - SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns
<b>Inhalation:</b>	Nose and throat irritation with coughing and wheezing.
	Headache, fatigue and blue color to the skin and lips (methemoglobinemia)

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **MALEIC ANHYDRIDE**

Synonyms: cis-Butenedioic Anhydride; Maleic Acid Anhydride

CAS No: 108-31-6

Molecular Formula: C<sub>4</sub>H<sub>2</sub>O<sub>3</sub>

RTK Substance No: 1152

Description: Colorless, needle-like, crystalline, flake, pellet or lumpy, fused mass with a strong, irritating odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>3 - Health</b></p> <p><b>1 - Fire</b></p> <p><b>1 - Reactivity</b></p> <p><b>DOT#:</b> UN 2215</p> <p><b>ERG Guide #:</b> 156</p> <p><b>Hazard Class:</b> 8 (Corrosive)</p>	<p>COMBUSTIBLE SOLID</p> <p>Use CO<sub>2</sub>, water spray or alcohol-resistant foam as extinguishing agents.</p> <p>DO NOT USE DRY CHEMICAL OR SOLID STREAMS OF WATER.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE.</p> <p>CONTAINERS MAY EXPLODE IN FIRE.</p> <p>Use water spray to keep fire-exposed containers cool.</p>	<p><b>Maleic Anhydride</b> reacts violently with STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE) and contact with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) may cause fires and explosions.</p> <p><b>Maleic Anhydride</b> reacts with WATER to release HEAT and <i>Maleic Acid</i>.</p> <p><b>Maleic Anhydride</b> is not compatible with ALKALI METALS (such as LITHIUM, SODIUM and POTASSIUM); ALKALINE EARTH METALS (such as BERYLLIUM, MAGNESIUM and CALCIUM); AMINES; CARBONATES; HYDROXIDES; and AQUEOUS AMMONIA.</p>

### SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

Use only non-sparking tools and equipment, especially when opening and closing containers of **Maleic Anhydride**.

DO NOT wash into sewer.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	0.32 ppm
<b>Flash Point:</b>	218°F (103°C)
<b>LEL:</b>	1.4%
<b>UEL:</b>	7.1%
<b>Auto Ignition Temp:</b>	890°F (477°C)
<b>Vapor Density:</b>	3.4 (air = 1)
<b>Vapor Pressure:</b>	0.2 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.5 (water = 1)
<b>Water Solubility:</b>	Soluble/Reactive
<b>Boiling Point:</b>	396°F (202°C)
<b>Melting Point:</b>	127°F (53°C)
<b>Ionization Potential:</b>	9.9 eV
<b>Molecular Weight:</b>	98.1

### EXPOSURE LIMITS

**OSHA:** 0.25 ppm, 8-hr TWA

**NIOSH:** 0.25 ppm, 10-hr TWA

**ACGIH:** 0.0025 ppm, 8-hr TWA

**IDLH:** 2.5 ppm

The Protective Action Criteria values are:

PAC-1 = 0.2 ppm; PAC-2 = 2 ppm; PAC-3 = 20 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Silver Shield®/4H® (>4-hr breakthrough)
<b>Coveralls:</b>	DuPont Tychem® Responder® (>8-hr breakthrough)
<b>Respirator:</b>	>0.0025 ppm - SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing and severe shortness of breath (pulmonary edema)
	Headache, dizziness, nausea and vomiting

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention immediately.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

**Medical** observation is recommended as symptoms may be delayed.

Common Name: **MANGANESE**

Synonyms: Colloidal Manganese

CAS No: 7439-96-5

Molecular Formula: Mn

RTK Substance No: 1155

Description: Pure **Manganese** is a silver or grey-white, brittle solid

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>2- Health</b></p> <p><b>3 (powder)- Fire</b></p> <p><b>1- Reactivity</b></p> <p>DOT#: UN 3089</p> <p>ERG Guide #: 170</p> <p>Hazard Class: 4.1 (Flammable solid)</p>	<p><b>Manganese powder and dust</b> are FLAMMABLE and DANGEROUS FIRE HAZARDS.</p> <p>Use sand or dry chemicals appropriate for extinguishing metal fires.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Manganese Oxides</i>.</p> <p><b>Manganese powder and dust</b> may form an ignitable vapor/air mixture in closed tanks or containers.</p> <p>Use water spray to keep fire-exposed containers cool.</p>	<p><i>Finely divided Manganese dust</i> can ignite spontaneously in AIR.</p> <p><b>Manganese</b> reacts with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC), and slowly with WATER or STEAM, to produce flammable and explosive <i>Hydrogen gas</i>.</p> <p><b>Manganese may</b> react with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); NITROGEN DIOXIDE; PHOSPHORUS; and SULFUR DIOXIDE to cause ignition and/or violent decomposition.</p>

### SPILL/LEAKS

**Isolation Distance:**

**Spill:** 25 meters (75 feet)

**Fire:** 800 meters (1/2 mile)

Collect powdered material in the most convenient and safe manner and place into sealed containers for disposal.

Ground and bond containers when transferring **Manganese powder**.

Use only non-sparking tools and equipment.

DO NOT wash into sewer.

**Manganese** may be hazardous to the environment, especially to aquatic organisms.

### PHYSICAL PROPERTIES

**Flash Point:** Flammable *powder and dust*

**Auto Ignition Temp:** 842°F (450°C) (*Dust*)

**Vapor Pressure:** 0 mm Hg at 68°F (20°C)

**Specific Gravity:** 7.2 (water = 1)

**Water Solubility:** Insoluble

**Boiling Point:** 3,564°F (1,962°C)

**Melting Point:** 2,271°F (1,244°C)

**Molecular Weight:** 54.9

### EXPOSURE LIMITS

**OSHA:** 5 mg/m<sup>3</sup>, Ceiling

**NIOSH:** 1 mg/m<sup>3</sup>, 8-hr TWA; 3 mg/m<sup>3</sup>, STEL

**ACGIH:** 0.2 mg/m<sup>3</sup> (*inhalable*); 0.02 mg/m<sup>3</sup> (*respirable*), 8-hr TWA

**IDLH:** 500 mg/m<sup>3</sup>

The Protective Action Criteria values are:

PAC-1 = 3 mg/m<sup>3</sup> PAC-2 = 5 mg/m<sup>3</sup> PAC-3 = 500 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

**Gloves:** Nitrile and Neoprene

**Coveralls:** Tyvek®  
**Use turn out gear or flash protection if ignition/fire is the greatest hazard.**

**Respirator:** Spill - full facepiece APR with *P100 filters*  
Fire - SCBA

### HEALTH EFFECTS

**Eyes:** Irritation

**Skin:** Irritation

**Inhalation:** Nose, throat and lung irritation with coughing, wheezing and shortness of breath

Headache, fever and chills, aches, chest tightness and cough ("*metal fume fever*")

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary. Transfer promptly to a medical facility.

Common Name: **MERCURIC CHLORIDE**

Synonyms: Mercury Dichloride; Perchloride of Mercury

CAS No: 7487-94-7

Molecular Formula: HgCl<sub>2</sub>

RTK Substance No: 1170

Description: Odorless, white crystal or powder

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<p><b>3 - Health</b></p> <p><b>0 - Fire</b></p> <p><b>1 - Reactivity</b></p> <p>DOT#: UN 1624</p> <p>ERG Guide #: 154</p> <p>Hazard Class: 6.1</p> <p>(Poison)</p>	<p><b>Mercuric Chloride</b> itself does not burn but may explode if exposed to heat, shock or friction.</p> <p>Use dry chemical, CO<sub>2</sub>, water spray or foam as extinguishing agents.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Chlorine, Hydrogen Chloride, Mercury and Mercury Oxides.</i></p> <p>CONTAINERS MAY EXPLODE IN FIRE.</p> <p>Use water spray to keep fire-exposed containers cool.</p>	<p><b>Mercuric Chloride</b> may explode with HEAT, FRICTION, SHOCK or on contact with ALKALI METALS (such as LITHIUM, SODIUM and POTASSIUM); SULFIDES; ACETYLENE; AMMONIA; and OXALIC ACID.</p> <p><b>Mercuric Chloride</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); FORMATES; PHOSPHATES; CARBONATES; ANTIMONY; BROMIDES; and BORAX.</p> <p><b>Mercuric Chloride</b> is decomposed by SUNLIGHT and reacts when in solution with STAINLESS and CARBON STEELS, BRASS and BRONZE.</p>

**SPILL/LEAKS**

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

For clean-up, use a specialized charcoal-filtered vacuum.

DO NOT wash into sewer.

**Mercuric Chloride** is very toxic to aquatic organisms.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Nonflammable
<b>Vapor Pressure:</b>	1 mm Hg at 277°F (136°C)
<b>Specific Gravity:</b>	5.4 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	576°F (302°C)
<b>Melting Point:</b>	529°F (276°C)
<b>Molecular Weight:</b>	271.5
<b>pH:</b>	4.7

**EXPOSURE LIMITS**

**NIOSH:** 0.05 mg/m<sup>3</sup>, 10-hr TWA (as *Mercury vapor*)  
0.1 mg/m<sup>3</sup>, Ceiling (as *Mercury*)

**ACGIH:** 0.025 mg/m<sup>3</sup>, 8-hr TWA (as *Mercury*)

**IDLH:** 10 mg/m<sup>3</sup> (as *Mercury*)

The Protective Action Criteria values are:

PAC-1 = 2 mg/m<sup>3</sup>      PAC-3 = 13.5 mg/m<sup>3</sup>

PAC-2 = 13.5 mg/m<sup>3</sup>

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Butyl, Nitrile, Neoprene, PVC, Silver Shield®/4H® (>8-hr breakthrough for <i>Mercury</i> )
<b>Coveralls:</b>	Tychem® fabrics
<b>Respirator:</b>	>0.025 mg/m <sup>3</sup> - full facepiece APR with cartridges specific for <i>Mercury</i> >2 mg/m <sup>3</sup> - SCBA

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns, skin rash, itching and gray skin color
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, wheezing and shortness of breath Nausea, vomiting and tremors
<b>Chronic:</b>	Cancer (thyroid) in animals

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.



Common Name: **MERCURIC CYANIDE**

Synonyms: Dicyanomercury; Mercury Cyanide

CAS No: 592-04-1

 Molecular Formula:  $C_2HgN_2$ 

RTK Substance No: 1171

Description: Odorless, clear or white, crystalline powder

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>0 - Fire</b> <b>1 - Reactivity</b> DOT#: UN 1636 ERG Guide #: 154 Hazard Class: 6.1 (Poison)	Extinguish fire using an agent suitable for type of surrounding fire. <b>Mercuric Cyanide</b> itself does not burn. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Mercury, Mercury Oxides, Hydrogen Cyanide</i> and <i>Nitrogen Oxides</i> . Use water spray to keep fire-exposed containers cool.	<b>Mercuric Cyanide</b> is slowly decomposed by WATER and LIGHT, and reacts rapidly with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC), to form flammable and poisonous <i>Hydrogen Cyanide gas</i> . <b>Mercuric Cyanide</b> reacts violently or explosively with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); MAGNESIUM; LIQUID HYDROGEN CYANIDE; SODIUM NITRATE; and SODIUM NITRITE.

**SPILL/LEAKS**
**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

For clean-up, use a specialized charcoal-filtered vacuum. Do not disturb spilled material.

DO NOT wash into sewer.

**Mercuric Cyanide** is harmful to aquatic life at low concentrations.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Nonflammable
<b>Specific Gravity:</b>	4 (water = 1)
<b>Water Solubility:</b>	Slightly soluble (mixes slowly)
<b>Boiling Point:</b>	Decomposes
<b>Melting Point:</b>	Decomposes
<b>Ionization Potential:</b>	11.6 eV (for <i>Hydrogen Cyanide</i> )
<b>Molecular Weight:</b>	252.6

**EXPOSURE LIMITS**
**NIOSH:** 0.05 mg/m<sup>3</sup>, 10-hr TWA (as *Mercury vapor*)  
 0.1 mg/m<sup>3</sup>, Ceiling (as *Mercury*)  
 5 mg/m<sup>3</sup> (4.7 ppm), 15-min STEL (as *Hydrogen Cyanide*)

**IDLH:** 10 mg/m<sup>3</sup> (as *Mercury*); 50 ppm (as *Hydrogen Cyanide*)

 The Protective Action Criteria values for **Mercuric Cyanide** are:

 PAC-1 = 1.5 mg/m<sup>3</sup>    PAC-3 = 12.6 mg/m<sup>3</sup>  
 PAC-2 = 12.6 mg/m<sup>3</sup>
**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Neoprene, Nitrile, Barrier® and Silver Shield®/4H® (>8-hr breakthrough for <i>Mercury</i> and <i>Hydrogen Cyanide</i> )
<b>Coveralls:</b>	Tychem® BR, Responder® and TK (>8-hr breakthrough for <i>Mercury</i> and <i>Hydrogen Cyanide</i> )
<b>Respirator:</b>	>1.5 mg/m <sup>3</sup> - SCBA (for <i>solid Mercuric Cyanide</i> ) Use SCBA for fires or if <b>Mercuric Cyanide</b> is heated

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns, skin rash, itching and gray skin color
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, wheezing and shortness of breath Nausea, vomiting and tremors

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Use** *Amyl Nitrite* capsules if symptoms of *Cyanide* poisoning develop.

**Transfer** promptly to a medical facility.



Common Name: **MERCURIC OXIDE**

Synonyms: Yellow Oxide of Mercury; Mercury Monoxide

CAS No: 21908-53-2

Molecular Formula: HgO

RTK Substance No: 2537

Description: Yellow to orange-yellow, odorless, crystalline powder

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<p><b>3 - Health</b></p> <p><b>0 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p><b>DOT#:</b> UN 1641</p> <p><b>ERG Guide #:</b> 151</p> <p><b>Hazard Class:</b> 6.1 (Poison)</p>	<p>Extinguish fire using an agent suitable for type of surrounding fire. <b>Mercuric Oxide</b> itself does not burn but may intensify a fire.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Mercury vapor</i>.</p> <p>Use water spray to keep fire-exposed containers cool.</p> <p><b>Mercuric Oxide</b> may ignite combustibles (wood, paper and oil).</p>	<p><b>Mercuric Oxide</b> reacts violently with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); COMBUSTIBLES; PETROLEUM HYDROCARBONS; HYDROGEN PEROXIDE; DISULFUR DICHLORIDE; HYDROGEN TRISULFIDE; ACETYL NITRATE; and DIBORON TETRAFLUORIDE.</p> <p><b>Mercuric Oxide</b> forms <i>shock-sensitive compounds</i> with METALS (such as POTASSIUM, SODIUM, MAGNESIUM and ZINC).</p> <p><b>Mercuric Oxide</b> is not compatible with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); ETHANOL; and HYDRAZINE HYDRATE.</p>

**SPILL/LEAKS**

**Isolation Distance:**

Spills: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Use special *Mercury vapor* suppressants or special vacuums for spill collection.

DO NOT wash into sewer.

Will accumulate in aquatic organisms.

Severe marine pollutant.

**PHYSICAL PROPERTIES**

**Odor Threshold:** Odorless

**Flash Point:** Noncombustible

**Specific Gravity:** 11.1 (water =1)

**Water Solubility:** Very slightly soluble

**Boiling Point:** Decomposes

**Melting Point:** Decomposes at 932°F (500°C)

**Molecular Weight:** 216.54

**EXPOSURE LIMITS**

**OSHA:** 0.1 mg/m<sup>3</sup>, 8-hr TWA

**NIOSH:** 0.05 mg/m<sup>3</sup>, 10-hr TWA; 0.1 mg/m<sup>3</sup>, Ceiling

**ACGIH:** 0.025 mg/m<sup>3</sup>, 8-hr TWA

**IDLH:** 10 mg/m<sup>3</sup>

**PAC** PAC-1 = 1.5 mg/m<sup>3</sup>; PAC-2 = 16 mg/m<sup>3</sup>;

**LEVELS:** PAC-3 = 30 mg/m<sup>3</sup>

**PROTECTIVE EQUIPMENT**

**Gloves:** Silver Shield®/4H®

**Coveralls:** DuPont Tychem® Polycoat, QC, CPF 1, SL and CPF 2; Kappler® Zytron® 300; and Saint-Gobain OneSUIT® TEC

**Respirator:** >0.05 mg/m<sup>3</sup> - APR with filter specific for *Mercury*  
>0.5 mg/m<sup>3</sup> - Supplied air

**HEALTH EFFECTS**

**Eyes:** Irritation and burns

**Skin:** Irritation and burns, skin rash, itching and gray skin color

**Inhalation:** Nose, throat and lung irritation with coughing, wheezing and shortness of breath

Nausea, vomiting and tremors

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention immediately.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention immediately.

**Transfer** to a medical facility.

Common Name: **MERCURIC SULFATE**

Synonyms: Mercury Bisulfate; Mercury Persulfate

CAS No: 7783-35-9

Molecular Formula: HgSO<sub>4</sub>

RTK Substance No: 1177

Description: Odorless, white, crystalline powder

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>0 - Fire</b> <b>1 - Reactivity</b> <b>DOT#:</b> UN 1645 <b>ERG Guide #:</b> 151 <b>Hazard Class:</b> 6.1 (Poison)	Extinguish fire using an agent suitable for type of surrounding fire. <b>Mercuric Sulfate</b> itself does not burn. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Mercury Oxides</i> and <i>Sulfur Oxides</i> . CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool.	<b>Mercuric Sulfate</b> decomposes when exposed to WATER to form corrosive <i>Sulfuric Acid</i> . <b>Mercuric Sulfate</b> reacts violently with HYDROGEN CHLORIDE. <b>Mercuric Sulfate</b> is not compatible with ACETYLENE; AMMONIA; ORGANIC MATERIALS; REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); NITROMETHANE; and BUTYNE-2. <b>Mercuric Sulfate</b> is corrosive to METALS (such as IRON, MAGNESIUM, ZINC, LEAD and COPPER).

### SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Use special *Mercury vapor* suppressants or charcoal-filtered vacuum for spill collection.

DO NOT wash into sewer.

**Mercuric Sulfate** is harmful to aquatic life at very low concentrations.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Nonflammable
<b>Specific Gravity:</b>	6.47 (water = 1)
<b>Water Solubility:</b>	Decomposes/Reacts
<b>Boiling Point:</b>	Decomposes
<b>Molecular Weight:</b>	296.6

### EXPOSURE LIMITS

**OSHA:** 0.1 mg/m<sup>3</sup>, 8-hr TWA

**NIOSH:** 0.05 mg/m<sup>3</sup>, 10-hr TWA  
0.1 mg/m<sup>3</sup>, Ceiling

**ACGIH:** 0.025 mg/m<sup>3</sup>, 8-hr TWA

**IDLH:** 10 mg/m<sup>3</sup>

The Protective Action Criteria values are:

PAC-1 = 0.037 mg/m<sup>3</sup>    PAC-2 = 0.148 mg/m<sup>3</sup>

PAC-3 = 14.8 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl, Nitrile, Neoprene, Natural Rubber, PVC, Silver Shield®/4H® and Viton (>8-hr breakthrough for <i>Mercury</i> )
<b>Coveralls:</b>	Tychem® SL, CPF 3, BR, Responder® and TK (>8-hr breakthrough for <i>Mercury</i> )
<b>Respirator:</b>	>0.025 mg/m <sup>3</sup> - Full facepiece APR with filters specific for <i>Mercury</i> >2.5 mg/m <sup>3</sup> - SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns, rash, and itching
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, wheezing and shortness of breath  Nausea, vomiting and metallic taste in the mouth

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.  
**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** promptly to a medical facility.

Common Name: **MERCURY, ELEMENTAL AND INORGANIC COMPOUNDS**

Synonyms: Colloidal Mercury; Quicksilver

CAS No: 7439-97-6

Molecular Formula: Hg

RTK Substance No: 1183

Description: Heavy, silvery, liquid metal

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 2809 ERG Guide #: 172 Hazard Class: 8 (Corrosive)	Extinguish fire using an agent suitable for type of surrounding fire. <b>Mercury</b> itself does not burn. POISONOUS GASES ARE PRODUCED IN FIRE. Use water spray to keep fire-exposed containers cool.	<b>Mercury</b> reacts with ACETYLENE to form explosive <i>Acetylide</i> . <b>Mercury</b> can form explosive compounds with AMMONIA and will explode when mixed with CHLORINE DIOXIDE; OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); and METHYL AZIDE. <b>Mercury</b> is not compatible with COMBUSTIBLE MATERIALS; METALS (such as ALUMINUM and COPPER); CALCIUM; SODIUM CARBIDE; AMINES; LITHIUM; and RUBIDIUM.

**SPILL/LEAKS**
**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 500 meters (1/3 mile)

 Cover spill with a *Sulfur compound* to prevent vaporization and collect with a charcoal filter vacuum.

 Use *Zinc* or *Copper flakes* and a flashlight to check for remaining **Mercury** after clean-up.

**Mercury** is very toxic to aquatic life and bioaccumulates.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Nonflammable
<b>Vapor Density:</b>	6.9 (air = 1)
<b>Vapor Pressure:</b>	0.002 mm Hg at 77°F (25°C)
<b>Specific Gravity:</b>	13.6 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	674°F (357°C)
<b>Melting Point:</b>	-38°F (-39°C)
<b>Ionization Potential:</b>	10.4 eV
<b>Molecular Weight:</b>	200.6

**EXPOSURE LIMITS**
**NIOSH:** 0.05 mg/m<sup>3</sup>, 10-hr TWA (as **Mercury vapor**)  
 0.1 mg/m<sup>3</sup>, Ceiling (as **Mercury**)

**ACGIH:** 0.025 mg/m<sup>3</sup>, 8-hr TWA (as **Mercury**)

**IDLH:** 10 mg/m<sup>3</sup> (as **Mercury**)

The Protective Action Criteria values are:

 PAC-1 = 0.3 mg/m<sup>3</sup>

 PAC-2 = 2.05 mg/m<sup>3</sup>

 PAC-3 = 4.1 mg/m<sup>3</sup>
**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Butyl, Nitrile, Neoprene, Polyvinyl Chloride, Silver Shield®/4H® and Viton (>8-hr breakthrough)
<b>Coveralls:</b>	Tychem® fabrics (>8-hr breakthrough)
<b>Respirator:</b>	>0.025 mg/m <sup>3</sup> - full facepiece APR with cartridges specific for <b>Mercury</b> >0.3 mg/m <sup>3</sup> - SCBA

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, wheezing and/or shortness of breath Nausea, vomiting and abdominal pain

**FIRST AID AND DECONTAMINATION**

<b>Remove</b>	the person from exposure.
<b>Flush</b>	eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention immediately.
<b>Quickly</b>	remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention immediately.
<b>Begin</b>	artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b>	promptly to a medical facility.

**Common Name: METHANE**

Synonyms: Biogas; Fire Damp; Marsh Gas; Methyl Hydride

CAS No: 74-82-8

Molecular Formula: CH<sub>4</sub>

RTK Substance No: 1202

Description: Colorless and odorless gas or a liquid under pressure

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>2 - Health</b></p> <p><b>4 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p><b>DOT#:</b> UN 1971</p> <p><b>ERG Guide #:</b> 115</p> <p><b>Hazard Class:</b> 2.1 (Flammable gas)</p>	<p>FLAMMABLE GAS</p> <p>Stop flow of gas or allow to burn.</p> <p><b>Methane</b> is an explosion hazard in enclosed areas.</p> <p><i>Liquefied Methane</i> floats on water and boils. The vapor cloud produced is FLAMMABLE.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE.</p> <p>Use water spray to keep fire-exposed containers cool.</p> <p>Vapors may travel to a source of ignition and flash back.</p>	<p><b>Methane</b> reacts violently with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).</p> <p><b>Methane</b> can react violently with <i>boiling</i> WATER and <i>cold</i> WATER.</p> <p><i>Liquefied Methane</i> combined with <i>liquefied</i> OXYGEN can form an explosive mixture.</p>

### SPILL/LEAKS

**Isolation Distance:**

Spill: 100 meters (330 feet)

Fire: 800 meters (1/2 mile)

Stop flow of gas. If source of leak is a cylinder and the leak cannot be stopped in place, remove the leaking cylinder to a safe place in the open air, and repair leak or allow cylinder to empty.

Ground and bond all metal containers when transferring **Methane** and use non-sparking tools and equipment.

Turn leaking cylinder with leak up to prevent escape of gas in liquid state.

Keep **Methane** out of confined spaces, such as sewers, because of the possibility of an explosion.

**Methane** is NOT harmful to aquatic life.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	-306 °F (-188 °C)
<b>LEL:</b>	5%
<b>UEL:</b>	15%
<b>Auto Ignition Temp:</b>	999 °F (537 °C)
<b>Vapor Density:</b>	0.55 (air = 1)
<b>Vapor Pressure:</b>	>760 mm Hg at 68 °F (20 °C)
<b>Specific Gravity:</b>	0.42 (water = 1)
<b>Water Solubility:</b>	Very slightly soluble
<b>Boiling Point:</b>	-259 °F (-162 °C)
<b>Freezing Point:</b>	-296.5 °F (-183 °C)
<b>Critical Temp:</b>	-116.5 °F (-82.5 °C)
<b>Ionization Potential:</b>	12.51 eV
<b>Molecular Weight:</b>	16.04

### EXPOSURE LIMITS

**ACGIH:** Maintain 19.5% Oxygen content

The Protective Action Criteria values are:

PAC-1 = 65,000 ppm    PAC-2 = 230,000 ppm

PAC-3 = 400,000 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	<i>Insulated</i> materials
<b>Coveralls:</b>	Tychem® CSM (>8-hr breakthrough) <b>Use turn out gear or flash protection if ignition/fire is the greatest hazard!</b>
<b>Respirator:</b>	< 19.5% Oxygen - SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	No information available
<b>Skin:</b>	Contact with <i>liquefied</i> gas can cause frostbite
<b>Inhalation:</b>	Headache, dizziness, weakness, nausea, vomiting, loss of coordination, increased breathing rate and loss of consciousness (ASPHYXIAN)

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes.

**Immerse** affected part in warm water. Seek medical attention.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **METHIDATHION**

Synonyms: DMTP; Supracide

CAS No: 950-37-8

 Molecular Formula: C<sub>6</sub>H<sub>11</sub>N<sub>2</sub>O<sub>4</sub>PS<sub>3</sub>

RTK Substance No: 1206

Description: Colorless, odorless, crystalline solid which is often dissolved in a flammable or combustible liquid carrier

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 2783 ERG Guide #: 152 Hazard Class: 6.1 (Poison)	Solid <b>Methidathion</b> does not burn, however it is often dissolved in a liquid carrier which may be flammable or combustible. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> , <i>Sulfur Oxides</i> and <i>Phosphorus Oxides</i> . Use water spray to keep fire-exposed containers cool.	<b>Methidathion</b> is not compatible with WATER as it may decompose.

## SPILL/LEAKS

## Isolation Distance:

Spill (solid): 25 meters (75 feet)

Spill (liquid): 60 meters (200 feet)

Fire: 800 meters (1/2 mile)

 Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit into sealed containers. Moisten spilled *solid* material first or use a HEPA-filter vacuum for clean-up and deposit into sealed containers.

DO NOT wash into sewer.

Very toxic to aquatic life.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Noncombustible (solid)
<b>Vapor Pressure:</b>	1 x 10 <sup>-6</sup> mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.5 (water = 1)
<b>Water Solubility:</b>	Soluble (degrades)
<b>Freezing Point:</b>	102° to 104°F (39° to 40°C)
<b>Molecular Weight:</b>	302.3

## EXPOSURE LIMITS

 No occupational exposure limits have been established for **Methidathion**.

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Polyvinyl Alcohol, Polyvinyl Chloride, Silver Shield®/4H® and Viton (>4-hr breakthrough)
<b>Coveralls:</b>	DuPont Tychem® BR, LV, Responder® and TK; Kappler® Zytron® 300; and Saint-Gobain ONESuit® TEC (>8-hr breakthrough for <i>Organophosphorus compounds</i> )
<b>Respirator:</b>	Supplied air

## HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Headache, dizziness, constriction of the pupils (miosis) with blurred vision, muscle twitching, loss of coordination, convulsions and death Nausea, vomiting and abdominal pain
<b>Chronic:</b>	Cancer (lung) in animals

## FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention immediately.  
**Quickly** remove contaminated clothing. Immediately wash contaminated skin with large amounts of water.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** promptly to a medical facility.

Common Name: **2-METHOXYETHYL ACETATE**

Synonyms: EGMEA; Methyl Cellosolve® Acetate

CAS No: 110-49-6

Molecular Formula: C<sub>5</sub>H<sub>10</sub>O<sub>3</sub>

RTK Substance No: 1212

Description: Colorless liquid with a pleasant odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>2 - Fire</b> <b>0 - Reactivity</b> <b>DOT#:</b> UN 1189 <b>ERG Guide #:</b> 129 <b>Hazard Class:</b> 3 (Flammable)	<b>COMBUSTIBLE LIQUID</b> Use dry chemical, CO <sub>2</sub> , water spray, alcohol-resistant foam or other foam as extinguishing agents. <b>POISONOUS GASES ARE PRODUCED IN FIRE.</b> Use water spray to keep fire-exposed containers cool.	<b>2-Methoxyethyl Acetate</b> reacts slowly with WATER to form <i>Acetic Acid</i> and <i>Methyl Alcohol</i> . <b>2-Methoxyethyl Acetate</b> is not compatible with <b>OXIDIZING AGENTS</b> (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); <b>STRONG BASES</b> (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); and <b>STRONG ACIDS</b> (such as HYDROCHLORIC, SULFURIC and NITRIC).

### SPILL/LEAKS

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers for disposal.

Keep **2-Methoxyethyl Acetate** out of confined spaces, such as sewers, because of the possibility of an explosion.

DO NOT wash into sewer.

**2-Methoxyethyl Acetate** is harmful to aquatic organisms.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	0.64 ppm
<b>Flash Point:</b>	120°F (49°C)
<b>LEL:</b>	1.5%
<b>UEL:</b>	12.3 %
<b>Auto Ignition Temp:</b>	740°F (393°C)
<b>Vapor Density:</b>	4.1 (air = 1)
<b>Vapor Pressure:</b>	2 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.01 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	293°F (145°C)
<b>Freezing Point:</b>	-85°F (-65°C)
<b>Molecular Weight:</b>	118.1

### EXPOSURE LIMITS

<b>OSHA:</b>	25 ppm, 8-hr TWA
<b>NIOSH:</b>	0.1 ppm, 10-hr TWA
<b>ACGIH:</b>	0.1 ppm, 8-hr TWA
<b>IDLH:</b>	200 ppm

The Protective Action Criteria values are:

PAC-1 = 0.3 ppm	PAC-3 = 200 ppm
PAC-2 = 20 ppm	

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl, Silver Shield®/4H®, and Barrier® (>4-hr breakthrough)
<b>Coveralls:</b>	Tychem® BR, LV, Responder®, and TK (>8-hr breakthrough)
<b>Respirator:</b>	>0.1 ppm - Supplied air >0.3 ppm - SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing and severe shortness of breath (pulmonary edema)  Headache, vomiting, dizziness, confusion, lightheadedness, and passing out

### FIRST AID AND DECONTAMINATION

<b>Remove</b>	the person from exposure.
<b>Flush</b>	eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
<b>Quickly</b>	remove contaminated clothing and wash contaminated skin with large amounts of soap and water.
<b>Begin</b>	artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b>	promptly to a medical facility.
<b>Medical</b>	observation is recommended as symptoms may be delayed.



**Common Name: METHYL ALCOHOL**

**Synonyms:** Carbinol; Methanol; Wood Alcohol

**CAS No:** 67-56-1

**Molecular Formula:** CH<sub>3</sub>OH

**RTK Substance No:** 1222

**Description:** Colorless liquid with a slightly sweet, strong odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>1 - Health</b> <b>3 - Fire</b> <b>0 - Reactivity</b> <b>DOT#:</b> UN 1268 <b>ERG Guide #:</b> 131 <b>Hazard Class:</b> 3 (Flammable liquid)	<p><b>Methyl Alcohol</b> is a <b>FLAMMABLE LIQUID</b>.                      Use dry chemical, CO<sub>2</sub>, water spray or alcohol-resistant foam as extinguishing agents.                      Water may not be effective in fighting fires.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE.                      CONTAINERS MAY EXPLODE IN FIRE.</p> <p>Use water spray to keep fire-exposed containers cool.                      Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source and flash back.</p> <p><b>Methyl Alcohol</b> may form an ignitable vapor/air mixture in closed tanks or containers.</p>	<p><b>Methyl Alcohol</b> reacts violently or explosively with <b>OXIDIZING AGENTS</b> (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); <b>ALKYL ALUMINUM SALTS</b>; <b>ACETYL BROMIDE</b>; <b>CHROMIC ANHYDRIDE</b>; MIXTURES of <b>CHLOROFORM</b> and <b>SODIUM HYDROXIDE</b>; <b>PHOSPHORUS TRIOXIDE</b>; MIXTURES of <b>SULFURIC ACID</b> and <b>HYDROGEN PEROXIDE</b>; <b>ISOCYANATES</b>; <b>METALS</b> (such as <b>LEAD</b>, <b>MAGNESIUM</b> and <b>POTASSIUM</b>); and <b>NITRIC ACID</b>.</p> <p><b>Methyl Alcohol</b> attacks some <b>PLASTICS</b>, <b>RUBBERS</b> and <b>COATINGS</b>.</p>

### SPILL/LEAKS

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in dry sand, earth, or a similar material and place into sealed containers for disposal.

Use only non-sparking tools and equipment.

Metal containers involving the transfer of **Methyl Alcohol** should be grounded and bonded.

Keep **Methyl Alcohol** out of confined spaces, such as sewers, because of the possibility of an explosion.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	100 to 1,500 ppm
<b>Flash Point:</b>	52°F (11°C)
<b>LEL:</b>	6%
<b>UEL:</b>	36%
<b>Auto Ignition Temp:</b>	867°F (464°C)
<b>Vapor Density:</b>	1.1 (air = 1)
<b>Vapor Pressure:</b>	96 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	0.8 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	147°F (64°C)
<b>Melting Point:</b>	-144°F (-97.8°C)
<b>Ionization Potential:</b>	10.84 eV
<b>Molecular Weight:</b>	32.04

### EXPOSURE LIMITS

**OSHA:** 200 ppm, 8-hr TWA

**NIOSH:** 200 ppm, 10-hr TWA; 250 ppm Ceiling

**ACGIH:** 200 ppm, 8-hr TWA; 250 ppm Ceiling

**IDLH:** 6,000 ppm

The Protective Action Criteria values are:

PAC-1 = 530 ppm    PAC-2 = 2,100 ppm

PAC-3 = 7,200 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl, Viton and Barrier® (>8-hr breakthrough)
<b>Coveralls:</b>	Tychem® SL, CSM and TK; Trelchem® HPS and VPS (>8-hr breakthrough) <b>Use turn out gear or flash protection if ignition/fire is the greatest hazard.</b>
<b>Respirator:</b>	>200 ppm - SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation, blurred vision and blindness. Irritation
<b>Skin:</b>	Nose, throat and lung irritation with coughing, wheezing and shortness of breath
<b>Inhalation:</b>	Headache, dizziness, drowsiness, loss of consciousness and death

### FIRST AID AND DECONTAMINATION

<b>Remove</b> the person from exposure.
<b>Flush</b> eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.
<b>Quickly</b> remove contaminated clothing and wash contaminated skin with large amounts of water. Seek medical attention.
<b>Begin</b> artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b> promptly to a medical facility.

Common Name: **METHYL AMYL ALCOHOL**

Synonyms: Methyl Isobutyl Carbinol; 4-Methyl-2-Pentanol

CAS No: 108-11-2

Molecular Formula: C<sub>6</sub>H<sub>14</sub>O

RTK Substance No: 1228

Description: Clear, colorless liquid with a mild odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>2 - Health</b></p> <p><b>2 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p><b>DOT#:</b> UN 2053</p> <p><b>ERG Guide #:</b> 129</p> <p><b>Hazard Class:</b> 3 (Flammable)</p>	<p>COMBUSTIBLE LIQUID</p> <p>Use dry chemical, CO<sub>2</sub>, water spray or alcohol-resistant foam as extinguishing agents.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE.</p> <p>Use water spray to keep fire-exposed containers cool and to disperse vapors.</p> <p>Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.</p> <p><b>Methyl Amyl Alcohol</b> may form an ignitable vapor/air mixture in closed tanks or containers.</p>	<p><b>Methyl Amyl Alcohol</b> reacts violently with POTASSIUM BUTOXIDE.</p> <p><b>Methyl Amyl Alcohol</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); ALKALI METALS (such as LITHIUM, SODIUM and POTASSIUM); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); ACID CHLORIDES; NITROGEN COMPOUNDS; and HALOGENATED HYDROCARBONS (such as METHYLENE CHLORIDE and 1,1,1-TRICHLOROETHANE).</p> <p><b>Methyl Amyl Alcohol</b> may form <i>explosive peroxides</i> when distilled, evaporated or concentrated.</p> <p><b>Methyl Amyl Alcohol</b> may accumulate static electricity.</p>

### SPILL/LEAKS

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in dry sand, earth, or a similar material and place into sealed containers for disposal.

Use only non-sparking tools and equipment, especially when opening and closing containers of **Methyl Amyl Alcohol**.

Keep **Methyl Amyl Alcohol** out of confined spaces, such as sewers, because of the possibility of an explosion.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	0.07 ppm
<b>Flash Point:</b>	106°F (41°C)
<b>LEL:</b>	1%
<b>UEL:</b>	5.5%
<b>Auto Ignition Temp:</b>	858°F (459°C)
<b>Vapor Density:</b>	3.5 (air = 1)
<b>Vapor Pressure:</b>	3 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	0.8 (water = 1)
<b>Water Solubility:</b>	Slightly soluble
<b>Boiling Point:</b>	266° to 271°F (130° to 133°C)
<b>Freezing Point:</b>	-130°F (-90°C)
<b>Molecular Weight:</b>	102.2

### EXPOSURE LIMITS

<b>OSHA:</b>	25 ppm, 8-hr TWA
<b>NIOSH:</b>	25 ppm, 10-hr TWA; 40 ppm, STEL
<b>ACGIH:</b>	25 ppm, 8-hr TWA; 40 ppm, STEL
<b>IDLH:</b>	400 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl, Neoprene, SilverShield®/4H®, Viton and Barrier® (>8-hr breakthrough)
<b>Coveralls:</b>	Tychem® BR, Responder® and TK (>8-hr breakthrough)
<b>Respirator:</b>	>25 ppm - SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns
<b>Inhalation:</b>	Nose and throat irritation with coughing and wheezing  Headache, dizziness, lightheadedness, and passing out

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **METHYL BENZOATE**

Synonyms: Methyl Benzenecarboxylate; Niobe Oil

CAS No: 93-58-3

 Molecular Formula: C<sub>8</sub>H<sub>8</sub>O<sub>2</sub>

RTK Substance No: 1230

Description: Colorless, oily liquid with a pleasant, fruity odor

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>1 - Health</b> <b>2 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 2938 ERG Guide #: 152 Hazard Class: 6.1 (Poison)	COMBUSTIBLE LIQUID Use dry chemical, CO <sub>2</sub> or foam as extinguishing agents. Water spray may be used to blanket fire. DO NOT USE solid water jets. POISONOUS GASES ARE PRODUCED IN FIRE. Use water spray to keep fire-exposed containers cool.	<b>Methyl Benzoate</b> may react with STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE) and REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES) to form flammable and explosive <i>Hydrogen gas</i> . <b>Methyl Benzoate</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC). <b>Methyl Benzoate</b> decomposes slowly on contact with WATER.

## SPILL/LEAKS

**Isolation Distance:**

Spills: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers for disposal.

 Use only non-sparking tools and equipment, especially when opening and closing containers of **Methyl Benzoate**.

DO NOT wash into sewer.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Pleasant, fruity odor
<b>Flash Point:</b>	181°F (83°C)
<b>Vapor Density:</b>	4.7 (air = 1)
<b>Vapor Pressure:</b>	1 mm Hg at 102°F (39°C)
<b>Specific Gravity:</b>	1.1 (water = 1)
<b>Water Solubility:</b>	Very slightly soluble
<b>Boiling Point:</b>	302°F (150°C)
<b>Freezing Point:</b>	10°F (-12°C)
<b>Ionization Potential:</b>	9.3 +/- 2 eV
<b>Molecular Weight:</b>	136.1

## EXPOSURE LIMITS

The Protective Action Criteria values are:

PAC-1 = 6 ppm

PAC-2 = 40 ppm

PAC-3 = 75 ppm

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl, Nitrile, Polyvinyl Alcohol, and Viton (>8-hr breakthrough for <i>Esters, Carboxylic</i> )
<b>Coveralls:</b>	Tychem® F, BR, LV, Responder®, and TK (>8-hr breakthrough for <i>Esters, Carboxylic</i> )
<b>Respirator:</b>	>6 ppm - SCBA

## HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, wheezing and shortness of breath

## FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.  
**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** promptly to a medical facility.

Common Name: **METHYL n-BUTYL KETONE**

Synonyms: Butyl Methyl Ketone; MBK; Propylacetone

CAS No: 591-78-6

Molecular Formula: C<sub>6</sub>H<sub>12</sub>O

RTK Substance No: 1280

Description: Colorless liquid with an *Acetone*-like odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>3 - Fire</b> <b>0 - Reactivity</b> <b>DOT#:</b> UN 1224 <b>ERG Guide #:</b> 127 <b>Hazard Class:</b> 3 (Flammable)	<b>FLAMMABLE LIQUID</b> Use dry chemical, CO <sub>2</sub> , water spray or alcohol-resistant foam as extinguishing agents. Water may not be effective in fighting fires and solid streams of water may spread fire. <b>POISONOUS GASES ARE PRODUCED IN FIRE.</b> <b>CONTAINERS MAY EXPLODE IN FIRE.</b> Use water spray to keep fire-exposed containers cool. <b>Methyl n-Butyl Ketone</b> may form an ignitable vapor/air mixture in closed tanks or containers.	<b>Methyl n-Butyl Ketone</b> reacts with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE). <b>Methyl n-Butyl Ketone</b> is not compatible with STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE) and REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES).

### SPILL/LEAKS

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers for disposal.

Use only non-sparking tools and equipment, especially when opening and closing containers of **Methyl n-Butyl Ketone**.

Keep **Methyl n-Butyl Ketone** out of confined spaces, such as sewers, because of the possibility of an explosion.

DO NOT wash into sewer.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	0.076 to 3 ppm
<b>Flash Point:</b>	77°F (25°C)
<b>LEL:</b>	1.2%
<b>UEL:</b>	8%
<b>Auto Ignition Temp:</b>	795°F (423°C)
<b>Vapor Density:</b>	3.5 (air = 1)
<b>Vapor Pressure:</b>	3.8 mm Hg at 77°F (25°C)
<b>Specific Gravity:</b>	0.8 (water = 1)
<b>Water Solubility:</b>	Slightly soluble
<b>Boiling Point:</b>	262°F (128°C)
<b>Freezing Point:</b>	-70.4 (-56.9°C)
<b>Ionization Potential:</b>	9.34 eV
<b>Molecular Weight:</b>	100.18

### EXPOSURE LIMITS

**NIOSH:** 1 ppm, 10-hr TWA

**ACGIH:** 5 ppm, 8-hr TWA; 10 ppm, STEL

**IDLH:** 1,600 ppm

The Protective Action Criteria values are:

PAC-1 = 10 ppm PAC-2 = 1,500 ppm PAC-3 = 1,600 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl, Polyvinyl Alcohol, Silver Shield®/4H®, and Barrier® (>8-hr breakthrough for <i>Ketones</i> )
<b>Coveralls:</b>	Tychem® F, BR, Responder®, and TK; Trelchem® HPS and VPS (>8-hr breakthrough for <i>Ketones</i> )
<b>Respirator:</b>	SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose and throat irritation with coughing and wheezing  Headache, dizziness, lightheadedness, and passing out

### FIRST AID AND DECONTAMINATION

<b>Remove</b> the person from exposure.
<b>Flush</b> eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
<b>Quickly</b> remove contaminated clothing and wash contaminated skin with large amounts of soap and water.
<b>Begin</b> artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b> promptly to a medical facility.

Common Name: **METHYL CHLOROFORM**

Synonyms: Methyltrichloromethane; 1,1,1-Trichloroethane

CAS No: 71-55-6

 Molecular Formula: C<sub>2</sub>H<sub>3</sub>Cl<sub>3</sub>

RTK Substance No: 1237

 Description: Colorless liquid with an *Ether*-like odor

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 2831 ERG Guide #: 160 Hazard Class: 6 (Poison)	<b>Methyl Chloroform</b> is nonflammable, but <b>Methyl Chloroform vapors</b> in containers can explode. Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Phosgene</i> and <i>Hydrogen Chloride</i> . CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool.	<b>Methyl Chloroform</b> reacts violently with CHEMICALLY ACTIVE METALS and their ALLOYS (such as POTASSIUM, SODIUM, MAGNESIUM and ZINC); DINITROGEN TETRAOXIDE; OXYGEN; and LIQUID OXYGEN. <b>Methyl Chloroform</b> reacts slowly with WATER to form toxic and corrosive <i>Hydrogen Chloride gas</i> . <b>Methyl Chloroform</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); and ACETONE. Keep <b>Methyl Chloroform</b> away from high energy sources, open flames or are welding as extremely toxic <i>Phosgene</i> and <i>Hydrogen Chloride gases</i> may form.

## SPILL/LEAKS

## Isolation Distance:

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in dry sand, earth, or a similar material and place into sealed containers for disposal.

DO NOT wash into sewer.

**Methyl Chloroform** is harmful to aquatic life.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	120 ppm
<b>Flash Point:</b>	>200°F (93.3°C)
<b>LEL:</b>	7%
<b>UEL:</b>	16%
<b>Auto Ignition Temp:</b>	932°F (500°C)
<b>Vapor Density:</b>	4.6 (air = 1)
<b>Vapor Pressure:</b>	100 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.34 (water = 1)
<b>Water Solubility:</b>	Very slightly soluble
<b>Boiling Point:</b>	165°F (74°C)
<b>Freezing Point:</b>	-22°F (-30°C)
<b>Ionization Potential:</b>	11.0 eV
<b>Molecular Weight:</b>	133.42

## EXPOSURE LIMITS

**OSHA:** 350 ppm, 8-hr TWA

**NIOSH:** 350 ppm, 15-min Ceiling

**ACGIH:** 350 ppm, 8-hr TWA; 450 ppm, Ceiling

**IDLH:** 700 ppm

The Protective Action Criteria values are:

PAC-1 = 230 ppm    PAC-2 = 600 ppm

PAC-3 = 4,200 ppm

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Polyvinyl Alcohol, SilverShield®/4H®, Viton and Barrier® (>8-hr breakthrough)
<b>Coveralls:</b>	Tychem® CPF3, BR, Responder® and TK (>8-hr breakthrough)
<b>Respirator:</b>	>230 ppm - SCBA

## HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns
<b>Inhalation:</b>	Nose and throat irritation, headache, dizziness, lightheadedness and passing out. Higher levels can cause coma and death.

## FIRST AID AND DECONTAMINATION

<b>Remove</b>	the person from exposure.
<b>Flush</b>	eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
<b>Quickly</b>	remove contaminated clothing and wash contaminated skin with large amounts of soap and water.
<b>Begin</b>	artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b>	promptly to a medical facility.



Common Name: **METHYL CHLOROSILANE**

Synonym: Chloromethylsilane

CAS No: 993-00-0

 Molecular Formula: CH<sub>3</sub>ClSi

RTK Substance No: 1240

Description: Colorless gas with a distinctive odor

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>4 - Fire</b> <b>2-W - Reactivity</b> DOT#: UN 2534 ERG Guide #: 119 Hazard Class: 2.3 (Toxic gas)	<b>FLAMMABLE AND REACTIVE GAS</b> Extinguish fire only if flow can be stopped. Use dry chemical, CO <sub>2</sub> , alcohol-resistant foam or other foam extinguishing agents, as water may not be effective in fighting fires. Water may form flammable and toxic gases. <b>POISONOUS GASES ARE PRODUCED IN FIRE, including Hydrogen Chloride and Phosgene.</b> <b>CONTAINERS MAY EXPLODE IN FIRE.</b> Vapors may travel to a source of ignition and flash back.	<b>Methyl Chlorosilane</b> may react violently with WATER; MOIST AIR; OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); and ORGANIC ACIDS (such as ACETIC ACID) to form flammable and toxic <i>Hydrogen Chloride</i> and <i>Hydrogen gases</i> . <b>Methyl Chlorosilane</b> attacks many METALS in the presence of WATER and MOISTURE.

## SPILL/LEAKS

**Isolation Distance:**

Small Spill: 30 meters (100 feet)

Large Spill: 300 meters (1,000 feet)

Fire: 1,600 meters (1 mile)

Stop flow of gas. If source of leak is a cylinder and the leak cannot be stopped in place, remove the leaking cylinder to a safe place in the open air, and repair leak or allow cylinder to empty.

 Use only non-sparking tools and equipment, especially when opening and closing containers of **Methyl Chlorosilane**.

 Keep **Methyl Chlorosilane** out of confined spaces, such as sewers, because of the possibility of an explosion.

DO NOT wash into sewer.

## PHYSICAL PROPERTIES

**Odor Threshold:** Distinctive odor

**Flash Point:** 16° to 55°F (-9° to 13°C)

**Vapor Pressure:** 137 mm Hg at 68°F (20°C)

**Water Solubility:** Insoluble/Reactive

**Molecular Weight:** 80.6

## EXPOSURE LIMITS

The Protective Action Criteria values are:

PAC-1 = 1.8 ppm

PAC-2 = 22 ppm

PAC-3 = 100 ppm

## PROTECTIVE EQUIPMENT

**Gloves:** Silver Shield®/4H®, Viton and Barrier® (>4-hr breakthrough for *Organo-Silicon compounds*)

**Coveralls:** Tychem® BR, LV, Responder®, and TK (>8-hr breakthrough for *Organo-Silicon compounds*)

**Respirator:** >1.8 ppm - SCBA

## HEALTH EFFECTS

**Eyes:** Irritation and burns

**Skin:** Irritation and burns

**Inhalation:** Nose, throat and lung irritation, with coughing, wheezing and shortness of breath

## FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention immediately

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.



Common Name: 4,4'-**METHYLENEBIS(2-CHLOROANILINE)**

Synonyms: Benzenamine, 4,4'-Methylenebis[2-Chloro-; MBOCA; MOCA

CAS No: 101-14-4

 Molecular Formula: C<sub>13</sub>H<sub>12</sub>Cl<sub>2</sub>N<sub>2</sub>

RTK Substance No: 1250

Description: Colorless to light brown crystalline solid or pellet with a faint odor

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b> DOT#: None ERG Guide #: 152 Hazard Class: None	<b>4,4'-Methylenebis(2-Chloroaniline)</b> may burn, but does not readily ignite. Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Hydrogen Chloride</i> and <i>Nitrogen Oxides</i> . CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool.	<b>4,4'-Methylenebis(2-Chloroaniline)</b> is not compatible with CHEMICALLY ACTIVE METALS (such as POTASSIUM, SODIUM, MAGNESIUM and ZINC).

## SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

DO NOT wash into sewer.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Faint <i>amine</i> -like odor
<b>Flash Point:</b>	Combustible
<b>Vapor Pressure:</b>	2.86 x 10 <sup>-7</sup> mm Hg at 77°F (25°C)
<b>Specific Gravity:</b>	1.44 (water = 1)
<b>Water Solubility:</b>	Very slightly soluble
<b>Boiling Point:</b>	396°F (202°C)
<b>Melting Point:</b>	210° to 225°F (99° to 107°C)
<b>Molecular Weight:</b>	267.2

## EXPOSURE LIMITS

**NIOSH:** 0.003 mg/m<sup>3</sup>, 10-hr TWA

**ACGIH:** 0.11 mg/m<sup>3</sup>, 8-hr TWA

The Protective Action Criteria values are:

 PAC-1 = 12.5 mg/m<sup>3</sup>

 PAC-2 = 75 mg/m<sup>3</sup>

 PAC-3 = 500 mg/m<sup>3</sup>

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Silver Shield®/4H® (>8 hr breakthrough in <i>solution</i> )
<b>Coveralls:</b>	Tyvek ( <i>solids</i> ) and Tychem® SL, BR, CSM and TK (>8-hr breakthrough in <i>solution</i> )
<b>Respirator:</b>	Spill: full facepiece APR with <i>P100 filters</i> for <i>solids</i> Fire: SCBA

## HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns
<b>Inhalation:</b>	Headache, fatigue and blue color to the skin and lips (methemoglobinemia)
<b>Chronic:</b>	Cancer (bladder) in humans

## FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **4,4'-METHYLENEBIS(N,N-DIMETHYLBENZENAMINE)**

Synonyms: 4,4'-Bis(Dimethylamino)Diphenylmethane; Michler's Base

CAS No: 101-61-1

Molecular Formula: C<sub>17</sub>H<sub>22</sub>N<sub>2</sub>

RTK Substance No: 1252

Description: Odorless, crystalline powder

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b>  <b>DOT#:</b> None <b>ERG Guide #:</b> None <b>Hazard Class:</b> None	Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> . Use water spray to keep fire-exposed containers cool.	<b>4,4'-Methylenebis(N,N-Dimethylbenzenamine)</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); ACID CHLORIDES; and ACID ANHYDRIDES.

### SPILL/LEAKS

**Isolation Distance:**

Spill: 30 meters (100 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and deposit into sealed containers.

DO NOT wash into sewer.

No information about affects on aquatic life.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	411°F (211°C)
<b>Vapor Density:</b>	8.8 (air = 1)
<b>Vapor Pressure:</b>	0.000075 mm Hg at 68°F (20°C)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	734°F (390°C)
<b>Melting Point:</b>	194° to 196°F (90° to 91°C)
<b>Molecular Weight:</b>	254.4

### EXPOSURE LIMITS

No occupational exposure limits have been established for **4,4'-Methylenebis(N,N-Dimethylbenzenamine)**.

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Nitrile and Natural Rubber
<b>Coveralls:</b>	DuPont Tyvek®
<b>Respirator:</b>	Full facepiece APR with High efficiency filter or Supplied air

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose and throat irritation Headache, fatigue, dizziness and a blue color to the skin and lips (methemoglobinemia)
<b>Chronic:</b>	Cancer (liver and thyroid) in animals

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.  
**Quickly** remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** promptly to a medical facility.

Common Name: **METHYLENE CHLORIDE**

Synonyms: Dichloromethane; Methylene Dichloride

CAS No: 75-09-2

Molecular Formula: CH<sub>2</sub>Cl<sub>2</sub>

RTK Substance No: 1255

Description: Colorless, volatile liquid with a sweet odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>2 - Health</b></p> <p><b>1 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p>DOT#: UN 1593</p> <p>ERG Guide #: 160</p> <p>Hazard Class: 6.1 (Poison)</p>	<p><b>Methylene Chloride</b> may burn, but does not readily ignite.</p> <p>Use dry chemical, CO<sub>2</sub>, water spray or foam as extinguishing agents.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Hydrogen Chloride</i> and <i>Phosgene</i>.</p> <p>Use water spray to keep fire-exposed containers cool.</p>	<p><b>Methylene Chloride</b> reacts violently with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); CHEMICALLY ACTIVE METALS (such as POTASSIUM, SODIUM, MAGNESIUM and ALUMINUM); and STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE).</p> <p><b>Methylene Chloride</b> is not compatible with LIQUID OXYGEN; TITANIUM; and AMINES.</p>

### SPILL/LEAKS

**Isolation Distance:**

Small Spill: 30 meters (100 feet)

Large Spill: 60 meters (200 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers.

DO NOT wash into sewer.

**Methylene Chloride** may be hazardous in the environment. Special attention should be given to ground water contamination.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	25 to 150 ppm
<b>Flash Point:</b>	Nonflammable
<b>LEL:</b>	13%
<b>UEL:</b>	23%
<b>Auto Ignition Temp:</b>	1,033°F (556°C)
<b>Vapor Density:</b>	2.9 (air = 1)
<b>Vapor Pressure:</b>	440 mm Hg at 77°F (25°C)
<b>Specific Gravity:</b>	1.3 (water = 1)
<b>Water Solubility:</b>	Very slightly soluble
<b>Boiling Point:</b>	104°F (40°C)
<b>Melting Point:</b>	-142°F (-97°C)
<b>Ionization Potential:</b>	11.32 eV
<b>Molecular Weight:</b>	85

### EXPOSURE LIMITS

<b>OSHA:</b>	25 ppm, 8-hr TWA; 125 ppm, STEL
<b>NIOSH:</b>	Lowest feasible concentration
<b>ACGIH:</b>	50 ppm, 8-hr TWA
<b>IDLH:</b>	2,300 ppm
<b>PAC:</b>	PAC-1: 200 ppm; PAC-2 560 ppm; PAC-3: 6,900 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Polyvinyl Alcohol and Silver Shield®/4H® (>8-hr breakthrough)
<b>Coveralls:</b>	Tychem® Responder® and TK; Zytron® 500; ONESuit® TEC; and Trelchem® HPS and VPS (>8-hr breakthrough)
<b>Respirator:</b>	>25 ppm - Supplied air

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, wheezing and shortness of breath
	Headache, nausea, fatigue, dizziness, lightheadedness, and unconsciousness
<b>Chronic:</b>	Cancer (liver and lung) in animals

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **METHYL ETHYL KETONE PEROXIDE**

Synonyms: 2-Butanone Peroxide; MEKP; MEK Peroxide

CAS No: 1338-23-4

 Molecular Formula: C<sub>8</sub>H<sub>16</sub>O<sub>4</sub>

RTK Substance No: 1259

 Description: Colorless to yellow liquid with a fragrant, mint-like odor, usually sold in 60% solution (with a *Phthalate* diluent) to prevent explosions

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>2 - Fire</b> <b>4 - Reactivity</b> DOT#: UN 3101 ERG Guide #: 146 Hazard Class: 5.2 (Organic Peroxide)	<b>Methyl Ethyl Ketone Peroxide</b> is a COMBUSTIBLE and REACTIVE LIQUID that may burn slowly at first, and after heating can burn violently and explosively. Use dry chemical, CO <sub>2</sub> , water spray or alcohol-resistant foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool. <b>Methyl Ethyl Ketone Peroxide</b> is a STRONG OXIDIZER that may ignite or explode on contact with other substances.	<b>Methyl Ethyl Ketone Peroxide</b> (not in solution or diluted) decomposes explosively at temperatures above 230°F (110°C) or if exposed to SHOCK or FRICTION. <b>Methyl Ethyl Ketone Peroxide</b> reacts violently with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); COMBUSTIBLES; STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES); ORGANICS; METALS (such as IRON, STEEL, COPPER and ALUMINUM, and their ALLOYS). <b>Methyl Ethyl Ketone Peroxide</b> is not compatible with MINERAL ACIDS; COBALT COMPOUNDS; AMINES; and ACETONE.

**SPILL/LEAKS**
**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquid with fly ash, cement powder or commercial sorbents and place into sealed containers for disposal.

 Use only non-sparking tools and equipment, especially when opening and closing containers of **Methyl Ethyl Ketone Peroxide**.

 Keep **Methyl Ethyl Ketone Peroxide** out of confined spaces, such as sewers, because of the possibility of an explosion.

DO NOT wash into sewer.

**PHYSICAL PROPERTIES**
**Odor Threshold:** Fragrant, mint-like odor

**Flash Point:** 125° to 200°F (52° to 93°C)

**Auto Ignition Temp:** 1,051°F (566°C)

**Vapor Density:** 6.7 (air = 1)

**Vapor Pressure:** <0.01 mm Hg at 68°F (20°C)

**Specific Gravity:** 1.12 (water = 1)

**Water Solubility:** Soluble

**Boiling Point:** 244°F (118°C), violent decomposition at 230°F (110°C)

**Molecular Weight:** 176.2

**EXPOSURE LIMITS**
**NIOSH:** 0.2 ppm, Ceiling

**ACGIH:** 0.2 ppm, Ceiling

The Protective Action Criteria values are:

PAC-1 = 3 ppm

PAC-3 = 20 ppm

PAC-2 = 20 ppm

**PROTECTIVE EQUIPMENT**
**Gloves:** Butyl, Neoprene and Viton (>4-hr breakthrough)

**Coveralls:** Tychem® BR, LV, Responder®, and TK (>8-hr breakthrough for *Peroxides*)

**Respirator:** >0.2 ppm - SCBA

**HEALTH EFFECTS**
**Eyes:** Severe irritation, and burns with possible damage

**Skin:** Severe irritation and burns

**Inhalation:** Nose, throat and lung irritation, with coughing, wheezing and shortness of breath

**FIRST AID AND DECONTAMINATION**
**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention immediately.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **METHYL ISOAMYL KETONE**

Synonyms: Isopentyl Methyl Ketone; MIAK; 5-Methylhexan-2-one

CAS No: 110-12-3

Molecular Formula: C<sub>7</sub>H<sub>14</sub>O

RTK Substance No: 1267

Description: Clear, colorless liquid with a pleasant odor

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>1 - Health</b> <b>3 - Fire</b> <b>0 - Reactivity</b> <b>DOT#:</b> UN 2302 <b>ERG Guide #:</b> 127 <b>Hazard Class:</b> 3 (Flammable)	<b>FLAMMABLE LIQUID</b> Use dry chemical, CO <sub>2</sub> or alcohol-resistant foam extinguishing agents, as water may not be effective in fighting fires. <b>POISONOUS GASES ARE PRODUCED IN FIRE.</b> <b>CONTAINERS MAY EXPLODE IN FIRE.</b> Use water spray to keep fire-exposed containers cool. Vapors may travel to a source of ignition and flash back. Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.	<b>Methyl Isoamyl Ketone</b> reacts violently with <b>OXIDIZING AGENTS</b> (such as <b>PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE</b> ); <b>STRONG BASES</b> (such as <b>SODIUM HYDROXIDE and POTASSIUM HYDROXIDE</b> ); <b>AMINES</b> ; <b>ALDEHYDES</b> ; and <b>ISOCYANATES</b> to cause fires and explosions. <b>Methyl Isoamyl Ketone</b> is not compatible with <b>REDUCING AGENTS</b> (such as <b>LITHIUM, SODIUM, ALUMINUM</b> and their <b>HYDRIDES</b> ); <b>STRONG ACIDS</b> (such as <b>HYDROCHLORIC, SULFURIC and NITRIC</b> ); and <b>NITRIDES</b> .

**SPILL/LEAKS**

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers for disposal.

Use only non-sparking tools and equipment, especially when opening and closing containers of **Methyl Isoamyl Ketone**.

Keep **Methyl Isoamyl Ketone** out of confined spaces, such as sewers, because of the possibility of an explosion.

DO NOT wash into sewer.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	0.012 ppm
<b>Flash Point:</b>	97°F (36°C)
<b>LEL:</b>	1%
<b>UEL:</b>	8.2%
<b>Auto Ignition Temp:</b>	375°F (191°C)
<b>Vapor Density:</b>	3.9 (air = 1)
<b>Vapor Pressure:</b>	5.8 mm Hg at 77°F (25°C)
<b>Specific Gravity:</b>	0.8 (water = 1)
<b>Water Solubility:</b>	Very slightly soluble
<b>Boiling Point:</b>	294°F (146°C)
<b>Freezing Point:</b>	-101°F (-74°C)
<b>Ionization Potential:</b>	9.28 eV
<b>Molecular Weight:</b>	114.2

**EXPOSURE LIMITS**

**OSHA:** 100 ppm, 8-hr TWA

**NIOSH:** 50 ppm, 10-hr TWA

**ACGIH:** 50 ppm, 8-hr TWA

The Protective Action Criteria values are:

PAC-1 = 150 ppm      PAC-3 = 1,500 ppm

PAC-2 = 1,500 ppm

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Butyl (1 to 4-hrs breakthrough); Silver Shield®/4H® and Barrier® (>8-hr breakthrough)
<b>Coveralls:</b>	Tychem® BR, LV, Responder®, and TK; and Trelchem® HPS and VPS (>8-hr breakthrough for <i>Ketones</i> )
<b>Respirator:</b>	>50 ppm - Full facepiece APR with <i>Organic vapor</i> cartridges >150 ppm - SCBA

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose and throat irritation with coughing and wheezing Headache, dizziness, lightheadedness, and passing out

**FIRST AID AND DECONTAMINATION**

<b>Remove</b> the person from exposure.
<b>Flush</b> eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
<b>Quickly</b> remove contaminated clothing and wash contaminated skin with large amounts of soap and water.
<b>Begin</b> artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b> promptly to a medical facility.

Common Name: **N-METHYL-N-NITROSOETHYLCARBAMATE**

Synonyms: N-Nitroso-N-Methylurethane

CAS No: 615-53-2

 Molecular Formula: C<sub>4</sub>H<sub>8</sub>N<sub>2</sub>O<sub>3</sub>

RTK Substance No: 1297

Description: Extremely volatile, light colored, yellow to pink oil with a sweet odor

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>2 - Fire</b> <b>1 - Reactivity</b>  DOT#: UN 3082 ERG Guide #: 171 Hazard Class: 9 (Environmentally Hazardous Material)	COMBUSTIBLE LIQUID Use dry chemical, CO <sub>2</sub> , water spray, alcohol-resistant foam or other foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> . CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool.	<b>N-Methyl-N-Nitrosoethylcarbamate</b> reacts with ACTIVE METALS (such as LITHIUM, POTASSIUM and SODIUM) and NITRIDES to form flammable and explosive <i>Hydrogen gas</i> . <b>N-Methyl-N-Nitrosoethylcarbamate</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); and STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE). <b>N-Methyl-N-Nitrosoethylcarbamate</b> is unstable and sensitive to LIGHT and HEAT.

## SPILL/LEAKS

**Isolation Distance:**

Small Spill: 60 meters (200 feet)

Large Spill: 270 meters (900 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.

DO NOT wash into sewer.

Bioaccumulation in aquatic life is low.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Sweet odor
<b>Flash Point:</b>	Combustible
<b>Specific Gravity:</b>	1.1 (water = 1)
<b>Vapor Pressure:</b>	1.18 mm Hg at 77°F (25°C)
<b>Water Solubility:</b>	Slightly soluble
<b>Boiling Point:</b>	144° to 147°F (62° to 64°C)
<b>Molecular Weight:</b>	132.1

## EXPOSURE LIMITS

 No occupational exposure limits have been established for **N-Methyl-N-Nitrosoethylcarbamate**.

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Nitrile and Silver Shield®/4H® (>8-hr breakthrough)
<b>Coveralls:</b>	DuPont Tychem® Responder®, CSM and TK (>8-hr breakthrough for <i>known carcinogens</i> )
<b>Respirator:</b>	Supplied air

## HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, wheezing and shortness of breath
<b>Chronic:</b>	Cancer (esophagus, skin, and lung) in animals

## FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.



# RIGHT TO KNOW

## HAZARDOUS SUBSTANCE FACT SHEET

**Common Name:** METHYL MERCAPTAN

Synonyms: Methylthioalcohol; Methyl Sulfhydrylate; Mercaptomethane  
 CAS Number: 74-93-1  
 Molecular Formula: CH<sub>4</sub>S  
 RTK Number: 1275  
 Description: Gas with disagreeable odor like garlic, or white liquid

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>Health:</b> 4 <b>Fire:</b> 4 <b>Reactivity:</b> 1 <b>DOT #:</b> UN 1064 <b>ERG #:</b> 117 <b>DOT Hazard:</b> 2.1 (flammable gas) 2.3 (inhalation hazard)	<b>Methyl Mercaptan</b> is a <b>HIGHLY FLAMMABLE GAS</b> . Stop flow of gas. Fires may be extinguished with dry chemical, foam, or carbon dioxide. Use water spray to reduce vapors. <b>POISONOUS GASES ARE PRODUCED IN FIRE</b> , including <i>Sulfur Oxides</i> . <b>CONTAINERS MAY EXPLODE IN FIRE</b> . Vapors may travel to a source of ignition and flash back.	Since violent reactions occur, <b>Methyl Mercaptan</b> must be stored to avoid contact with <b>OXIDIZING AGENTS</b> (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); <b>MERCURY II OXIDE</b> ; <b>STRONG ACIDS</b> (such as HYDROCHLORIC, SULFURIC and NITRIC); <b>STRONG BASES</b> (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); <b>COPPER</b> or <b>NICKEL</b> and their <b>ALLOYS</b> ; <b>ALUMINUM</b> ; and <b>BLEACHES</b> since violent reactions occur. Store in tightly closed containers in a cool, well-ventilated area away from <b>HEAT</b> , <b>FLAME</b> and <b>STEAM</b> . Sources of ignition, such as smoking and open flames, are prohibited where <b>Methyl Mercaptan</b> is used, handled, or stored. Metal containers involving the transfer of <b>Methyl Mercaptan</b> should be grounded and bonded. Use only non-sparking tools and equipment, especially when opening and closing containers of <b>Methyl Mercaptan</b> .

### SPILLS/LEAKS

**Isolation Distances:**  
**Small Spill:** 30 m (100 ft)  
**Large Spill:** 200 m (600 ft)  
**Fire:** 1600 m (1 mile)  
 Evacuate personnel.  
 Secure and control entrance to the area.  
 If it is safe to do so, remove potential ignition sources.  
 Ventilate area of leak to disperse the gas.  
 Stop flow of gas. If source of leak is a cylinder and the leak cannot be stopped in place, remove the leaking cylinder to a safe place in the open air, and repair leak or allow cylinder to empty.  
 Liquid **Methyl Mercaptan** may be absorbed in vermiculite, dry sand, earth, or a similar material and placed in an appropriate container.  
 Keep **Methyl Mercaptan** out of a confined space, such as a sewer, because of the possibility of an explosion, unless the sewer is designed to prevent the build-up of explosive concentrations.  
 Do not allow this substance to enter waterways, including the sewer system, as it is very toxic to aquatic life with long-lasting effects.

### PHYSICAL PROPERTIES

**Molecular Weight:** 48.1  
**Flash Point:** -17 °C (0 °F) for *liquid Methyl Mercaptan*  
**Vapor Density:** 1.66 (air = 1)  
**Vapor Pressure:** 1520 mm Hg at 26 °C (79 °F)  
**Specific Gravity:** 0.892 at 6 °C (42.8 °F)  
**Water Solubility:** Soluble  
**Boiling Point:** 5.94 °C (42.7 °F) at 760 mm Hg  
**Melting Point:** -178.6 °C (-189.4 °F)  
**Ionization Potential:** 9.44 eV  
**Odor Threshold:** 0.002 ppm  
**LEL:** 3.9%  
**UEL:** 21.8%

### EXPOSURE LIMITS

The following exposure limits are for **Methyl Mercaptan**:  
**OSHA:** 10 ppm, never to be exceeded  
**NIOSH:** 0.5 ppm, 15 min  
**ACGIH:** 0.5 ppm, 8 h average  
**IDLH:** 150 ppm  
**PAC:** PAC-1 = 0.005 ppm, PAC-2 = 23 ppm, PAC-3 = 68 ppm

### PROTECTIVE EQUIPMENT

**Gloves:** Neoprene or Butyl  
**Coverall:** DuPont Tychem® 6000, Tychem® 8000FR, Tychem® and Tychem® Responder CSM or the equivalent as protective materials for clothing.  
**Respirator:** < 0.5 ppm - full facepiece respirator with *organic vapor cartridges*  
 ≥ 500 ppm - SCBA

### ACUTE HEALTH EFFECTS

**Eyes:** Irritation  
**Skin:** Irritation  
**Inhalation:** Irritation, coughing, shortness of breath, pulmonary edema, headache, nausea, vomiting, dizziness, muscle weakness, loss of coordination, loss of consciousness, death

### FIRST AID AND DECONTAMINATION

Remove the person from exposure.  
 Quickly remove contaminated clothing.  
 Immediately wash contaminated skin with large amounts of water.  
 Immediately flush eyes with large amounts of water for at least 15 minutes, occasionally lifting upper and lower lids.  
 Contact with *gas* or *liquid* can cause frostbite type injury.  
 Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.  
 Transfer promptly to a medical facility.  
 Medical observation is recommended for 24 to 48 hours after breathing overexposure, as pulmonary edema may be delayed.

Common Name: **METHYL PROPYL KETONE**

Synonyms: Ethyl Acetone; MPK

CAS No: 107-87-9

 Molecular Formula: C<sub>5</sub>H<sub>10</sub>O

RTK Substance No: 1292

Description: Clear, colorless, liquid with a strong fruity odor

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>3 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 1249 ERG Guide #: 127 Hazard Class: 3 (Flammable)	Use dry chemical, CO <sub>2</sub> , alcohol-resistant foam or other foaming agent as extinguishing agents, as water may not be effective in fighting fires. POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool. Vapors may travel to a source of ignition and flash back. Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.	<b>Methyl Propyl Ketone</b> reacts explosively with BROMINE TRIFLUORIDE and OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE). <b>Methyl Propyl Ketone</b> is not compatible with STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES); AMINES; ISOCYANATES; HYDROGEN PEROXIDE; ALDEHYDES; NITRIC ACID; and PERCHLORIC ACID.

**SPILL/LEAKS**
**Isolation Distance:**

Small Spills: 60 meters (200 feet)

Large Spills: 270 meters (900 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.

 Keep **Methyl Propyl Ketone** out of confined spaces, such as sewers, because of the possibility of an explosion.

DO NOT wash into sewer.

Slowly biodegrades in water and soil.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	11 ppm
<b>Flash Point:</b>	45°F (7°C)
<b>LEL:</b>	1.5%
<b>UEL:</b>	8.2%
<b>Auto Ignition:</b>	846°F (452°C)
<b>Vapor Density:</b>	3 (air = 1)
<b>Vapor Pressure:</b>	27 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	0.8 (water = 1)
<b>Water Solubility:</b>	Slightly soluble
<b>Boiling Point:</b>	216°F (102°C)
<b>Ionization Potential:</b>	9.39 eV
<b>Molecular Weight:</b>	86.2

**EXPOSURE LIMITS**
**OSHA:** 200 ppm, 8-hr TWA

**NIOSH:** 150 ppm, 10-hr TWA

**ACGIH:** 150 ppm, STEL

**IDLH:** 1,500 ppm

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Butyl (<5-hr breakthrough) or Silver Shield®/4H® (>8-hr breakthrough)
<b>Coveralls:</b>	DuPont Tychem® CPF 4, BR, LV, Responder®, TK; Kappler® Zytron® 300; and Saint-Gobain ONESuit® TEC (>8-hr breakthrough for <i>Acetone</i> )
<b>Respirator:</b>	>150 ppm - Full facepiece APR with Organic vapor cartridge >1,000 ppm - Supplied air

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation, rash, dryness and redness
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, wheezing and shortness of breath Headache, dizziness, lightheadedness and passing out

**FIRST AID AND DECONTAMINATION**

<b>Remove</b> the person from exposure.
<b>Immediately</b> flush with large amounts of water for at least 15 minutes, lifting upper and lower lids. Remove contact lenses, if worn, while rinsing.
<b>Quickly</b> remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water.
<b>Begin</b> artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b> to a medical facility.

Common Name: **1-METHYL-2-PYRROLIDONE**

Synonyms: N-Methyl-2-Pyrrolidone

CAS No: 872-50-4

Molecular Formula: C<sub>5</sub>H<sub>9</sub>NO

RTK Substance No: 3716

Description: Colorless liquid with a mild, fishy odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>2 - Health</b></p> <p><b>2 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p><b>DOT#:</b> UN 1993</p> <p><b>ERG Guide #:</b> 128</p> <p><b>Hazard Class:</b> 3 (Flammable)</p>	<p><b>1-Methyl-2-Pyrrolidone</b> is a COMBUSTIBLE LIQUID.</p> <p>Use dry chemical, CO<sub>2</sub>, water spray or alcohol-resistant foam as extinguishing agents.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i>.</p> <p>Use water spray to keep fire-exposed containers cool.</p> <p>Vapors may travel to a source of ignition and flash back.</p> <p>Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.</p>	<p><b>1-Methyl-2-Pyrrolidone</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES); and STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE).</p>

### SPILL/LEAKS

**Isolation Distance:**

Small Spill: 60 meters (200 feet)

Large Spill: 300 meters (1,000 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.

DO NOT wash into sewer.

Potential for bioconcentration is low.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Mild fishy or amine odor
<b>Flash Point:</b>	204°F (96°C)
<b>LEL:</b>	1%
<b>UEL:</b>	9.5%
<b>Auto Ignition Temp:</b>	518°F (270°C)
<b>Vapor Density:</b>	3.4 (air = 1)
<b>Vapor Pressure:</b>	0.5 mm Hg at 77°F (25°C)
<b>Specific Gravity:</b>	1.03 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	396°F (202°C)
<b>Melting Point:</b>	-13°F (-25°C)
<b>Molecular Weight:</b>	99.1

### EXPOSURE LIMITS

AIHA WEEL: 10 ppm, 8-hr TWA  
(American Industrial Hygiene Association Workplace Environmental Exposure Level)

May be absorbed through the skin.

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl, Neoprene over Natural Rubber, and Silver Shield®/4H®
<b>Coveralls:</b>	DuPont Tychem® fabrics; Kappler Zytron® 400; Saint-Gobain ONESuit® TEC for <i>Amides</i> (>8-hr breakthrough)
<b>Respirator:</b>	>10 ppm - Full facepiece APR with Organic vapor filter >100 ppm - Supplied air

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation, rash, blisters, dryness and redness
<b>Inhalation:</b>	Nose and throat irritation with coughing and wheezing Headache, stomach pain, nausea and vomiting

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **2-METHYL VALERALDEHYDE**

Synonyms: 2-Formyl Pentane; 2-Methyl Pentaldehyde; 2-Methyl Pentanal

CAS No: 123-15-9

 Molecular Formula: C<sub>6</sub>H<sub>12</sub>O

RTK Substance No: 1299

Description: Colorless liquid with a strong odor

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>3 - Fire</b> <b>1W - Reactivity</b> <b>DOT#:</b> UN 2367 <b>ERG Guide #:</b> 130 <b>Hazard Class:</b> 3 (Flammable)	<b>FLAMMABLE AND WATER REACTIVE</b> Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. Solid streams of water may not be effective in fighting fires. <b>POISONOUS GASES ARE PRODUCED IN FIRE.</b> <b>CONTAINERS MAY EXPLODE IN FIRE.</b> Use water spray to keep fire-exposed containers cool. Vapor is heavier than air and may travel a distance to cause a fire or explosion and flashback far from the source. <b>2-Methyl Valeraldehyde</b> may form an ignitable vapor/air mixture in closed tanks or containers.	<b>2-Methyl Valeraldehyde</b> is not compatible with <b>OXIDIZING AGENTS</b> (such as <b>PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE</b> ); <b>STRONG BASES</b> (such as <b>SODIUM HYDROXIDE and POTASSIUM HYDROXIDE</b> ); <b>REDUCING AGENTS</b> (such as <b>LITHIUM, SODIUM, ALUMINUM and their HYDRIDES</b> ); <b>AMINES</b> ; and <b>WATER</b> .

**SPILL/LEAKS**
**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in dry sand, earth, or a similar material and place into sealed containers for disposal.

 Use only non-sparking tools and equipment, especially when opening and closing containers of **2-Methyl Valeraldehyde**.

 Metal containers involving the transfer of **2-Methyl Valeraldehyde** should be grounded and bonded.

 Keep **2-Methyl Valeraldehyde** out of confined spaces, such as sewers, because of the possibility of an explosion.

**PHYSICAL PROPERTIES**

<b>Flash Point:</b>	50° to 68°F (10° to 20°C)
<b>LEL:</b>	1.6%
<b>UEL:</b>	6.6%
<b>Auto Ignition Temp:</b>	347°F (175°C)
<b>Vapor Density:</b>	3.5 (air = 1)
<b>Vapor Pressure:</b>	9.75 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	0.8 (water = 1)
<b>Water Solubility:</b>	Very slightly soluble
<b>Boiling Point:</b>	243° to 248°F (117° to 120°C)
<b>Freezing Point:</b>	-148°F (-100°C)
<b>Molecular Weight:</b>	100.1

**EXPOSURE LIMITS**

 No occupational exposure limits have been established for **2-Methyl Valeraldehyde**.

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Butyl, Silver Shield®/4H® and Barrier® (>8-hr breakthrough)
<b>Coveralls:</b>	Tychem® F, BR, Responder®, and TK; Trelchem® HPS and VPS (>8-hr breakthrough)
<b>Respirator:</b>	SCBA

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns
<b>Inhalation:</b>	Nose, throat and lung irritation, with coughing, wheezing and shortness of breath Headache and dizziness

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.  
**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** promptly to a medical facility.

**Common Name: METOLACHLOR**

Synonyms: Codal; Dual; Milocep; Primextra

CAS No: 51218-45-2

Molecular Formula: C<sub>15</sub>H<sub>22</sub>ClNO<sub>2</sub>

RTK Substance No: 3374

Description: Odorless, off-white to colorless liquid when pure, and a white to tan or brown, oily liquid, with a sweet smell, in formulation

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<p><b>2 - Health</b></p> <p><b>1 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p><b>DOT#:</b> None</p> <p><b>ERG Guide #:</b> 171</p> <p><b>Hazard Class:</b> None</p>	<p>COMBUSTIBLE LIQUID</p> <p>Commercial formulations of <b>Metolachlor</b> may be dissolved in a liquid carrier that is flammable or combustible.</p> <p>Use dry chemical, CO<sub>2</sub> or foam as extinguishing agents.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> and <i>Hydrogen Chloride</i>.</p>	<p><b>Metolachlor</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE) and AZO COMPOUNDS (such as DINITROANILINE).</p>

**SPILL/LEAKS**

**Isolation Distance:**

**Spill:** 50 meters (150 feet)

**Fire:** 800 meters (1/2 mile)

Absorb liquids in dry sand, earth, or a similar material and place into sealed containers for disposal.

DO NOT wash into sewer.

**Metolachlor** is toxic to aquatic organisms.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	Odorless to sweet
<b>Flash Point:</b>	>230°F (>110°C)
<b>Auto Ignition Temp:</b>	510°F (266°C)
<b>Vapor Pressure:</b>	1.3 x 10 <sup>-5</sup> mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.12 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	212°F (100°C)
<b>Melting Point:</b>	-79.8°F (-62.1°C)
<b>Molecular Weight:</b>	283.81

**EXPOSURE LIMITS**

No occupational exposure limits have been established for **Metolachlor**.

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Butyl, Viton and Barrier®
<b>Coveralls:</b>	Tychem® F, CPF3, and TK; Trelchem® HPS and VPS (for <i>Halogen compounds, aromatic</i> )
<b>Respirator:</b>	Small Spill - full facepiece APR with <i>Organic vapor cartridge</i> Large Spill - SCBA

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose and throat irritation with coughing and shortness of breath Headache, sweating, nausea and vomiting, diarrhea, dizziness, tremors and convulsions

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.



**Common Name: METOLCARB**

Synonyms: 3-Tolyl-N-Methylcarbamate; Dicrosyl N-Methylcarbamate  
 CAS Number: 1129-41-5  
 Molecular Formula: C<sub>9</sub>H<sub>11</sub>NO<sub>2</sub>  
 RTK Number: 2563  
 Description: Colorless, sand-like powder, also comes in liquid form

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>Health:</b> 3 <b>Fire:</b> 1 <b>Reactivity:</b> 1 <b>DOT #:</b> UN 2757 UN 2992 <b>ERG #:</b> 151 <b>DOT Hazard:</b> 6.1 (poison)	Use dry chemical, CO <sub>2</sub> , water spray, or foam extinguishers. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> . CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool.	<b>Metolcarb</b> is not compatible with STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE).

### SPILLS/LEAKS

**Isolation Distances:**  
**Liquid Spill:** 50 meters (150 feet)  
**Solid Spill:** 25 meters (75 feet)  
**Fire:** 800 meters (1/2 mile)

Evacuate personnel.  
 Secure and control entrance to the area.  
 If it is safe to do so, remove potential ignition sources.  
 Absorb *liquids* in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.  
 Collect powdered material in the most convenient and safe manner and deposit in sealed containers.  
 DO NOT DRY SWEEP.  
 Do not allow this substance to enter waterways, including sewers, as it is very toxic to aquatic life with long-lasting effects.  
 Ventilate and wash area after clean-up is complete.

### PHYSICAL PROPERTIES

**Molecular Weight:** 165.21  
**Melting Point:** 76-77 °C (169-171 °F)  
**Water Solubility:** Slightly soluble  
**Vapor Pressure:** 1 x 10<sup>-5</sup> mm Hg at 25 °C (77 °F)

### EXPOSURE LIMITS

There are no occupational exposure limits for this substance.  
**PAC:** PAC-1 = 0.44 mg/m<sup>3</sup>  
 PAC-2 = 4.8 mg/m<sup>3</sup>  
 PAC-3 = 21 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

**Gloves:** Nitrile and Neoprene  
**Coverall:** Tychem® BR, CSM and TK, or the equivalent  
**Respirator:** High exposure – supplied-air, full facepiece, pressure-demand or another positive-pressure mode

### ACUTE HEALTH EFFECTS

**Eyes:** Blurred vision  
**Skin:** None reported  
**Inhalation:** Headache, dizziness, chest tightness, twitching, loss of coordination, convulsions, coma, death

### FIRST AID AND DECONTAMINATION

Immediately flush eyes with large amounts of water for at least 15 minutes, occasionally lifting upper and lower lids.  
 Remove contaminated clothing.  
 Wash contaminated skin with soap and water.  
 Shampoo hair immediately if contaminated.  
 Remove the person from exposure.  
 Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.  
 Transfer promptly to a medical facility.  
 Medical observation is required for several days as symptoms may be delayed.  
 In case of severe poisoning with **Metolcarb** consider administration of *Atropine* in a medical facility.



Common Name: **MIREX**

Synonyms: Dechlorane; Ferriamicide

CAS No: 2385-85-5

 Molecular Formula: C<sub>10</sub>Cl<sub>12</sub>

RTK Substance No: 1306

Description: Odorless, white, crystalline solid

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 2761 ERG Guide #: 151 Hazard Class: 6.1 (Poison)	Extinguish fire using an agent suitable for type of surrounding fire. <b>Mirex</b> itself does not burn. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Hydrogen Chloride</i> , <i>Chlorine</i> , <i>Phosgene</i> and <i>Carbon Tetrachloride</i> . Use water spray to keep fire-exposed containers cool.	<b>Mirex</b> reacts with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); LITHIUM; and TERTIARY BUTYL ALCOHOL.

## SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and deposit into sealed containers.

**Mirex** does not degrade and will bioaccumulate.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Noncombustible
<b>Vapor Pressure:</b>	8 x 10 <sup>-7</sup> mm Hg at 77°F (25°C)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	905°F (485°C) Decomposes
<b>Molecular Weight:</b>	546

## EXPOSURE LIMITS

 No occupational exposure limits have been established for **Mirex**.

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Silver Shield/4H® and Viton (>8-hr breakthrough for <i>Aromatic Halogen compounds</i> )
<b>Coveralls:</b>	DuPont Tychem® BR, LV, Responder® and TK; Kappler® Zytron® 500; and Saint-Gobain ONESuit®TEC (>8-hr breakthrough for <i>Aromatic Halogen compounds</i> )
<b>Respirator:</b>	Outside or Low Exposure - APR with Organic vapor/acid gas cartridges and High efficiency prefilters Inside or High Exposure - Supplied air

## HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation, burns with rash and redness
<b>Inhalation:</b>	Nose and throat irritation Nausea, vomiting, headache, dizziness, weakness, convulsions and passing out
<b>Chronic:</b>	Cancer (lung and thyroid) in animals

## FIRST AID AND DECONTAMINATION

<b>Remove</b>	the person from exposure.
<b>Flush</b>	eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
<b>Quickly</b>	remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water.
<b>Begin</b>	artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b>	promptly to a medical facility.

Common Name: **MOLYBDENUM**

Synonyms: None

CAS No: 7439-98-7

Molecular Formula: Mo

RTK Substance No: 1309

Description: Silver-white metal or a dark gray or black powder

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>1 - Health</b> <b>0 - Fire (Solid)</b> <b>3 - Fire (Powder or Dust)</b> <b>0 - Reactivity</b> DOT#: UN 3089 (Powder) ERG Guide #: 170 Hazard Class: 4.1 (Flammable solids)	<b>Molybdenum powder or dust</b> may be FLAMMABLE. <b>Molybdenum powder or dust</b> is an explosion hazard when mixed in air. For <i>solid Molybdenum</i> , extinguish fire using an agent suitable for type of surrounding fire as <b>Molybdenum</b> itself does not burn. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Molybdenum Oxides</i> . CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool.	<b>Molybdenum</b> reacts violently with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC).

## SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Collect powdered material in the most convenient and safe manner and place into sealed containers for disposal.

 For **Molybdenum powder** use only non-sparking tools and equipment,

 Keep **Molybdenum powder and dust** out of confined spaces, such as sewers, because of the possibility of an explosion.

 DO NOT wash into sewer as **Molybdenum** is toxic to aquatic organisms and may cause long-term adverse effects in the aquatic environment.

## PHYSICAL PROPERTIES

<b>Flash Point:</b>	Nonflammable solid, Flammable <i>powder or dust</i>
<b>Vapor Pressure:</b>	~0 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	10.28 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	8,717°F (4,825°C)
<b>Melting Point:</b>	4,752°F (2,622°C)
<b>Molecular Weight:</b>	95.9

## EXPOSURE LIMITS

**OSHA:** 15 mg/m<sup>3</sup>, 8-hr TWA (as *total dust*)

**ACGIH:** 3 mg/m<sup>3</sup>, 8-hr TWA (as the *respirable fraction*)

**IDLH:** 5,000 mg/m<sup>3</sup>

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Nitrile and Natural Rubber
<b>Coveralls:</b>	Tyvek®
<b>Respirator:</b>	>3 mg/m <sup>3</sup> - full facepiece APR with <i>High efficiency filters</i> >30 mg/m <sup>3</sup> - SCBA

## HEALTH EFFECTS

**Eyes:** Irritation

**Skin:** Irritation

**Inhalation:** Nose and throat irritation with coughing and wheezing

## FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Remove** contaminated clothing and wash contaminated skin with soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **MOLYBDENUM PENTACHLORIDE**

Synonyms: Molybdenum Chloride

CAS No: 10241-05-1

Molecular Formula: MoCl<sub>5</sub>

RTK Substance No: 1311

Description: Green, blue, gray or black, odorless solid

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>2 - Health</b></p> <p><b>0 - Fire</b></p> <p><b>1 - Reactivity</b></p> <p><b>DOT#:</b> UN 2508</p> <p><b>ERG Guide #:</b> 156</p> <p><b>Hazard Class:</b> 8 (Corrosive)</p>	<p>Extinguish fire using an agent suitable for type of surrounding fire. <b>Molybdenum Pentachloride</b> itself does not burn.</p> <p>DO NOT USE WATER DIRECTLY on <b>Molybdenum Pentachloride</b>.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Hydrogen Chloride</i> and <i>Chlorine gas</i>.</p> <p>Use water spray to keep fire-exposed containers cool.</p> <p><b>Molybdenum Pentachloride</b> may be an explosion hazard.</p>	<p><b>Molybdenum Pentachloride</b> reacts with WATER, STEAM, and MOISTURE to produce corrosive <i>Hydrogen Chloride gas</i>.</p> <p><b>Molybdenum Pentachloride</b> reacts violently with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and concentrated NITRIC ACID.</p>

### SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Keep dry and use a HEPA-filter vacuum or collect powdered material in the most convenient and safe manner and place into sealed containers for disposal.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Nonflammable
<b>Vapor Pressure:</b>	1.75 mm Hg at 77°F (25°C)
<b>Specific Gravity:</b>	2.9 (water =1)
<b>Water Solubility:</b>	Reacts
<b>Boiling Point:</b>	514°F (268°C)
<b>Melting Point:</b>	381°F (194°C)
<b>Molecular Weight:</b>	273.2

### EXPOSURE LIMITS

**OSHA:** 5 mg/m<sup>3</sup>, 8-hr TWA

**ACGIH:** 0.5 mg/m<sup>3</sup>, 8-hr TWA

**IDLH:** 1,000 mg/m<sup>3</sup> (as *Molybdenum*)

The Protective Action Criteria values are:

PAC-1 = 4.27 mg/m<sup>3</sup>    PAC-2 = 500 mg/m<sup>3</sup>

PAC-3 = 500 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Nitrile and Natural Rubber
<b>Coveralls:</b>	Tyvek®
<b>Respirator:</b>	>0.5 mg/m <sup>3</sup> - full facepiece APR with <i>P100 filter</i> >5 mg/m <sup>3</sup> - SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns
<b>Inhalation:</b>	Nose and throat irritation with coughing and wheezing. Headache, weakness, nausea and vomiting

### FIRST AID AND DECONTAMINATION

<b>Remove</b> the person from exposure.
<b>Flush</b> eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.
<b>Quickly</b> remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention.
<b>Begin</b> artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b> promptly to a medical facility.

Common Name: **MORPHOLINE**

Synonyms: Diethyleneimide Oxide; Tetrahydro-2H-1, 4-Oxazine

CAS No: 110-91-8

Molecular Formula: C<sub>4</sub>H<sub>9</sub>NO

RTK Substance No: 1315

Description: Colorless liquid with a weak *Ammonia* or fish-like odor

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<p><b>3 - Health</b></p> <p><b>3 - Fire</b></p> <p><b>1 - Reactivity</b></p> <p><b>DOT#:</b> UN 2054</p> <p><b>ERG Guide #:</b> 132</p> <p><b>Hazard Class:</b> 8 (Corrosive)</p>	<p><b>Morpholine</b> is a FLAMMABLE LIQUID. Use dry chemical, CO<sub>2</sub>, water spray or alcohol-resistant foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> and <i>Ammonia</i>. Vapors may travel to a source of ignition and flash back. Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.</p>	<p><b>Morpholine</b> reacts violently with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) to cause fires. <b>Morpholine</b> may react with REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES) to form flammable and explosive <i>Hydrogen gas</i>. <b>Morpholine</b> is not compatible with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); ISOCYANATES; EPOXIDES; PHENOLS; and NITRO COMPOUNDS.</p>

**SPILL/LEAKS**

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers for disposal.

Keep **Morpholine** out of confined spaces, such as sewers, because of the possibility of an explosion.

Use only non-sparking tools and equipment, especially when opening and closing containers of **Morpholine**.

DO NOT wash into sewer.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	0.01 to 0.07 ppm
<b>Flash Point:</b>	98°F (37°C)
<b>LEL:</b>	1.4%
<b>UEL:</b>	11.2%
<b>Auto Ignition Temp:</b>	555°F (291°C)
<b>Vapor Density:</b>	3 (air = 1)
<b>Vapor Pressure:</b>	6 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	262°F (128°C)
<b>Freezing Point:</b>	23.2°F (-4.9°C)
<b>Ionization Potential:</b>	8.88 eV
<b>Molecular Weight:</b>	87.12

**EXPOSURE LIMITS**

**OSHA:** 20 ppm, 8-hr TWA

**NIOSH:** 20 ppm, 10-hr TWA; 30 ppm, STEL

**ACGIH:** 20 ppm, 8-hr TWA

**IDLH:** 1,400 ppm

The Protective Action Criteria values are:

PAC-1 = 30 ppm PAC-2 = 30 ppm PAC-3 = 1,400 ppm

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Butyl, Silver Shield®/4H® and Barrier® (>8-hr breakthrough)
<b>Coveralls:</b>	Tychem® BR, Responder® and TK (>8-hr breakthrough)
<b>Respirator:</b>	>20 ppm - full facepiece APR with Organic vapor cartridge >200 - SCBA

**HEALTH EFFECTS**

**Eyes:** Severe irritation and burns with possible damage

**Skin:** Severe irritation and burns

**Inhalation:** Nose, throat and lung irritation, with coughing, wheezing and shortness of breath

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention immediately

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **NAPHTHALENE**

Synonyms: Moth Flakes; Naphthalin; Tar Camphor; White Tar

CAS No: 91-20-3

 Molecular Formula: C<sub>10</sub>H<sub>8</sub>

RTK Substance No: 1322

Description: Colorless, white or brown solid, in flake, cake or powder form, with a mothball odor

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>2 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 1334 UN 2304 (molten) ERG Guide #: 133 Hazard Class: 4.1 (Flammable solid)	<p><b>Naphthalene</b> is a COMBUSTIBLE SOLID. It may also be transported in a "molten" or heated form. The vapor given off when <b>Naphthalene</b> is heated is FLAMMABLE and a DANGEROUS FIRE HAZARD.</p> <p>Use dry chemical, CO<sub>2</sub>, water spray or alcohol-resistant foam as extinguishing agents.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE.</p> <p>Use water spray to keep fire-exposed containers cool and to reduce vapors.</p> <p><i>Molten Naphthalene</i> may form an ignitable vapor/air mixture. <i>Finely dispersed Naphthalene particles</i> may form explosive mixtures in air.</p>	<p><b>Naphthalene</b> may react violently with CHROMIC ANHYDRIDE and OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).</p> <p>Protect from DIRECT SUNLIGHT.</p>

## SPILL/LEAKS

**Isolation Distance:**
**Spill:** 25 meters (75 feet)

**Fire:** 800 meters (1/2 mile)

 Moisten **Naphthalene powder** or *flake* first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

 Shovel *molten Naphthalene* into a suitable, dry container.

 Keep *molten Naphthalene* out of confined spaces, such as sewers, because of the possibility of an explosion.

DO NOT wash into sewer.

 Ground and bond containers when transferring *molten Naphthalene*.

 Use only non-sparking tools and equipment, especially when opening and closing containers of *molten Naphthalene*.

**Naphthalene** is toxic to aquatic organisms and may cause long-term effects in the aquatic environment.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	0.038 ppm
<b>Flash Point:</b>	174°F (79°C)
<b>LEL:</b>	0.9%
<b>UEL:</b>	5.9%
<b>Auto Ignition Temp:</b>	979°F (526°C)
<b>Vapor Density:</b>	4.42 (air = 1)
<b>Vapor Pressure:</b>	0.05 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.2 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	424°F (218°C)
<b>Melting Point:</b>	176°F (80°C)
<b>Ionization Potential:</b>	8.1
<b>Molecular Weight:</b>	128.2

## EXPOSURE LIMITS

**OSHA:** 10 ppm, 8-hr TWA

**NIOSH:** 10 ppm, 10-hr TWA; 15 ppm STEL

**ACGIH:** 2 ppm, 8-hr TWA

**IDLH:** 250 ppm

The Protective Action Criteria values are:

PAC-1 = 15 ppm    PAC-2 = 15 ppm    PAC-3 = 250 ppm

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Barrier®
<b>Coveralls:</b>	Tychem® F and CPF 3 (>8-hr breakthrough)
<b>Respirator:</b>	Spill: Full facepiece APR with <i>Organic vapor/P100 cartridges</i>
	Fire or >250 ppm - SCBA

## HEALTH EFFECTS

**Eyes:** Irritation and burns

**Skin:** Irritation and burns

**Inhalation:** Nose and throat irritation with coughing and wheezing

Headache, fatigue, confusion, tremor, nausea and vomiting

**Chronic:** Cancer (nasal and lung) in animals

## FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses. Seek medical attention.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility

Common Name: **NEOHEXANE**

Synonyms: 2,2-Dimethyl Butane; Ethyl Trimethyl Methane

CAS No: 75-83-2

 Molecular Formula: C<sub>6</sub>H<sub>14</sub>

RTK Substance No: 1335

 Description: Colorless liquid with a *Gasoline*-like odor

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>3 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 1208 ERG Guide #: 128 Hazard Class: 3 (Flammable)	<b>Neohexane</b> is a FLAMMABLE LIQUID. Use dry chemical, CO <sub>2</sub> , alcohol-resistant foam or other foam extinguishing agents, as water may not be effective in fighting fires. POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool. Vapors may travel to a source of ignition and flash back. Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source. <b>Neohexane</b> is lighter than water and may float and travel to a source of ignition.	<b>Neohexane</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).

## SPILL/LEAKS

**Isolation Distance:**  
 Small Spills: 60 meters (200 feet)  
 Large Spills: 210 meters (900 feet)  
 Fire: 800 meters (1/2 mile in all directions)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.  
 Keep **Neohexane** out of confined spaces, such as sewers, because of the possibility of an explosion.  
 No information is available about effects on aquatic life.

## PHYSICAL PROPERTIES

**Odor Threshold:** *Gasoline*-like  
**Flash Point:** -54°F (-48°C)  
**LEL:** 1.2%  
**UEL:** 7%  
**Auto Ignition Temp:** 761°F (405°C)  
**Vapor Density:** 3 (air = 1)  
**Vapor Pressure:** 400 mm Hg at 86°F (30°C)  
**Specific Gravity:** 0.6 (water = 1)  
**Water Solubility:** Insoluble  
**Boiling Point:** 122° to 145°F (50° to 63°C)  
**Melting Point:** -148°F (-100°C)  
**Molecular Weight:** 86.2

## EXPOSURE LIMITS

**OSHA:** None  
**NIOSH:** 100 ppm, 10-hr TWA; 510 ppm, 15-min Ceiling  
**ACGIH:** 500 ppm, 8-hr TWA; 1,000 ppm STEL  
**IDLH:** 1,100 ppm (as *n-Hexane*)

## PROTECTIVE EQUIPMENT

**Gloves:** Nitrile and Viton (>8-hr breakthrough) for *Hexane*  
**Coveralls:** DuPont Tychem® CPF 3, CPF 4, BR and LV, Responder® and TK; Kappler® Zytron® 300; and Saint-Gobain ONESuit® TEC (>8-hr breakthrough) for *Hexane*  
**Respirator:** >100 ppm - Supplied air  
 >1,100 ppm - SCBA

## HEALTH EFFECTS

**Eyes:** Irritation  
**Skin:** Irritation, drying and cracking  
**Inhalation:** Nose and throat irritation with coughing and wheezing  
 Headache, nausea, vomiting, dizziness and passing out

## FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.  
**Quickly** remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** to a medical facility.



Common Name: **NICKEL**

Synonyms: Nickel Catalyst; Pulverized Nickel; Raney Alloy; Raney Nickel

CAS No: 7440-02-0

Molecular Formula: Ni

RTK Substance No: 1341

Descriptions: **Nickel** is an odorless, silvery, hard, metallic solid; *Raney Nickel* is a finely powdered, grayish metal

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<p><b>3 - Health</b></p> <p><b>4 - Fire</b></p> <p><b>1 - Reactivity</b></p> <p><b>DOT#:</b> UN 2881 (Nickel catalyst, dry)</p> <p><b>ERG Guide #:</b> 135</p> <p><b>Hazard Class:</b> 4.1 (Flammable Solid)</p>	<p><b>Nickel powder and Raney Nickel</b> are FLAMMABLE SOLIDS.</p> <p>Use dry sand, sodium chloride powder, graphite or an approved Class D extinguisher appropriate for extinguishing metal fires.</p> <p>DO NOT USE WATER directly on <b>Nickel powder</b> or <b>Raney Nickel</b> as flammable and explosive <i>Hydrogen gas</i> may be formed.</p> <p>DO NOT USE foam or CO<sub>2</sub> as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nickel Carbonyl</i> and <i>Nickel Oxide</i>. CONTAINERS MAY EXPLODE IN FIRE.</p> <p>Use water spray to keep fire-exposed containers cool. <b>Nickel powder and dust, and Raney Nickel</b>, may form ignitable dust/air mixtures in closed tanks or containers.</p>	<p><i>Very fine Nickel powder and dust, and Raney Nickel</i>, react with AIR and can spontaneously ignite or produce flammable and explosive <i>Hydrogen gas</i>.</p> <p><b>Nickel powder and Raney Nickel</b> react violently with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC).</p> <p><b>Nickel powder</b> reacts violently with TITANIUM POWDER; POTASSIUM PERCHLORATE; and AMMONIUM NITRATE to cause fire and explosions.</p> <p><b>Nickel</b> is not compatible with ALUMINUM; AMMONIA; AMMONIUM NITRATE; BROMINE PENTAFLUORIDE; DIOXANE; HYDRAZINE; METHANOL; NITRYL FLUORIDE; ORGANIC SOLVENTS; PHOSPORUS; POTASSIUM PERCHLORATE; SELENIUM; and SULFUR.</p>

**SPILL/LEAKS**

**Isolation Distance:**

**Spill:** 25 meters (75 feet)

**Fire:** 800 meters (1/2 mile)

Cover with dry earth or sand and place into sealed containers for disposal.

DO NOT wash into sewer.

Use only non-sparking tools and equipment.

Keep **Nickel powder and dust, and Raney Nickel**, out of confined spaces, such as sewers, because of the possibility of an explosion.

**PHYSICAL PROPERTIES**

**Odor Threshold:** Odorless

**Flash Point:** *Nickel powder and Raney Nickel* are Flammable

**Vapor Pressure:** 1 mm Hg at 3,290°F (1,810°C)

**Specific Gravity:** 8.9 (water = 1)

**Water Solubility:** Insoluble

**Boiling Point:** 4,946°F (2,730°C)

**Melting Point:** 2,651°F (1,455°C)

**Molecular Weight:** 58.7

**EXPOSURE LIMITS**

**OSHA:** 1 mg/m<sup>3</sup>, 8-hr TWA

**NIOSH:** 0.015 mg/m<sup>3</sup>, 10-hr TWA

**ACGIH:** 1.5 mg/m<sup>3</sup>, 8-hr TWA

**IDLH:** 10 mg/m<sup>3</sup>, 8-hr TWA

The Protective Action Criteria values are:  
 PAC-1 = 4.5 mg/m<sup>3</sup>    PAC-2 = 10 mg/m<sup>3</sup>  
 PAC-3 = 10 mg/m<sup>3</sup>

**PROTECTIVE EQUIPMENT**

**Gloves:** Nitrile and Neoprene

**Coveralls:** Tyvek®  
**Use turn out gear or flash protection if ignition/fire is the greatest hazard.**

**Respirator:** Spill - full facepiece APR with *P100* cartridges  
 Fire - SCBA

**HEALTH EFFECTS**

**Eyes:** Irritation and burns

**Skin:** Irritation and burns

**Inhalation:** Nose, throat and lung irritation with coughing, wheezing and shortness of breath  
 Headache, dizziness, nausea and vomiting

**Chronic:** Cancer (lung) in humans and animals

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Chemical Name: **NICKEL CARBONATE**

Synonyms: Nickelous Carbonate, Nickel II Carbonate

CAS No: 3333-67-3

 Molecular Formula: NiCO<sub>3</sub>

RTK Substance No: 3086

Description: Light green, odorless, solid or powder

**DOT/NFPA DATA**

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b>  DOT ID #: UN 3086 ERG Guide #: 171 Hazard Class: 9 (Environmentally Hazardous Substance)	- Extinguish fire using an agent suitable for type of surrounding fire. <b>Nickel Carbonate</b> itself does not burn. - POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nickel Oxides</i> and <i>Nickel Carbonyl</i> . - CONTAINERS MAY EXPLODE IN FIRE. - <b>Nickel Carbonate</b> may ignite combustibles (wood, paper and oil).	- <b>Nickel Carbonate</b> must be stored to avoid contact with ANILINE; HYDROGEN SULFIDE; FLAMMABLE SOLVENTS; HYDRAZINE; and METAL POWDERS (such as ZINC, ALUMINUM, and MAGNESIUM) since violent reactions occur. - <b>Nickel Carbonate</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE). - <b>Nickel Carbonate</b> decomposes on contact with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) or when HEATED to produce <i>Carbon Dioxide</i> .

**SPILL/LEAKS**
**Isolation Distance:** 50 meters (150 feet)

- Use a wet method or a vacuum with a HEPA filter for cleanup.
- DO NOT let this chemical enter the environment. It is toxic to aquatic organisms.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	No Odor
<b>Flash Point:</b>	Noncombustible
<b>Density:</b>	2.6 g/cm <sup>2</sup>
<b>Melting Point:</b>	Decomposes
<b>Solubility:</b>	Insoluble

**EXPOSURE LIMITS**

<b>OSHA:</b>	1.0 mg/m <sup>3</sup> 8-hr TWA (as <i>Nickel</i> )
<b>NIOSH:</b>	0.015 mg/m <sup>3</sup> 10-hr TWA (as <i>Nickel</i> )
<b>ACGIH:</b>	0.2 mg/m <sup>3</sup> 8-hr TWA (as <i>Nickel</i> )
<b>IDLH LEVEL:</b>	10 mg/m <sup>3</sup>

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	No Information
<b>Coverall:</b>	No Information
<b>Boot:</b>	No Information
<b>Respirator:</b>	>0.015 mg/m <sup>3</sup> N95 > 0.15 mg/m <sup>3</sup> SA

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Acute:</b>	Coughing and wheezing
<b>Chronic:</b>	Cancer. <i>Nickel compounds</i> may cause lung cancer in humans and animals. Skin allergy, asthma-like allergy, kidney damage

**FIRST AID AND DECONTAMINATION**

- Remove** the person from exposure.
- Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
- Remove** contaminated clothing and wash contaminated skin with soap and water.
- Begin** artificial respiration if breathing has stopped and CPR is necessary.
- Transfer** to a medical facility.

Common Name: **NICKEL NITRATE**

Synonyms: Nickel Dinitrate; Nickelous Nitrate

CAS No: 13138-45-9

Molecular Formula: Ni(NO<sub>3</sub>)<sub>2</sub>

RTK Substance No: 1347

Description: Odorless, yellow to green, crystalline solid

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 2725 ERG Guide #: 140 Hazard Class: 5.1 (Oxidizer)	<p><b>Nickel Nitrate</b> is not combustible, but it is a STRONG OXIDIZER that enhances the combustion of other substances.</p> <p>Use water only. DO NOT USE CHEMICAL or CO<sub>2</sub> as extinguishing agents.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> and <i>Nickel Oxides</i>.</p> <p>Use water spray to keep fire-exposed containers cool.</p> <p><b>Nickel Nitrate</b> may ignite combustibles (wood, paper and oil).</p>	<p><b>Nickel Nitrate</b> may react violently with REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES); MAGNESIUM; TIN II CHLORIDE; TETRAHYDRAZINE; and TETRAMINES.</p> <p><b>Nickel Nitrate</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); CYANIDES; STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); ESTERS; PHOSPHORUS; and BORON PHOSPHIDE.</p>

### SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

DO NOT wash into sewer.

**Nickel Nitrate** is very toxic to aquatic organisms.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Noncombustible
<b>Specific Gravity:</b>	2.05 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	278°F (136.7°C)
<b>Melting Point:</b>	134°F (56.7°C)
<b>Molecular Weight:</b>	182.7

### EXPOSURE LIMITS

**OSHA:** 1 mg/m<sup>3</sup>, 8-hr TWA

**NIOSH:** 0.015 mg/m<sup>3</sup>, 10-hr TWA

**ACGIH:** 0.1 mg/m<sup>3</sup>, 8-hr TWA (*inhalable fraction*)

**IDLH:** 10 mg/m<sup>3</sup>

(All of the above are for *Nickel*)

The Protective Action Criteria values are:

PAC-1 = 1.5 mg/m<sup>3</sup>    PAC-2 = 12.5 mg/m<sup>3</sup>

PAC-3 = 31.1 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Nitrile and Natural Rubber
<b>Coveralls:</b>	Tyvek®
<b>Respirator:</b>	<1 mg/m <sup>3</sup> - full facepiece APR with <i>High efficiency filter</i> >1 mg/m <sup>3</sup> - SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose and throat irritation with coughing and wheezing
<b>Chronic:</b>	<i>Nickel compounds</i> cause cancer (lung, nose) in humans

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing. Immediately wash contaminated skin with large amounts of water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** to a medical facility.

Common Name: **NICKEL OXIDE**

Synonyms: Nickel Monoxide; Nickelous Oxide

CAS No: 1313-99-1

Molecular Formula: NiO

RTK Substance No: 3082

Description: Green to black crystalline powder that turns yellow when heated

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>4 - Health</b> <b>0 - Fire</b> <b>1 - Reactivity</b> DOT#: UN 3077 ERG Guide #: 171 Hazard Class: 9 (Environmentally Hazardous Substance)	Extinguish fire using an agent suitable for type of surrounding fire. <b>Nickel Oxide</b> itself does not burn. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nickel Carbonyl</i> . Use water spray to keep fire-exposed containers cool.	<b>Nickel Oxide</b> reacts violently with IODINE; HYDROXGEN SULFIDE; mixtures of BARIUM OXIDE in AIR or CALCIUM OXIDE in AIR; FLUORINE GAS; and HYDROGEN PEROXIDE to cause a fire and explosion hazard. <b>Nickel Oxide</b> is not compatible with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); and ANILINIUM PERCHLORATE.

## SPILL/LEAKS

**Isolation Distance:**

Spills: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first, or use a HEPA-filter vacuum for clean-up, and deposit in sealed containers.

DO NOT wash into sewer.

**Nickel Oxide** is harmful to aquatic life.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Not combustible
<b>Vapor Pressure:</b>	0 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	6.67 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Melting Point:</b>	3,603°F (1,984°C)
<b>Ionization Potential:</b>	9.5 +/-4 eV
<b>Molecular Weight:</b>	74.7

## EXPOSURE LIMITS

<b>OSHA:</b>	1 mg/m <sup>3</sup> , 8-hr TWA
<b>NIOSH:</b>	0.015 mg/m <sup>3</sup> , 10-hr TWA
<b>ACGIH:</b>	0.2 mg/m <sup>3</sup> , 8-hr TWA
<b>IDLH:</b>	10 mg/m <sup>3</sup>
(All of the above are for <i>inorganic Nickel compounds</i> measured as <i>Nickel</i> )	

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Nitrile and Neoprene (>8-hr breakthrough)
<b>Coveralls:</b>	DuPont Tyvek®
<b>Respirator:</b>	<0.015 mg/m <sup>3</sup> - APR with High efficiency filter >0.015 mg/m <sup>3</sup> - Supplied air

## HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation, itching and skin rash
<b>Inhalation:</b>	Nose and throat irritation with coughing and wheezing
<b>Chronic:</b>	<i>Nickel compounds</i> cause lung cancer in humans

## FIRST AID AND DECONTAMINATION

<b>Remove</b>	the person from exposure.
<b>Flush</b>	eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
<b>Quickly</b>	remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water.
<b>Begin</b>	artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b>	to a medical facility.

Common Name: **NICOTINE**

Synonyms: 1-Methyl-2-(3-Pyridyl)Pyrrolidine

CAS No: 54-11-5

Molecular Formula: C<sub>10</sub>H<sub>14</sub>N<sub>2</sub>

RTK Substance No: 1349

Description: Oily, colorless to pale yellow liquid, with a fishy odor, that turns brown with exposure to air

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b> <b>DOT#:</b> UN 1654 <b>ERG Guide #:</b> 151 <b>Hazard Class:</b> 6 (Poison)	<b>COMBUSTIBLE LIQUID</b> Use dry chemical, CO <sub>2</sub> , water spray or alcohol-resistant foam as extinguishing agents. <b>POISONOUS GASES ARE PRODUCED IN FIRE,</b> including <i>Nitrogen Oxides</i> . Use water spray to keep fire-exposed containers cool. <b>Nicotine</b> , when heated above 203°F (95°C), may form an ignitable vapor/air mixture in closed tanks or containers. Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.	<b>Nicotine</b> is not compatible with <b>OXIDIZING AGENTS</b> (such as <b>PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE</b> ) and <b>STRONG ACIDS</b> (such as <b>HYDROCHLORIC, SULFURIC and NITRIC</b> ).

### SPILL/LEAKS

**Isolation Distance:**

Spill: 50 meter (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers for disposal.

DO NOT wash into sewer.

**Nicotine** is very toxic to aquatic organisms.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Fishy odor
<b>Flash Point:</b>	203°F (95°C)
<b>LEL:</b>	0.7%
<b>UEL:</b>	4%
<b>Auto Ignition Temp:</b>	471°F (244°C)
<b>Vapor Density:</b>	5.6 (air = 1)
<b>Vapor Pressure:</b>	0.08 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.01 ( water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	475°F (246°C) (Decomposes)
<b>Freezing Point:</b>	-110°F (-79°C)
<b>Ionization Potential:</b>	8.01 eV
<b>Molecular Weight:</b>	162.2

### EXPOSURE LIMITS

**OSHA:** 0.5 mg/m<sup>3</sup>, 8-hr TWA

**NIOSH:** 0.5 mg/m<sup>3</sup>, 10-hr TWA

**ACGIH:** 0.5 mg/m<sup>3</sup>, 8-hr TWA

**IDLH:** 5 mg/m<sup>3</sup>

The Protective Action Criteria values are:

PAC-1 = 1.5 mg/m<sup>3</sup> PAC-2 = 3.5 mg/m<sup>3</sup>

PAC-3 = 5 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl and SilverShield®/4H® (>4-hr breakthrough)
<b>Coveralls:</b>	Tychem® SL, CPF3, BR, Responder® and TK (>8-hr breakthrough)
<b>Respirator:</b>	>0.5 mg/m <sup>3</sup> - SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation, rash, and burning feeling
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, wheezing and shortness of breath  Headache, dizziness, convulsions, restlessness, confusion, and even death

### FIRST AID AND DECONTAMINATION

<b>Remove</b> the person from exposure.
<b>Flush</b> eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.
<b>Quickly</b> remove contaminated clothing and wash contaminated skin with large amounts of water. Seek medical attention.
<b>Begin</b> artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b> promptly to a medical facility.



Common Name: **NITRIC ACID**

Synonyms: Aqua Fortis; Hydrogen Nitrate

CAS No: 7697-37-2

 Molecular Formula: HNO<sub>3</sub>

RTK Substance No: 1356

 Description: Colorless to yellow liquid, or reddish if *fuming Nitric Acid*, with a characteristic, irritating odor

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>4 - Health</b> <b>0 - Fire</b> <b>2 - Reactivity</b> DOT#: UN 3031 UN 3032 ERG Guide #: 157 Hazard Class: 8 (Corrosive)	REACTIVE LIQUID <b>Nitric Acid</b> is not combustible, but it is a STRONG OXIDIZER that enhances the combustion of other substances. Use water only in flooding quantities. DO NOT USE CHEMICAL or FOAM as extinguishing agents. Use water spray to reduce vapors. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> . Use water spray to keep fire-exposed containers cool.	<b>Nitric Acid</b> reacts with WATER to release heat. <b>Nitric Acid</b> reacts violently or explosively with most METALS and POWDERED METALS (such as ANTIMONY, BISMUTH, MANGANESE and TITANIUM); ALKALI METALS (such as LITHIUM, SODIUM and POTASSIUM); ALKALINE EARTH METALS (such as BERYLLIUM, MAGNESIUM and CALCIUM); and METAL HYDRIDES to form flammable and explosive <i>Hydrogen gas</i> . <b>Nitric Acid</b> may react violently or cause fires with COMBUSTIBLES; ORGANICS (such as TURPENTINE, CHARCOAL and other CARBON CONTAINING COMPOUNDS); AMMONIA; CYANIDES; SULFIDES; CARBIDES; OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); and ALCOHOLS.

## SPILL/LEAKS

**Isolation Distance:**

Small Spill: 30 meters (100 feet)

Large Spill: 150 meters (500 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in dry sand, earth, or a similar noncombustible material and place into sealed containers for disposal.

 Neutralize remaining liquid with *Sodium Carbonate* or mild caustic.

*Nitrogen Oxides* are toxic to animal life.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	0.29 to 0.98 ppm
<b>Flash Point:</b>	Nonflammable
<b>Vapor Density:</b>	2.2 (air = 1)
<b>Vapor Pressure:</b>	48 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.5 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	181°F (83°C)
<b>Freezing Point:</b>	-44°F (-42°C)
<b>Ionization Potential:</b>	11.95 eV
<b>Molecular Weight:</b>	63.02
<b>pH:</b>	1

## EXPOSURE LIMITS

**OSHA:** 2 ppm, 8-hr TWA

**NIOSH:** 2 ppm, 10-hr TWA; 4 ppm STEL

**ACGIH:** 2 ppm, 8-hr TWA; 4 ppm STEL

**IDLH:** 25 ppm

The Protective Action Criteria values are:

PAC-1 = 0.16 ppm    PAC-2 = 24 ppm    PAC-3 = 92 ppm

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl, Neoprene, SilverShield®/4H®, Viton and Barrier® (>8-hr breakthrough) (only Barrier® for <i>fuming Nitric Acid</i> )
<b>Coveralls:</b>	Tychem® CPF3, F, BR, Responder® and TK; and Trelchem®, HPS and VPS (>8-hr breakthrough)
<b>Respirator:</b>	>2 ppm - full facepiece APR with <i>acid gas filters</i> specific for <b>Nitric Acid</b> >20 ppm - SCBA

## HEALTH EFFECTS

**Eyes:** Severe irritation, burns and possible eye damage

**Skin:** Irritation and burns

**Inhalation:** Nose, throat and lung irritation with coughing and severe shortness of breath (pulmonary edema)

## FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water. Seek medical attention.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

**Medical** observation is recommended as symptoms may be delayed.



Common Name: **NITRIC OXIDE**

Synonyms: Nitrogen Monoxide

CAS No: 10102-43-9

Molecular Formula: NO

RTK Substance No: 1357

Description: Colorless gas with a sharp odor that spontaneously converts to *Nitrogen Dioxide* in air

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>0 - Fire</b> <b>2 - Reactivity</b> DOT#: UN 1660 ERG Guide #: 124 Hazard Class: 2.3 (Toxic gas)	REACTIVE AND STRONG OXIDIZER that enhances the combustion of other substances. Extinguish fire using an agent suitable for type of surrounding fire. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> . CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool. <b>Nitric Oxide</b> may ignite combustibles (wood, paper and oil).	<b>Nitric Oxide</b> reacts with AIR, OXYGEN, WATER and MOISTURE to form toxic and corrosive <i>Nitric Acid</i> and <i>Nitrogen Dioxide</i> . <b>Nitric Oxide</b> may react violently or explosively with HALOGENS (such as FLUORINE and CHLORINE); NITROGEN TRICHLORIDE; OZONE; and CHLORINE MONOXIDE. <b>Nitric Oxide</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES and NITRATES); COMBUSTIBLES; REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES); POTASSIUM; BORON; CARBON DISULFIDE; FUELS; CHLORINATED HYDROCARBONS (such as TRICHLOROETHYLENE and METHYLENE CHLORIDE); OLEFINS; METALS (such as IRON, MANGANESE and MAGNESIUM); and METAL SALTS.

**SPILL/LEAKS**

**Isolation Distance:**

Small Spill: 30 meters (100 feet)

Large Spill: 100 meters (300 feet)

Fire: 800 meters (1/2 mile)

Stop flow of gas. If source of leak is a cylinder and the leak cannot be stopped in place, remove the leaking cylinder to a safe place in the open air, and repair leak or allow cylinder to empty.

Purge system with *inert gas* prior to repairs.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	0.3 to 1 ppm
<b>Flash Point:</b>	Nonflammable
<b>Vapor Density:</b>	1.04 (air = 1)
<b>Vapor Pressure:</b>	26,000 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.3 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	-177° to -241°F (-116° to -152°C)
<b>Freezing Point:</b>	-198° to -263°F (-128° to -164°C)
<b>Critical Temperature:</b>	-135°F (-93°C)
<b>Molecular Weight:</b>	30.01

**EXPOSURE LIMITS**

**OSHA:** 25 ppm, 8-hr TWA

**NIOSH:** 25 ppm, 8-hr TWA

**ACGIH:** 25 ppm, 8-hr TWA

**IDLH:** 100 ppm

The Protective Action Criteria values are:

PAC-1 = 0.61 ppm PAC-2 = 14.7 ppm PAC-3 = 24.5 ppm

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Teflon® (>4-hr breakthrough)
<b>Coveralls:</b>	Tychem® TK and Zytron® 500 (>8-hr breakthrough)
<b>Respirator:</b>	SCBA

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing and severe shortness of breath (pulmonary edema)  Headache, fatigue and blue color to the skin and lips (methemoglobinemia)

**FIRST AID AND DECONTAMINATION**

<b>Remove</b> the person from exposure.
<b>Flush</b> eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
<b>Remove</b> contaminated clothing and wash contaminated skin with soap and water.
<b>Begin</b> artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b> promptly to a medical facility.
<b>Medical</b> observation is recommended as symptoms may be delayed.

Common Name: **NITROCELLULOSE**

Synonyms: Collodion; Cellulose Nitrate Solution; Pyroxylin Solution

CAS No: 9004-70-0

Molecular Formula: Varies

RTK Substance No: 1366

Description: White, granular chip or fibrous material, which is usually in a water or alcohol solution

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>2 - Health</b>  <b>3 - Fire</b> (<i>Nitrocellulose</i>)  <b>4 - Fire</b> (<i>Collodion</i>)  <b>3 - Reactivity</b>                      (Nitrocellulose)  <b>0 - Reactivity</b>                      (<i>Collodion</i>)</p> <p><b>DOT#:</b>                      UN 2556 (<i>Solid</i>)                      UN 2059 (<i>Solution</i>)</p> <p><b>ERG Guide #:</b>                      113 (<i>Solid</i>)                      127 (<i>Solution</i>)</p> <p><b>Hazard Class:</b>                      4.1 (Flammable solid)                      3 (Flammable liquid)</p>	<p><b>Nitrocellulose</b> is a FLAMMABLE LIQUID, or an EXPLOSIVE when dry, and can be ignited or exploded with HEAT, SPARKS, or FRICTION. For <b>Nitrocellulose</b> in solution, use dry chemical or CO<sub>2</sub> as extinguishing agents.</p> <p>For dry <b>Nitrocellulose</b>, use water spray or fog. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> and <i>Hydrogen Cyanides</i>.</p> <p>CONTAINERS MAY EXPLODE IN FIRE.</p> <p>Use water spray to keep fire-exposed containers cool.</p>	<p><b>Nitrocellulose</b>, when dry, is shock sensitive and can ignite spontaneously and explode when exposed to HEAT; FLAMES; IGNITION SOURCES; AIR; SUNLIGHT or OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).</p> <p><b>Nitrocellulose</b> is not compatible with ACETYL PEROXIDE; BROMOAZIDE; STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); METALS; METAL SALTS; METAL OXIDES; and AMINES.</p> <p><b>Nitrocellulose</b> attacks some RUBBER, COATINGS and PLASTICS. <b>Nitrocellulose</b> may accumulate static electricity when being filled into properly grounded containers.</p>

### SPILL/LEAKS

**Isolation Distance:**

Small Spill: 100 meters (330 feet)

Large Spill: 500 meters (1/3 mile)

Fire: 800 meters (1/2 mile)

Absorb liquids in dry sand, earth, or a similar material and place into sealed containers for disposal.

For dry **Nitrocellulose**, thoroughly wet with water, sweep-up, and place into tightly closed, water tight containers.

Keep **Nitrocellulose** out of confined spaces, such as sewers, because of the possibility of an explosion.

Use only non-sparking tools and equipment, especially when opening and closing containers of **Nitrocellulose**.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless to <i>Ether</i> or <i>Alcohol</i> -like
<b>Flash Point:</b>	55°F (13°C) ( <i>Solid</i> ) <0°F (<-18°C) ( <i>Solution</i> )
<b>LEL:</b>	1.9% ( <i>Solution</i> )
<b>UEL:</b>	48% ( <i>Solution</i> )
<b>Auto Ignition Temp:</b>	338°F (170°C) ( <i>Solution</i> )
<b>Vapor Density:</b>	2.6 ( <i>Solution</i> ) air = 1
<b>Specific Gravity:</b>	1.66 ( <i>Solid</i> ) 0.8 ( <i>Solution</i> ) (water = 1)
<b>Boiling Point:</b>	95°F (35°C) ( <i>Solution</i> )
<b>Molecular Weight:</b>	459 to 594

### EXPOSURE LIMITS

The Protective Action Criteria values are:

PAC-1 = 60 mg/m<sup>3</sup>

PAC-2 = 400 mg/m<sup>3</sup>

PAC-3 = 500 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	SilverShield®/4H® and Barrier® (>8-hr breakthrough for <i>Nitro compounds</i> and <i>Ethyl Ether</i> )
<b>Coveralls:</b>	Tychem® Responder and Trelchem VPS (>8-hr breakthrough for <i>Nitro compounds</i> and <i>Ethyl Ether</i> ) (Use safety shoes with antistatic base and flash protection at >10% of the LEL)
<b>Respirator:</b>	SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose and throat irritation Headache, dizziness, difficulty breathing and loss of consciousness

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.  
**Remove** contaminated clothing and wash contaminated skin with soap and water.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** promptly to a medical facility.

Common Name: **NITROETHANE**

Synonyms: None

CAS No: 79-24-3

 Molecular Formula: C<sub>2</sub>H<sub>5</sub>NO<sub>2</sub>

RTK Substance No: 1373

Description: Colorless, oily liquid with a mild, fruity odor

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>3 - Fire</b> <b>3 - Reactivity</b>  DOT#: UN 2842 ERG Guide #: 129 Hazard Class: 3 (Flammable)	<b>FLAMMABLE AND REACTIVE</b> Use dry chemical, CO <sub>2</sub> , or alcohol-resistant foam extinguishing agents, as water may not be effective in fighting fires. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> . CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool. Vapors may travel to a source of ignition and flash back.	<b>Nitroethane</b> forms shock-sensitive compounds with STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); ALKALI METALS (such as LITHIUM, SODIUM and POTASSIUM); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); and a combination of AMINES and HEAVY METAL OXIDES.  <b>Nitroethane</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); HYDROCARBONS; and HYDROXIDES.  Explosive decomposition may occur with SHOCK and HIGH TEMPERATURES, especially in confined spaces.

**SPILL/LEAKS**
**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers for disposal.

 Use only non-sparking tools and equipment, especially when opening and closing containers of **Nitroethane**.

 Keep **Nitroethane** out of confined spaces, such as sewers, because of the possibility of an explosion.

DO NOT wash into sewer.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	2.1 ppm
<b>Flash Point:</b>	82°F (28°C)
<b>LEL:</b>	3.4%
<b>Auto Ignition Temp:</b>	778°F (414°C)
<b>Vapor Density:</b>	2.58 (air = 1)
<b>Vapor Pressure:</b>	15.6 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.05 (water = 1)
<b>Water Solubility:</b>	Slightly soluble
<b>Boiling Point:</b>	237°F (114°C)
<b>Freezing Point:</b>	-130°F (-90°C)
<b>Ionization Potential:</b>	10.88 eV
<b>Molecular Weight:</b>	75.1

**EXPOSURE LIMITS**

<b>OSHA:</b>	100 ppm, 8-hr TWA
<b>NIOSH:</b>	100 ppm, 10-hr TWA
<b>ACGIH:</b>	100 ppm, 8-hr TWA
<b>IDLH:</b>	1,000 ppm

The Protective Action Criteria values are:

PAC-1 = 100 ppm	PAC-3 = 1,000 ppm
PAC-2 = 200 ppm	

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Butyl and Silver Shield®/4H® (>8-hr breakthrough)
<b>Coveralls:</b>	Tychem® BR, LV, Responder® and TK (>8-hr breakthrough for <i>Nitromethane</i> )
<b>Respirator:</b>	>100 ppm - SCBA

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, wheezing and severe shortness of breath (pulmonary edema)  Methemoglobinemia with headache, fatigue and blue color to the skin and lips

**FIRST AID AND DECONTAMINATION**

<b>Remove</b> the person from exposure.
<b>Flush</b> eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
<b>Quickly</b> remove contaminated clothing and wash contaminated skin with large amounts of soap and water.
<b>Begin</b> artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b> promptly to a medical facility.
<b>Medical</b> observation is recommended as symptoms may be delayed.

Common Name: **NITROGEN MUSTARD**

Synonyms: Chloramine; HN-2; MBA; Mustine

CAS No: 51-75-2

Molecular Formula: C<sub>5</sub>H<sub>11</sub>Cl<sub>2</sub>N

RTK Substance No: 1377

Description: Colorless to yellow, oily liquid with a soapy or fruity odor

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>1 - Fire</b> <b>1 - Reactivity</b> DOT#: UN 2810 ERG Guide #: 153 Hazard Class: 6.1 (Poison)	<p><b>Nitrogen Mustard</b> may burn, but does not readily ignite.</p> <p>Use dry chemical, CO<sub>2</sub>, water spray or foam as extinguishing agents.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Chlorine, Nitrogen Oxides</i> and <i>Hydrogen Chloride</i>.</p> <p>Use water spray to keep fire-exposed containers cool.</p>	<p><b>Nitrogen Mustard</b> may react violently with REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES) to form flammable and explosive <i>Hydrogen gas</i>.</p> <p><b>Nitrogen Mustard</b> is not compatible with ISOCYANATES; HALOGENATED ORGANIC COMPOUNDS; PHENOLS; EPOXIDES; ANHYDRIDES; and ACID HALIDES.</p> <p><b>Nitrogen Mustard</b> in contact with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) may result in a fire.</p> <p><b>Nitrogen Mustard</b> is unstable in LIGHT and HEAT.</p>

**SPILL/LEAKS**

**Isolation Distance:**

Small Spill: 60 meters (200 feet)  
 Large Spill: 270 meters (900 feet)  
 Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit into sealed containers. Ventilate and wash area after clean-up is complete. DO NOT wash into sewer. Bioaccumulation is not expected.

**PHYSICAL PROPERTIES**

**Odor Threshold:** Soapy (low concentration)  
 Fruity (high concentration)

**Flash Point:** May burn

**Vapor Density:** 5.9 (air = 1)

**Vapor Pressure:** 0.43 mm Hg at 77°F (25°C)

**Specific Gravity:** 1.2 (water = 1)

**Water Solubility:** Very slightly soluble

**Boiling Point:** 167°F (75°C)

**Melting Point:** -76°F (-60°C)

**Freezing Point:** -76° to -85°F (-60° to -65°C)

**Molecular Weight:** 156.1

**EXPOSURE LIMITS**

U.S. Military: **0.003 mg/m<sup>3</sup>**

**PROTECTIVE EQUIPMENT**

**Gloves:** Silver Shield®/4H®

**Coveralls:** DuPont Tychem® BR, LV, CSM, Responder®, and TK; Kappler® Zytron® 300; and Saint-Gobain ONESuit® TEC (>8-hr breakthrough)

**Respirator:** <0.003 mg/m<sup>3</sup> - Full facepiece APR with CBRN cartridges  
 >0.003 mg/m<sup>3</sup> - Supplied air

**HEALTH EFFECTS**

**Eyes:** Irritation and burns

**Skin:** Irritation, severe burns with itching and blisters

**Inhalation:** Nose and throat irritation with coughing and wheezing  
 Headache, dizziness, nausea, vomiting and passing out

**Chronic:** Cancer (leukemia and skin) in humans

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention immediately.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention .

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **NITROMETHANE**

Synonyms: Nitrocarbol

CAS No: 75-52-5

Molecular Formula: CH<sub>3</sub>NO<sub>2</sub>

RTK Substance No: 1386

Description: Colorless, oily liquid with a mild disagreeable or fruity odor

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<p><b>2 - Health</b></p> <p><b>3 - Fire</b></p> <p><b>4 - Reactivity</b></p> <p><b>DOT#:</b> UN 1261</p> <p><b>ERG Guide #:</b> 129</p> <p><b>Hazard Class:</b> 3 (Flammable)</p>	<p><b>Nitromethane</b> is a FLAMMABLE LIQUID.</p> <p>Use CO<sub>2</sub>, water spray or alcohol-resistant foam as extinguishing agents.</p> <p>DO NOT use dry chemical extinguishers on a fire.</p> <p><b>Nitromethane</b> may explosively decompose from SHOCK, FRICTION or CONCUSSION.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i>.</p> <p>CONTAINERS MAY EXPLODE IN FIRE.</p> <p>Use water spray to keep fire-exposed containers cool.</p> <p>Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.</p> <p><b>Nitromethane</b> may ignite combustibles (wood, paper and oil).</p>	<p><b>Nitromethane</b> is unstable and SHOCK; FRICTION or ELEVATED TEMPERATURES can cause explosive decomposition, especially when confined.</p> <p><b>Nitromethane</b> reacts violently with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); ALKYL METAL HALIDES (such as SODIUM CHLORIDE and LITHIUM BROMIDE); DIETHYL ALUMINUM BROMIDE; METHYL ZINC IODIDE; AMMONIA HYDROXIDE; CALCIUM HYPOCHLORITE; FORMALDEHYDE, and many other substances.</p> <p><b>Nitromethane</b> forms shock-sensitive mixtures with AMINES; STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); ACETONE; ALUMINUM POWDER; COPPER; COPPER ALLOYS; and LEAD and LEAD ALLOYS.</p>

**SPILL/LEAKS**

**Isolation Distance:**

Small Spills: 60 meters (200 feet)

Large Spills: 300 meters (1,000 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.

Keep **Nitromethane** out of confined spaces, such as sewers, because of the possibility of an explosion.

Does not accumulate in aquatic life.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	3.5 ppm
<b>Flash Point:</b>	95°F (35°C)
<b>LEL:</b>	7.3%
<b>UEL:</b>	62%
<b>Auto Ignition Temp:</b>	785°F (418°C)
<b>Vapor Density:</b>	2.1 (air = 1)
<b>Vapor Pressure:</b>	27.8 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.14 (water = 1)
<b>Water Solubility:</b>	Slightly soluble
<b>Boiling Point:</b>	214°F (101°C)
<b>Ionization Potential:</b>	11.08 eV
<b>Molecular Weight:</b>	61

**EXPOSURE LIMITS**

**OSHA:** 100 ppm, 8-hr TWA

**ACGIH:** 20 ppm, 8-hr TWA

**IDLH:** 750 ppm

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Butyl and Silver Shield®/4H® (>8-hr breakthrough)
<b>Coveralls:</b>	DuPont Tychem® BR, LV, CSM, Responder®, and TK; Kappler Zytron® 300; and Saint-Gobain ONESuit®TEC (>8-hr breakthrough)
<b>Respirator:</b>	>20 ppm - Supplied air

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation with drying, cracking and redness
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, wheezing and shortness of breath  Headache, weakness, dizziness, nausea and vomiting
<b>Chronic:</b>	Cancer (liver, lung, glandular) in animals

**FIRST AID AND DECONTAMINATION**

<b>Remove</b> the person from exposure.
<b>Flush</b> eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
<b>Quickly</b> remove contaminated clothing and wash contaminated skin with large amounts of water.
<b>Begin</b> artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b> to a medical facility.



Common Name: **1-NITROPROPANE**

Synonym: 1-NP

CAS No: 108-03-2

Molecular Formula: C<sub>3</sub>H<sub>7</sub>NO<sub>2</sub>

RTK Substance No: 1394

Description: Colorless liquid with a mild, fruity odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>1 - Health</b> <b>3 - Fire</b> <b>2 - Reactivity</b> <b>DOT#:</b> UN 2608 <b>ERG Guide #:</b> 129 <b>Hazard Class:</b> 3 (Flammable)	<b>FLAMMABLE AND REACTIVE LIQUID</b> Use CO <sub>2</sub> , water spray or alcohol-resistant foam as extinguishing agents. <b>POISONOUS GASES ARE PRODUCED IN FIRE,</b> including <i>Nitrogen Oxides</i> . <b>CONTAINERS MAY EXPLODE IN FIRE.</b> Use water spray to keep fire-exposed containers cool. Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source. Flow or agitation may generate electrostatic charges. <b>1-Nitropropane</b> may form an ignitable vapor/air mixture in closed tanks or containers.	<b>1-Nitropropane</b> reacts violently with <b>OXIDIZING AGENTS</b> (such as <b>PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE</b> ) and <b>STRONG BASES</b> (such as <b>SODIUM HYDROXIDE, POTASSIUM HYDROXIDE and CALCIUM HYDROXIDE</b> ). <b>1-Nitropropane</b> is not compatible with <b>METAL OXIDES; AMINES; STRONG ACIDS</b> (such as <b>HYDROCHLORIC, SULFURIC and NITRIC</b> ); and <b>HYDROCARBONS</b> .

### SPILL/LEAKS

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers for disposal.

Keep **1-Nitropropane** out of confined spaces, such as sewers, because of the possibility of an explosion.

Use water spray to keep containers cool and to knock down vapors.

Use only non-sparking tools and equipment, especially when opening and closing containers of **1-Nitropropane**.

DO NOT wash into sewer.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	11 ppm
<b>Flash Point:</b>	75° to 97°F (24° to 36°C)
<b>LEL:</b>	2.2%
<b>Auto Ignition Temp:</b>	789° to 802°F (421° to 428°C)
<b>Vapor Density:</b>	3.1 (air = 1)
<b>Vapor Pressure:</b>	13 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.003 (water = 1)
<b>Water Solubility:</b>	Very slightly soluble
<b>Boiling Point:</b>	269°F (132°C)
<b>Freezing Point:</b>	-162°F (-108°C)
<b>Ionization Potential:</b>	10.81 eV
<b>Molecular Weight:</b>	89.09

### EXPOSURE LIMITS

**OSHA:** 25 ppm, 8-hr TWA

**NIOSH:** 25 ppm, 10-hr TWA

**ACGIH:** 25 ppm, 8-hr TWA

**IDLH:** 1,000 ppm

The Protective Action Criteria values are:

PAC-1 = 25 ppm PAC-2 = 25 ppm PAC-3 = 1,000 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl, Polyvinyl Alcohol, Silver Shield®/4H® and Barrier® (>8-hr breakthrough)
<b>Coveralls:</b>	Tychem® Responder® and TK (>8-hr breakthrough)
<b>Respirator:</b>	SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, wheezing and shortness of breath Headache, fatigue and blue color to the skin and lips (methemoglobinemia) Dizziness, weakness, loss of coordination and restlessness

### FIRST AID AND DECONTAMINATION

<b>Remove</b> the person from exposure.
<b>Flush</b> eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
<b>Remove</b> contaminated clothing and wash contaminated skin with soap and water.
<b>Begin</b> artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b> promptly to a medical facility.



Common Name: **N-NITROSODIETHYLAMINE**

Synonyms: NDEA; Diethylnitrosoamine

CAS No: 55-18-5

Molecular Formula: C<sub>4</sub>H<sub>10</sub>N<sub>2</sub>O

RTK Substance No: 1404

Description: Pale yellow liquid with an *Amine* or *Aromatic* odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>2 - Fire</b> <b>1 - Reactivity</b> <b>DOT#:</b> UN 3082 <b>ERG Guide #:</b> 171 <b>Hazard Class:</b> 9 (Environmentally hazardous)	COMBUSTIBLE LIQUID Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> . CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool.	<b>N-Nitrosodiethylamine</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES); ORGANIC ANHYDRIDES; ACRYLATES; ALCOHOLS; ALDEHYDES; CRESOLS; ISOCYANATES; KETONES; GLYCOLS; PHENOLS; and VINYL ACETATE.

### SPILL/LEAKS

**Isolation Distance:**

Small Spill: 60 meters (200 feet)

Large Spill: 270 meters (900 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.

DO NOT wash into sewer.

Bioaccumulation is low in aquatic organisms.

### PHYSICAL PROPERTIES

**Odor Threshold:** *Amine* or *Aromatic* odor

**Flash Point:** 145.4°F (63°C)

**Vapor Pressure:** 0.86 mm Hg at 68°F (20°C)

**Specific Gravity:** 0.94 (water = 1)

**Water Solubility:** Soluble

**Boiling Point:** 351°F (177°C)

**Molecular Weight:** 102.2

### EXPOSURE LIMITS

No occupational exposure limits have been established for **N-Nitrosodiethylamine**.

### PROTECTIVE EQUIPMENT

**Gloves:** Butyl and Silver Shield®/4H® (>8-hr breakthrough)

**Coveralls:** DuPont Tychem® Responder®, CPF 3, F, CPF 4, BR, LV and TK; Kappler® Zytron® 300; and Saint-Gobain ONESuit® TEC (>8-hr breakthrough for *Diethyl Amine*)

**Respirator:** Supplied air

### HEALTH EFFECTS

**Eyes:** Irritation

**Skin:** Irritation

**Inhalation:** Nose and throat irritation

**Chronic:** Cancer (liver, lung, gastrointestinal tract) in animals

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Remove** contaminated clothing and wash contaminated skin with soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **N-NITROSODIMETHYLAMINE**

Synonyms: Dimethylnitrosamine; Nitrosodimethylamine

CAS No: 62-75-9

Molecular Formula:  $(CH_3)_2N_2O$

RTK Substance No: 1405

Description: Yellow, oily liquid with a faint odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>2 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 2810 ERG Guide #: 153 Hazard Class: 6.1 (Toxic)	<b>N-Nitrosodimethylamine</b> is a COMBUSTIBLE LIQUID. Use dry chemical, CO <sub>2</sub> , water spray or alcohol-resistant foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> . Use water spray to keep fire-exposed containers cool.	<b>N-Nitrosodimethylamine</b> reacts with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE). <b>N-Nitrosodimethylamine</b> is not compatible with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) and STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE).

### SPILL/LEAKS

**Isolation Distance:**

**Spill (small):** 60 meters (200 feet)  
**(large):** 300 meters (1,000 feet)

**Fire:** 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers for disposal.

**N-Nitrosodimethylamine** is toxic to aquatic organisms and may cause long-term adverse effects to the aquatic environment.

### PHYSICAL PROPERTIES

<b>Flash Point:</b>	142°F (61°C)
<b>Vapor Density:</b>	2.56 (air = 1)
<b>Vapor Pressure:</b>	5 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.01 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	307°F (153°C)
<b>Ionization Potential:</b>	8.69 eV
<b>Molecular Weight:</b>	74.08

### EXPOSURE LIMITS

**NIOSH:** Lowest feasible concentration

The Protective Action Criteria values are:

- PAC-1 = 10 mg/m<sup>3</sup>
- PAC-2 = 19 mg/m<sup>3</sup>
- PAC-3 = 100 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl and Silver Shield®/4H® (>4-hr breakthrough)
<b>Coveralls:</b>	Tychem® F (>8-hr breakthrough)
<b>Respirator:</b>	SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation, and possible eye damage
<b>Skin:</b>	Irritation (skin absorbable)
<b>Inhalation:</b>	Nausea, vomiting, diarrhea and abdominal pain
<b>Chronic:</b>	Cancer (lung, liver, kidney, nasal cavity) in animals

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.  
**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** promptly to a medical facility.

Common Name: **N-NITROSODIPHENYLAMINE**

Synonyms: Benzenamine, N-Nitro-N-Phenyl-; Diphenylnitrosamine; Nitrous Diphenylamide

CAS No: 86-30-6

Molecular Formula: C<sub>12</sub>H<sub>10</sub>N<sub>2</sub>O

RTK Substance No: 1408

Description: Yellow to brown or orange powder or flake

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> DOT#: None ERG Guide #: 171 Hazard Class: None	Extinguish fire using an agent suitable for type of surrounding fire. <b>N-Nitrosodiphenylamine</b> itself does not burn. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> . Use water spray to keep fire-exposed containers cool.	<b>N-Nitrosodiphenylamine</b> reacts with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).

### SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

DO NOT wash into sewer.

### PHYSICAL PROPERTIES

**Flash Point:** 326°F (163.4°C)

**Specific Gravity:** 1.23 (water = 1)

**Water Solubility:** Insoluble

**Boiling Point:** 514°F (268°C)

**Melting Point:** 152°F (67°C)

**Molecular Weight:** 198.2

### EXPOSURE LIMITS

No occupational exposure limits have been established for **N-Nitrosodiphenylamine**.

### PROTECTIVE EQUIPMENT

**Gloves:** Nitrile, Neoprene and Natural Rubber

**Coveralls:** Tyvek®

**Respirator:** Spill: Full facepiece APR with *High efficiency filters*  
 Fire: SCBA

### HEALTH EFFECTS

**Eyes:** Irritation

**Skin:** No information

**Inhalation:** Nausea, vomiting and abdominal pain

**Chronic:** Cancer (bladder) in animals

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Remove** contaminated clothing and wash contaminated skin with soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **N-NITROSO-N-ETHYLUREA**

Synonyms: ENU; N-Ethyl-N-Nitrosourea

CAS No: 759-73-9

Molecular Formula: C<sub>3</sub>H<sub>7</sub>N<sub>3</sub>O<sub>2</sub>

RTK Substance No: 1410

Description: Light yellow powder or yellow-pink crystal

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>1 - Fire</b> <b>1 - Reactivity</b> <b>DOT#:</b> UN 3077 <b>ERG Guide #:</b> 171 <b>Hazard Class:</b> 9 (Miscellaneous Hazardous Material)	<b>N-Nitroso-N-Ethylurea</b> may burn, but does not readily ignite. Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. <b>POISONOUS GASES ARE PRODUCED IN FIRE,</b> including <i>Nitrogen Oxides</i> .	<b>N-Nitroso-N-Ethylurea</b> is highly sensitive to <b>MOISTURE</b> and <b>LIGHT</b> . <b>N-Nitroso-N-Ethylurea</b> may be decomposed by <b>STRONG BASES</b> (such as <b>SODIUM HYDROXIDE</b> and <b>POTASSIUM HYDROXIDE</b> ) to form flammable and reactive <i>Diazoethane</i> .

### SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

Wash contaminated surfaces with 5% *Acetic Acid* after clean-up is complete.

### PHYSICAL PROPERTIES

**Water Solubility:** Soluble

**Melting Point:** 217° to 219°F (103° to 104°C) (Decomposes)

**Molecular Weight:** 117.1

### EXPOSURE LIMITS

No occupational exposure limits have been established for **N-Nitroso-N-Ethylurea**.

### PROTECTIVE EQUIPMENT

**Gloves:** Nitrile and Natural Rubber

**Coveralls:** Tyvek®

**Respirator:** Full facepiece APR with *High efficiency filters* or SCBA

### HEALTH EFFECTS

**Eyes:** Irritation

**Skin:** Irritation

**Inhalation:** Nose and throat irritation  
Headache, dizziness, lightheadedness, and weakness

**Chronic:** Cancer (liver, brain, and intestines) in animals

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Remove** contaminated clothing and wash contaminated skin with water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **N-NITROSOPYRROLIDINE**

Synonyms: NPYR; NO-PYR

CAS No: 930-55-2

 Molecular Formula: C<sub>4</sub>H<sub>8</sub>N<sub>2</sub>O

RTK Substance No: 3000

Description: Yellow liquid

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>2 - Fire</b> <b>0 - Reactivity</b>  DOT#: UN 3082 ERG Guide #: 171 Hazard Class: 6.1 (Poison)	<b>N-Nitrosopyrrolidine</b> is a COMBUSTIBLE LIQUID. Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> . Use water spray to keep fire-exposed containers cool.	<b>N-Nitrosopyrrolidine</b> reacts vigorously with REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES) and OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).

## SPILL/LEAKS

**Isolation Distance:**

Small Spill: 60 meters (200 feet)

Large Spill: 270 meters (900 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.

DO NOT wash into sewer.

No environmental information is available.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Not available
<b>Flash Point:</b>	181°F (83°C)
<b>Vapor Density:</b>	1.2 (air = 1)
<b>Vapor Pressure:</b>	0.06 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.1 (water = 1)
<b>Water Solubility:</b>	Miscible
<b>Boiling Point:</b>	417°F (214°C)
<b>Molecular Weight:</b>	100.1

## EXPOSURE LIMITS

 No occupational exposure limits have been established for **N-Nitrosopyrrolidine**.

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Neoprene
<b>Coveralls:</b>	DuPont Tyvek®
<b>Respirator:</b>	Supplied air

## HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Chronic:</b>	Cancer (liver and lung) in animals

## FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Remove** contaminated clothing and wash contaminated skin with soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** to a medical facility.

Common Name: **OCTANE**

Synonyms: n-Octane; Normal Octane; Alkane C(8)

CAS No: 111-65-9

Molecular Formula: C<sub>8</sub>H<sub>18</sub>

RTK Substance No: 1434

Description: Clear, colorless liquid with a *gasoline*-like odor

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>1 - Health</b> <b>3 - Fire</b> <b>0 - Reactivity</b> <b>DOT#:</b> UN 1262 <b>ERG Guide #:</b> 128 <b>Hazard Class:</b> 3 (Flammable)	<b>FLAMMABLE LIQUID</b> Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. Water may not be effective in fighting fires. <b>POISONOUS GASES ARE PRODUCED IN FIRE.</b> <b>CONTAINERS MAY EXPLODE IN FIRE.</b> Use water spray to keep fire-exposed containers cool. Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source. Flow or agitation may generate electrostatic charges. <b>Octane</b> may form an ignitable vapor/air mixture in closed tanks or containers.	<b>Octane</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); NITRIC ACID; and COMBUSTIBLE MATERIALS.

**SPILL/LEAKS**

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers for disposal.

Use only non-sparking tools and equipment, especially when opening and closing containers of **Octane**.

DO NOT wash into sewer.

**Octane** may be hazardous to the environment, especially to aquatic organisms.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	48 to 150 ppm
<b>Flash Point:</b>	56°F (13°C)
<b>LEL:</b>	1%
<b>UEL:</b>	6.5%
<b>Auto Ignition Temp:</b>	403°F (206°C)
<b>Vapor Density:</b>	3.9 (air = 1)
<b>Vapor Pressure:</b>	10 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	0.7 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	258°F (126°C)
<b>Melting Point:</b>	-70°F (-57°C)
<b>Critical Temperature:</b>	563°F (295°C)
<b>Ionization Potential:</b>	9.82 eV
<b>Molecular Weight:</b>	114.2

**EXPOSURE LIMITS**

**OSHA:** 500 ppm, 8-hr TWA

**NIOSH:** 75 ppm, 10-hr TWA; 385 ppm, 15-min Ceiling

**ACGIH:** 300 ppm, 8-hr TWA

**IDLH:** 1,000 ppm

The Protective Action Criteria values are:

PAC-1 = 300 ppm PAC-2 = 385 ppm PAC-3 = 1,000 ppm

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Nitrile, Fluoroelastomer and Viton (4 to 8-hr breakthrough)
<b>Coveralls:</b>	Tychem® BR, Responder®, and TK (>8-hr breakthrough) >10% LEL - Use flash protection or turn-out gear
<b>Respirator:</b>	>75 ppm - Supplied Air >300 ppm SCBA

**HEALTH EFFECTS**

**Eyes:** Irritation

**Skin:** Irritation

**Inhalation:** Nose, throat and lung irritation with coughing, wheezing and shortness of breath  
Headache, dizziness, lightheadedness, confusion and passing out

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Remove** contaminated clothing and wash contaminated skin with soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.



Common Name: **ORYZALIN**

Synonyms: Dirimal; Surflan

CAS No: 19044-88-3

Molecular Formula: C<sub>12</sub>H<sub>18</sub>N<sub>4</sub>O<sub>6</sub>S

RTK Substance No: 3409

Description: Odorless, bright yellow-orange, crystalline powder

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b> <b>DOT#:</b> UN 2588 <b>ERG Guide #:</b> 151 <b>Hazard Class:</b> 6.1 (Poison)	<b>Oryzalin</b> may burn, but does not readily ignite, however, it is often dissolved in a liquid carrier which may be flammable or combustible. Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> and <i>Sulfur Oxides</i> .	<b>Oryzalin</b> is not compatible with STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE).

**SPILL/LEAKS**

**Isolation Distance:**

Spills (solid): 25 meters (75 feet)  
 (liquid): 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

DO NOT wash into sewer.

**Oryzalin** is toxic to aquatic organisms and can harm birds.

**PHYSICAL PROPERTIES**

**Odor Threshold:** Odorless  
**Flash Point:** 200°F (93°C)  
**Vapor Pressure:** 9.8 x 10<sup>-9</sup> mm Hg at 77°F (25°C)  
**Specific Gravity:** 1.1 to 1.2 (water = 1)  
**Water Solubility:** Slightly soluble  
**Boiling Point:** 212°F (100°C)  
**Melting Point:** 286° to 288°F (141° to 142°C)  
**Molecular Weight:** 346.4

**EXPOSURE LIMITS**

No occupational exposure limits have been established for **Oryzalin**.

**PROTECTIVE EQUIPMENT**

**Gloves:** Butyl and Silver Shield®/4H® (>4-hr breakthrough for *Amides*)  
**Coveralls:** Tyvek® (for *pesticides, hazardous dusts*)  
**Respirator:** Supplied air or SCBA

**HEALTH EFFECTS**

**Eyes:** Irritation  
**Skin:** Irritation  
**Inhalation:** Headache, dizziness, muscle weakness, nausea and vomiting  
**Chronic:** Cancer (thyroid) in animals

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.  
**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** promptly to a medical facility

Common Name: **OXALIC ACID**

Synonyms: Oxalic Acid Dihydrate; Ethanedionic Acid

CAS No: 144-62-7

 Molecular Formula: C<sub>2</sub>H<sub>2</sub>O<sub>4</sub>

RTK Substance No: 1445

Description: Colorless to white, odorless powder or crystalline solid

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 3261 ERG Guide #: 154 Hazard Class: 8 (Corrosive)	<b>Oxalic Acid</b> is a COMBUSTIBLE SOLID. Use dry chemical, CO <sub>2</sub> , water spray or alcohol-resistant foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Formic Acid</i> . Use water spray to keep fire-exposed containers cool. Use water spray to prevent dust/air mixtures from igniting or exploding.	<b>Oxalic Acid</b> reacts violently with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); FURFURYL ALCOHOL; and CHLORITES to cause fires and explosions. <b>Oxalic Acid</b> will react with SILVER and SILVER COMPOUNDS to form explosive <i>Silver Oxalate</i> . <b>Oxalic Acid</b> is not compatible with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); ALKALI METALS (such as LITHIUM, SODIUM and POTASSIUM); and ACID CHLORIDES.

## SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

Neutralize liquid spills with lime or soda ash.

**Oxalic Acid** may be dangerous to aquatic life at high concentrations.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Combustible
<b>Vapor Density:</b>	4.3 (air = 1)
<b>Vapor Pressure:</b>	<0.001 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.9 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	Sublimes (goes from a solid directly to a gas)
<b>Melting Point:</b>	215°F (101.5°C) (Decomposes)
<b>Molecular Weight:</b>	90.04
<b>pH:</b>	1.3 (in solution)

## EXPOSURE LIMITS

**OSHA:** 1 mg/m<sup>3</sup>, 8-hr TWA

**NIOSH:** 1 mg/m<sup>3</sup>, 10-hr TWA; 2 mg/m<sup>3</sup>, STEL

**ACGIH:** 1 mg/m<sup>3</sup>, 8-hr TWA; 2 mg/m<sup>3</sup>, STEL

**IDLH:** 500 mg/m<sup>3</sup>

The Protective Action Criteria values are:

 PAC-1 = 2 mg/m<sup>3</sup> PAC-2 = 40 mg/m<sup>3</sup> PAC-3 = 500 mg/m<sup>3</sup>

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl, Neoprene, Silver Shield®/4H® and Viton (>8-hr breakthrough for <b>Oxalic Acid</b> in solution)
<b>Coveralls:</b>	Tychem® BR, Responder® and TK (>8-hr breakthrough for <b>Oxalic Acid</b> in solution)
<b>Respirator:</b>	>1 mg/m <sup>3</sup> - full facepiece APR with <i>High efficiency filters</i> >50 mg/m <sup>3</sup> - Supplied air or SCBA

## HEALTH EFFECTS

**Eyes:** Severe irritation and burns and possible eye damage

**Skin:** Severe irritation and burns

**Inhalation:** Nose, throat and lung irritation with coughing, wheezing and shortness of breath  
 Headache, dizziness, convulsions, coma and even death

## FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention immediately.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **1,2-OXATHIOLANE, 2,2-DIOXIDE**

Synonyms: Propane Sultone; 1,3-Propane Sultone

CAS No: 1120-71-4

Molecular Formula: C<sub>3</sub>H<sub>6</sub>O<sub>3</sub>S

RTK Substance No: 1446

Description: White, crystalline solid or colorless liquid

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 2811 ERG Guide #: 154 Hazard Class: 6.1 (Poison)	<b>1,2-Oxathiolane, 2,2-Dioxide</b> may burn, but does not readily ignite. Extinguish fire using an agent suitable for type of surrounding fire. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Sulfur Dioxide</i> . Use water spray to keep fire-exposed containers cool.	<b>1,2-Oxathiolane, 2,2-Dioxide</b> reacts with REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES) to produce toxic and flammable <i>Hydrogen Sulfide</i> gas. <b>1,2-Oxathiolane, 2,2-Dioxide</b> reacts with MOIST AIR to form toxic <i>3-Propane Sulfonic Acid</i> .

### SPILL/LEAKS

**Isolation Distance:**

Spills (solid): 25 meters (75 feet)  
(liquid): 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in dry sand, earth, or a noncombustible material and place into sealed containers for disposal.

Moisten spilled *solid* material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

DO NOT wash into sewer.

### PHYSICAL PROPERTIES

**Flash Point:** >235° F (>113° C)

**Specific Gravity:** 1.39 (water = 1)

**Water Solubility:** Slightly soluble

**Boiling Point:** 311° to 315° F (155° to 157° C)

**Melting Point:** 87° F (31° C)

**Molecular Weight:** 122.1

### EXPOSURE LIMITS

**NIOSH:** Lowest feasible

**ACGIH:** Low as possible

The Protective Action Criteria values are:

PAC-1 = 0.5 mg/m<sup>3</sup>

PAC-2 = 3.5 mg/m<sup>3</sup>

PAC-3 = 250 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

**Gloves:** Nitrile and Neoprene (for *solid 1,2-Oxathiolane, 2,2-Dioxide*)

**Coveralls:** Tyvek® (for *solid 1,2-Oxathiolane, 2,2-Dioxide*)

**Respirator:** >0.5 mg/m<sup>3</sup> - SA or SCBA

### HEALTH EFFECTS

**Eyes:** Irritation

**Skin:** Irritation

**Inhalation:** Nose and throat irritation

**Chronic:** Cancer (Leukemia and brain, skin and mammary gland)

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **PARAFORMALDEHYDE**

Synonyms: Metaformaldehyde; Paraform; Polyoxymethylene

CAS No: 30525-89-4

Molecular Formula: (CH<sub>2</sub>O)<sub>n</sub> (Polymer)

RTK Substance No: 1454

Description: White, crystalline solid with an odor of *Formaldehyde*

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>2 - Fire</b> <b>1 - Reactivity</b> <b>DOT#:</b> UN 2213 <b>ERG Guide #:</b> 133 <b>Hazard Class:</b> 4.1 (Flammable Solid)	<b>COMBUSTIBLE SOLID</b> Use dry chemical, CO <sub>2</sub> , water spray or alcohol-resistant foam as extinguishing agents. <b>POISONOUS GASES ARE PRODUCED IN FIRE,</b> including <i>Formaldehyde</i> , which is <b>HIGHLY FLAMMABLE.</b> Use water spray to keep fire-exposed containers cool. <b>Paraformaldehyde</b> may form an ignitable vapor/air mixture in closed tanks or containers at temperatures above 160°F (71°C).	<b>Paraformaldehyde</b> decomposes slowly in WATER to form toxic and flammable <i>Formaldehyde gas</i> . <b>Paraformaldehyde</b> is not compatible with <b>OXIDIZING AGENTS</b> (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); <b>STRONG ACIDS</b> (such as HYDROCHLORIC, SULFURIC and NITRIC); <b>STRONG BASES</b> (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); <b>ISOCYANATES</b> ; <b>ACID ANHYDRIDES</b> ; <b>REDUCING AGENTS</b> (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES) and <b>METALS</b> (such as BRASS, COPPER, STEEL AND BRONZE).

### SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

DO NOT wash into sewer.

**Paraformaldehyde** is harmful to aquatic organisms.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	<i>Formaldehyde</i> -like
<b>Flash Point:</b>	160°F (71°C)
<b>LEL:</b>	7%
<b>UEL:</b>	73%
<b>Auto Ignition Temp:</b>	572°F (300°C)
<b>Vapor Density:</b>	1.03 (air = 1)
<b>Vapor Pressure:</b>	1.2 mm Hg at 75°F (25°C)
<b>Specific Gravity:</b>	1.46 (water = 1)
<b>Water Solubility:</b>	Slowly dissolves
<b>Boiling Point:</b>	Decomposes
<b>Melting Point:</b>	313°F (156°C)
<b>Molecular Weight:</b>	600 (approx.)

### EXPOSURE LIMITS

**OSHA:** 0.75 ppm, 8-hr TWA; 2 ppm, STEL (as *Formaldehyde*)

**ACGIH:** 0.3 ppm, Ceiling

**IDLH:** 20 ppm (as *Formaldehyde*)

The Protective Action Criteria values are:

PAC-1 = 12.5 mg/m<sup>3</sup>    PAC-2 = 75 mg/m<sup>3</sup>

PAC-3 = 100 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl, Nitrile, Silver Shield®/4H®, Viton and Barrier® (>8-hr breakthrough for <i>Formaldehyde</i> )
<b>Coveralls:</b>	Tychem® SL, CPF 3, F, BR, Responder®, and TK; and Trelchem® HPS and VPS (>8-hr breakthrough for <i>Formaldehyde</i> )
<b>Respirator:</b>	SCBA

### HEALTH EFFECTS

**Eyes:** Severe irritation, burns and possible damage

**Skin:** Severe irritation and burns

**Inhalation:** Nose, mouth, throat and lung irritation with coughing and severe shortness of breath (pulmonary edema)

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

**Medical** observation is recommended as symptoms may be delayed.

**Common Name: PARAOXON**

Synonyms: Phosphacol; Ester 25; Eticol; Fosfakol; Mintacol; Miotisal A; Soluglaucit  
 CAS Number: 311-45-5  
 Molecular Formula: C<sub>10</sub>H<sub>14</sub>NO<sub>6</sub>P  
 RTK Number: 1457  
 Description: Odorless, reddish-yellow oil

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>Health:</b> 4 <b>Fire:</b> 1 <b>Reactivity:</b> 1 <b>DOT #:</b> UN 3018 <b>ERG #:</b> 152 <b>DOT Hazard:</b> 6.1 (poison)	Use dry chemical, CO <sub>2</sub> , alcohol or polymer foam extinguishers, as water may not be effective in fighting fires. <b>POISONOUS GASES ARE PRODUCED IN FIRE,</b> including Oxides of <i>Nitrogen</i> and <i>Phosphorus</i> . <b>CONTAINERS MAY EXPLODE IN FIRE.</b> Use water spray to keep fire-exposed containers cool.	<b>Paraoxon</b> is not compatible with <b>STRONG BASES</b> (such as <b>SODIUM HYDROXIDE</b> and <b>POTASSIUM HYDROXIDE</b> ); and <b>OXIDIZING AGENTS</b> (such as <b>PERCHLORATES</b> , <b>PEROXIDES</b> , <b>PERMANGANATES</b> , <b>CHLORATES</b> , <b>NITRATES</b> , <b>CHLORINE</b> , <b>BROMINE</b> and <b>FLUORINE</b> ).

### SPILLS/LEAKS

**Isolation Distances:**  
**Liquid Spill:** 50 meters (150 feet)  
**Solid Spill:** 25 meters (75 feet)  
**Fire:** 800 meters (1/2 mile)

Evacuate personnel.  
 Secure and control entrance to the area.  
 If it is safe to do so, remove potential ignition sources.  
 Absorb liquids in vermiculite, dry sand, earth or similar material and deposit in sealed containers.  
 Do NOT allow this substance to enter waterways, including sewers, as it is very toxic to aquatic life with long-lasting effects.  
 Ventilate and wash area after clean-up is complete.

### PHYSICAL PROPERTIES

**Molecular Weight:** 275.22  
**Specific Gravity:** 1.274 at 20° C (68° F) at 760 mm Hg  
**Boiling Point:** 170° C (338° F) at 1mmHg  
**Water Solubility:** Slightly soluble

### EXPOSURE LIMITS

There are no occupational exposure limits to this substance.

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Nitrile and Neoprene
<b>Coverall:</b>	Tychem® BR, CSM, and TK
<b>Respirator:</b>	Supplied-air, full facepiece, pressure-demand or another positive-pressure mode

### ACUTE HEALTH EFFECTS

**Eyes:** Blurred vision  
**Skin:** No known effects  
**Inhalation:** Headache, dizziness, blurred vision, chest tightness, twitching, loss of coordination, convulsions, coma, death

### FIRST AID AND DECONTAMINATION

Immediately flush eyes with large amounts of water for at least 15 minutes.  
 Quickly remove contaminated clothing. Immediately wash area with large amounts of soap and water.  
 Shampoo hair promptly if contaminated.  
 Remove the person from exposure.  
 Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.  
 Transfer promptly to a medical facility.  
 Medical observation is required for several days as symptoms may be delayed.

Common Name: **PARAQUAT**

Synonyms: Dimethyl Viologen; Pathclear; Sweep

CAS No: 4685-14-7

Molecular Formula: C<sub>12</sub>H<sub>14</sub>N<sub>2</sub>

RTK Substance No: 1458

Description: Colorless to yellow, odorless solid

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<p><b>3 - Health</b></p> <p><b>0 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p><b>DOT#:</b> UN 2781</p> <p><b>ERG Guide #:</b> 151</p> <p><b>Hazard Class:</b> 6.1 (Poison)</p>	<p>Extinguish fire using an agent suitable for type of surrounding fire. <b>Paraquat</b> itself does not burn. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i>. CONTAINERS MAY EXPLODE IN FIRE.</p> <p>Use water spray to keep fire-exposed containers cool.</p>	<p><b>Paraquat</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE).</p>

**SPILL/LEAKS**

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and deposit into sealed containers.

Ventilate and wash area after clean-up is complete.

DO NOT wash into sewer.

Toxic to animals, birds and aquatic life.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Nonflammable
<b>Vapor Pressure:</b>	0 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.2 (water = 1)
<b>Water Solubility:</b>	Very soluble
<b>Boiling Point:</b>	347° to 356°F (175° to 180°C)
<b>Molecular Weight:</b>	186

**EXPOSURE LIMITS**

**OSHA:** 0.5 mg/m<sup>3</sup>, 8-hr TWA (as *respirable dust*)

**NIOSH:** 0.1 mg/m<sup>3</sup>, 10-hr TWA (as *Paraquat Dichloride*)

**ACGIH:** 0.5 mg/m<sup>3</sup>, 8-hr TWA (as *total particulate*)  
0.1 mg/m<sup>3</sup>, 8-hr TWA (as the *respirable fraction*)

**IDLH:** 1 mg/m<sup>3</sup>

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Silver Shield®/4H/®
<b>Coveralls:</b>	DuPont® Tyvek®
<b>Respirator:</b>	>0.1 mg/m <sup>3</sup> - full facepiece APR with Organic vapor cartridges and High efficiency pre-filters <1 mg/m <sup>3</sup> - Supplied air >1 mg/m <sup>3</sup> - SCBA

**HEALTH EFFECTS**

**Eyes:** Irritation and burns

**Skin:** Irritation and burns

**Inhalation:** Nose, throat and lung irritation with coughing, wheezing, nose bleeds and severe shortness of breath (pulmonary edema)

Nausea and vomiting

**Chronic:** Cancer (skin) in animals

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention immediately.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

**Medical** observation is recommended as symptoms may be delayed.



Common Name: **PARATHION**

Synonyms: Ethyl Parathion; Methyl Parathion

CAS No: 56-38-2

 Molecular Formula: C<sub>10</sub>H<sub>14</sub>NO<sub>5</sub>PS

RTK Substance No: 1459

 Description: Yellowish liquid with a garlic-like odor when pure, commercial product is usually dissolved in a hydrocarbon solvent (such as *Toluene* or *Xylene*)

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>4 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b> <b>DOT#:</b> UN 2783 <b>ERG Guide #:</b> 152 <b>Hazard Class:</b> 6.1 (Poison)	<b>Parathion</b> is often dissolved in a liquid carrier which may be flammable or combustible. Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> , <i>Sulfur Oxides</i> , <i>Phosphorus Oxides</i> and <i>Diethyl Sulfide</i> . CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool and to disperse vapors.	<b>Parathion</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and ALKALINE MATERIALS (such as LIME, SODA ASH, and BAKING SODA). <b>Parathion</b> attacks some forms of PLASTICS, RUBBER or COATINGS.

## SPILL/LEAKS

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Treat liquid spills with an alkaline material (such as Calcium Carbonate or Soda Ash).

Absorb liquids in dry sand, earth, or a similar material and place into sealed containers for disposal.

 For **Parathion** (in a *flammable solvent*), use only non-sparking tools and equipment, especially when opening and closing containers of **Parathion**.

 Keep **Parathion** (in a *flammable solvent*) out of confined spaces, such as sewers, because of the possibility of an explosion.

DO NOT wash into sewer.

**Parathion** is a severe marine pollutant.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	0.04 ppm
<b>Flash Point:</b>	248° to 320°F (120° to 160°C)
<b>Vapor Pressure:</b>	0.00004 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.26 (water = 1)
<b>Water Solubility:</b>	Slightly soluble
<b>Boiling Point:</b>	707°F (375°C)
<b>Freezing Point:</b>	43°F (6°C)
<b>Molecular Weight:</b>	291.2

## EXPOSURE LIMITS

**OSHA:** 0.1 mg/m<sup>3</sup>, 8-hr TWA

**NIOSH:** 0.05 mg/m<sup>3</sup>, 10-hr TWA

**ACGIH:** 0.05 mg/m<sup>3</sup>, 8-hr TWA

**IDLH:** 10 mg/m<sup>3</sup>

The Protective Action Criteria values are:

 PAC-1 = 0.15 mg/m<sup>3</sup>    PAC-2 = 2 mg/m<sup>3</sup>

 PAC-3 = 10 mg/m<sup>3</sup>

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl and SilverShield®/4H® (>8-hr breakthrough for <i>Organophosphorus compounds</i> )
<b>Coveralls:</b>	Tychem® BR, Responder® and TK (>8-hr breakthrough for <i>Organophosphorus compounds</i> )
<b>Respirator:</b>	Full facepiece APR with <i>Organic vapor cartridges</i> and P100 filters >2.5 mg/m <sup>3</sup> - SCBA

## HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose, throat and lung irritation, with coughing, and severe shortness of breath (pulmonary edema)  Headache, sweating, nausea and vomiting, loss of coordination, and death ( <i>Organophosphate poisoning</i> )
<b>Chronic:</b>	Cancer (adrenal gland) in animals

## FIRST AID AND DECONTAMINATION

<b>Remove</b> the person from exposure.
<b>Flush</b> eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention immediately.
<b>Quickly</b> remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention.
<b>Shampoo</b> hair immediately if contaminated.
<b>Begin</b> artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b> promptly to a medical facility.
<b>Medical</b> observation is recommended as symptoms may be delayed.

Common Name: **PENDIMETHALIN**

Synonyms: Phenoxalin; Prowl®; Stomp®

CAS No: 40487-42-1

Molecular Formula: C<sub>13</sub>H<sub>19</sub>N<sub>3</sub>O<sub>4</sub>

RTK Substance No: 3415

Description: Orange-yellow, crystalline solid with a fruit-like odor; the commercial products may be dark orange liquids

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b> DOT#: None ERG Guide #: None Hazard Class: None	Although <b>Pendimethalin</b> does not burn or burns with difficulty, it may be dissolved in a liquid carrier that is flammable or combustible. Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> . Use water spray to keep fire-exposed containers cool. Flow or agitation may generate electrostatic charges.	<b>Pendimethalin</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE). <b>Pendimethalin</b> is slowly decomposed by light.

### SPILL/LEAKS

**Isolation Distance:**

**Spill (solid):** 25 meters (75 feet)

**Spill (liquid):** 50 meters (150 feet)

**Fire:** 800 meters (1/2 mile)

Absorb liquids in dry sand, earth, or a similar material and place into sealed containers for disposal.

Collect solid material in the most convenient and safe manner and place into sealed containers for disposal.

**Pendimethalin** is toxic to aquatic life and does not biodegrade quickly.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Fruity
<b>Flash Point:</b>	92° to >230°F (33° to > 110°C)
<b>Vapor Pressure:</b>	3 x 10 <sup>-5</sup> mm Hg at 77°F (25°C)
<b>Specific Gravity:</b>	1.19 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	126°F (52°C)
<b>Melting Point:</b>	117° to 127°F (47° to 53°C)
<b>Molecular Weight:</b>	281

### EXPOSURE LIMITS

No occupational exposure limits have been established for **Pendimethalin**.

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Viton/Butyl and Barrier® (>4-hr breakthrough for <i>Amines</i> and <i>Anilines</i> )
<b>Coveralls:</b>	Tyvek® for solids and aerosols  Tychem® SL, BR, CSM and TK; and Trelchem® HPS and VPS (>8-hr breakthrough for liquid mixtures containing <b>Pendimethalin</b> )
<b>Respirator:</b>	Small spill: full facepiece APR with <i>Organic vapor</i> and <i>P100 cartridges</i> Large spill or fire: SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation (skin absorbable)
<b>Inhalation:</b>	Headache, dizziness, muscle weakness, nausea and vomiting
<b>Chronic:</b>	Cancer (thyroid) in animals

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.  
**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** promptly to a medical facility.

Common Name: **PENTANE**

Synonyms: Amyl Hydride; Normal Pentane

CAS No: 109-66-0

Molecular Formula: C<sub>5</sub>H<sub>12</sub>

RTK Substance No: 1476

Description: Clear, colorless liquid with a mild gasoline-like odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>1 - Health</b> <b>4 - Fire</b> <b>0 - Reactivity</b> <b>DOT#:</b> UN 1265 <b>ERG Guide #:</b> 128 <b>Hazard Class:</b> 3 (Flammable)	<b>FLAMMABLE LIQUID</b> Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. <b>POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE.</b> Use water spray to keep fire-exposed containers cool. <b>Pentane</b> may form an ignitable vapor/air mixture in closed tanks or containers.	<b>Pentane</b> may react violently with <b>OXIDIZING AGENTS</b> (such as <b>PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE</b> and <b>FLUORINE</b> ) to cause fires and explosions. <b>Pentane</b> is not compatible with <b>STRONG ACIDS</b> (such as <b>HYDROCHLORIC, SULFURIC</b> and <b>NITRIC</b> ); <b>STRONG BASES</b> (such as <b>SODIUM HYDROXIDE</b> and <b>POTASSIUM HYDROXIDE</b> ); and <b>COMBUSTIBLE MATERIALS</b> .

### SPILL/LEAKS

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers for disposal.

Use only non-sparking tools and equipment, especially when opening and closing containers of **Pentane**.

DO NOT wash into sewer.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Gasoline-like
<b>Flash Point:</b>	-56°F (-49°C)
<b>LEL:</b>	1.5%
<b>UEL:</b>	7.8%
<b>Auto Ignition Temp:</b>	500°F (260°C)
<b>Vapor Density:</b>	2.48 (air = 1)
<b>Vapor Pressure:</b>	426 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	0.6 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	97°F (36°C)
<b>Freezing Point:</b>	-202°F (-130°C)
<b>Ionization Potential:</b>	10.34 eV
<b>Molecular Weight:</b>	72.15

### EXPOSURE LIMITS

**OSHA:** 1,000 ppm, 8-hr TWA

**NIOSH:** 120 ppm, 10-hr TWA; 610 ppm, 15-min Ceiling

**ACGIH:** 600 ppm, 8-hr TWA

**IDLH:** 1,500 ppm

The Protective Action Criteria values are:

PAC-1 = 610 ppm PAC-2 = 610 ppm PAC-3 = 1,500 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Nitrile, Silver Shield®/4H®, Viton and Barrier® (>8-hr breakthrough)
<b>Coveralls:</b>	Tychem® BR, Responder®, and TK (>8-hr breakthrough for <i>Hydrocarbons, aliphatic</i> )
<b>Respirator:</b>	>120 ppm - Supplied air >610 ppm - SCBA

### HEALTH EFFECTS

**Eyes:** Irritation and burns

**Skin:** Irritation and burns

**Inhalation:** Nose, throat and lung irritation, with coughing, and severe shortness of breath (pulmonary edema)  
 Headache, dizziness, confusion, lightheadedness, loss of balance and passing out

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **PERMETHRIN**

Synonyms: 3-Phenoxybenzyl (IRS)-cis-trans-3-(2,2-Dichlorovinyl)-2,2-Dimethylcyclopropanecarboxylate

CAS No: 52645-53-1

Molecular Formula: C<sub>21</sub>H<sub>20</sub>Cl<sub>2</sub>O<sub>3</sub>

RTK Substance No: 3422

Description: White to pale yellow or beige granular or crystalline solid or a light brown liquid (*Pyrethroid insecticide*)

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b> <b>DOT#:</b> UN 2588 <b>ERG Guide #:</b> 151 <b>Hazard Class:</b> 6.1 (Poison)	<b>Permethrin</b> does not burn or burns with difficulty. However, it is often dissolved in a liquid carrier which may be flammable or combustible. Use dry chemical, CO <sub>2</sub> , or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Hydrogen Chloride</i> . Use water spray only to keep fire-exposed containers cool.	<b>Permethrin</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).

### SPILL/LEAKS

**Isolation Distance:**

Spill (solid): 25 meters (75 feet)

Spill (liquid): 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in dry sand, earth, or a similar material and place into sealed containers for disposal.

Moisten *solid* material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

DO NOT wash into sewer.

**Permethrin** is highly toxic to fish and aquatic organisms.

### PHYSICAL PROPERTIES

<b>Flash Point:</b>	Varies (dependent on "carrier")
<b>Vapor Pressure:</b>	2.15 x 10 <sup>-8</sup> mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.2 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	392°F (200°C)
<b>Melting Point:</b>	93°F (34°C)
<b>Molecular Weight:</b>	391.3

### EXPOSURE LIMITS

No occupational exposure limits have been established for **Permethrin**.

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Silver Shield®/4H®, Viton and Barrier® (>8-hr breakthrough for <i>Halogen compounds, aromatic</i> )
<b>Coveralls:</b>	Tychem® F, C3, BR, CSM and TK (>8-hr breakthrough for <i>Halogen compounds, aromatic</i> )
<b>Respirator:</b>	Spill: full facepiece APR with <i>Organic vapor cartridges</i> and <i>P100 prefilters</i> Fire: SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation, burns, itching, rash and redness
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, wheezing and shortness of breath  Headache, dizziness, fatigue, muscle weakness, nausea and vomiting

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses.  
**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** promptly to a medical facility.

Common Name: **PETROLEUM DISTILLATES**

Synonyms: Crude Oil; Petroleum; Petroleum Oil

CAS No: 8002-05-9

Molecular Formula: Varies

RTK Substance No: 2648

Description: Dark yellow to brown or green-black liquids with a mild *gasoline* or *kerosene* odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>2 - Health</b></p> <p><b>3 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p><b>DOT#:</b> UN 1268</p> <p><b>ERG Guide #:</b> 128</p> <p><b>Hazard Class:</b> 3 (Flammable)</p>	<p>FLAMMABLE LIQUIDS</p> <p>Use dry chemical, CO<sub>2</sub>, alcohol-resistant foam or other foam extinguishing agents, as water may not be effective in fighting fires.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE.</p> <p>Use water spray to keep fire-exposed containers cool.</p> <p>Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source and flash back.</p> <p>Flow or agitation may generate electrostatic charges.</p> <p><b>Petroleum Distillates</b> may form an ignitable vapor/air mixture in closed tanks or containers.</p>	<p><b>Petroleum Distillates</b> may react violently with OXIDIZING AGENTS (such as NITROGEN TETROXIDE, PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and NITRIC ACID.</p>

### SPILL/LEAKS

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in dry sand, earth, or a noncombustible material and place into sealed containers for disposal.

Bond and ground containers when transferring

**Petroleum Distillates.**

Use only non-sparking tools and equipment.

Keep **Petroleum Distillates** out of confined spaces, such as sewers, because of the possibility of an explosion.

DO NOT wash into sewer.

### PHYSICAL PROPERTIES

**Odor Threshold:** Mild *gasoline* or *kerosene*-like

**Flash Point:** -40° to -86°F (-40° to -66°C)

**LEL:** 1.1%

**UEL:** 5.9%

**Vapor Pressure:** 40 mm Hg at 68°F (20°C) (approximately)

**Specific Gravity:** 0.78 to 0.97 (water = 1)

**Water Solubility:** Insoluble

**Boiling Point:** 86 ° to 460°F (30° to 238°C)

**Freezing Point:** -99°F (-73°C)

**Molecular Weight:** 98 (approximately)

### EXPOSURE LIMITS

**OSHA:** 500 ppm, 8-hr TWA

**NIOSH:** 88 ppm, 10-hr TWA; 450 ppm, Ceiling (15-minute)

**IDLH:** 1,100 ppm

**The Protective Action Criteria values are:**

PAC-1 = 87.5 ppm    PAC-2 = 450 ppm

PAC-3 = 1,100 ppm

### PROTECTIVE EQUIPMENT

**Gloves:** Silver Shield®/4H®, Viton, Viton/Butyl and Barrier® (>8-hr breakthrough for *Hydrocarbons*)

**Coveralls:** Tychem® BR, CSM and TK; and Trelchem® HPS and VPS (>8-hr breakthrough for *Hydrocarbons*)

**Use turn out gear or flash protection if ignition/fire is the greatest hazard.**

**Respirator:** >88 ppm - SCBA

### HEALTH EFFECTS

**Eyes:** Irritation and burns

**Skin:** Irritation and burns

**Inhalation:** Nose, throat and lung irritation, with coughing, wheezing and shortness of breath

Headache, dizziness, confusion and loss of balance

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **PHENANTHRENE**

Synonyms: Phenantrin; Coal Tar Pitch Volatiles

CAS No: 85-01-8

Molecular Formula: C<sub>14</sub>H<sub>10</sub>

RTK Substance No: 3004

Description: Colorless to white, crystalline solid with a faint odor, also present as a by-product of incomplete combustion of wood and fossil fuels

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b>  <b>DOT#:</b> UN 3077 <b>ERG Guide #:</b> 171 <b>Hazard Class:</b> 9 (Environmentally Hazardous Substance)	<b>Phenanthrene</b> may burn, but does not readily ignite. Use dry chemical, CO <sub>2</sub> or water as extinguishing agents.  POISONOUS GASES ARE PRODUCED IN FIRE. Use water spray to keep fire-exposed containers cool.	<b>Phenanthrene</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).

### SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

DO NOT wash into sewer.

**Phenanthrene** is an environmental hazard and very toxic to aquatic organisms.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Aromatic odor
<b>Flash Point:</b>	340°F (171°C)
<b>Vapor Density:</b>	6.14 (air = 1)
<b>Vapor Pressure:</b>	1 mm Hg at 245°F (118.3°C)
<b>Specific Gravity:</b>	1.1 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	642°F (339°C)
<b>Melting Point:</b>	212°F (100°C)
<b>Molecular Weight:</b>	178.23

### EXPOSURE LIMITS

**OSHA:** 0.2 mg/m<sup>3</sup>, 8-hr TWA

**NIOSH:** 0.1 mg/m<sup>3</sup>, 10-hr TWA

**ACGIH:** 0.2 mg/m<sup>3</sup>, 8-hr TWA

**IDLH:** 80 mg/m<sup>3</sup>

(All the above are for *Coal Tar Pitch Volatiles*)

The Protective Action Criteria values are:

PAC-1 = 6 mg/m<sup>3</sup>    PAC-2 = 40 mg/m<sup>3</sup>

PAC-3 = 500 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Nitrile, Neoprene and Barrier® (>1-hr breakthrough for <i>Coal Tar Extract</i> )
<b>Coveralls:</b>	Tyvek®
<b>Respirator:</b>	>0.1 mg/m <sup>3</sup> - full facepiece APR with <i>Organic vapor and P100 cartridges</i> >1 mg/m <sup>3</sup> - SCBA

### HEALTH EFFECTS

**Eyes:** Irritation

**Skin:** Irritation

**Inhalation:** Nose and throat irritation

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.



Common Name: **PHENOL**

Synonyms: Carbolic Acid; Hydroxybenzene

CAS No: 108-95-2

 Molecular Formula: C<sub>6</sub>H<sub>5</sub>OH

RTK Substance No: 1487

Description: Colorless or white, crystalline solid that is usually sold or used in solution

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>4 - Health</b> <b>2 - Fire</b> <b>0 - Reactivity</b>  DOT#: UN 1671 ERG Guide #: 153 Hazard Class: 6.1 (Poison)	<b>Phenol</b> is a COMBUSTIBLE SOLID. Use dry chemical, CO <sub>2</sub> , water spray or alcohol-resistant foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE. Use water spray to keep fire-exposed containers cool.	<b>Phenol</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); ALUMINUM CHLORIDE; CALCIUM HYPOCHLORITE; STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); FORMALDEHYDE; ISOCYANATES; BUTADIENE; SODIUM NITRITE; and many other materials. <b>Phenol</b> is corrosive to COPPER, BRASS and STAINLESS STEELS.

**SPILL/LEAKS**
**Isolation Distance:**

 Spill: 25 meters (75 feet) (Solid)  
 50 meters (150 feet) (Liquid)

Fire: 800 meters (1/2 mile)

 For **Phenol** in *solution*, cover with sand and place into sealed containers for disposal.

 Collect *solid* material in the most convenient and safe manner and place into sealed containers for disposal.

DO NOT wash into sewer.

Neutralize water spills with dry lime or soda ash.

**Phenol** is harmful to aquatic life at very low concentrations.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	0.4 ppm
<b>Flash Point:</b>	175°F (79.4°C)
<b>LEL:</b>	1.3%
<b>UEL:</b>	8.6%
<b>Auto Ignition Temp:</b>	1,319°F (715°C)
<b>Vapor Density:</b>	3.2 (air = 1)
<b>Vapor Pressure:</b>	0.4 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.1 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	358°F (181°C)
<b>Melting Point:</b>	106°F (41°C)
<b>Ionization Potential:</b>	8.5 eV
<b>Molecular Weight:</b>	94.1
<b>pH:</b>	6 (aqueous solution)

**EXPOSURE LIMITS**
**OSHA:** 5 ppm, 8-hr TWA

**NIOSH:** 5 ppm, 10-hr TWA; 15.6 ppm, 15-min Ceiling

**ACGIH:** 5 ppm, 8-hr TWA

**IDLH:** 250 ppm

The Protective Action Criteria values are:

PAC-1 = 15 ppm PAC-2 = 23 ppm PAC-3 = 200 ppm

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Butyl, Silver Shield®/4H®, Viton and Barrier® (>8-hr breakthrough)
<b>Coveralls:</b>	Tychem® BR, Responder®, and TK; Trelchem® HPS and VPS (>8-hr breakthrough)
<b>Respirator:</b>	>5 ppm - full facepiece APR with <i>Organic vapor cartridges</i> and <i>High efficiency prefilters</i> >50 ppm - SCBA

**HEALTH EFFECTS**
**Eyes:** Irritation and burns

**Skin:** Irritation and burns

**Inhalation:** Nose, throat and lung irritation with coughing and severe shortness of breath (pulmonary edema)

Methemoglobinemia with headache, dizziness, lightheadedness and passing out

**FIRST AID AND DECONTAMINATION**
**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water. Seek medical attention.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

**Medical** observation is recommended as symptoms may be delayed.

Common Name: **PHENOTHRIN**

Synonyms: 3-Phenoxybenzyl(1R)-cis-trans-Chrysanthemate; Phenothrine; Sumitrin

CAS No: 26002-80-2

 Molecular Formula: C<sub>23</sub>H<sub>26</sub>O<sub>3</sub>

RTK Substance No: 3727

 Description: Pale yellow to yellow-brown liquid *Pyrethroid* insecticide

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b> <b>DOT#:</b> UN 2902 <b>ERG Guide #:</b> 151 <b>Hazard Class:</b> 6.1 (Poison)	<b>Phenothrin</b> does not burn, however, it is often dissolved in a liquid carrier that may be flammable or combustible. Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE.	<b>Phenothrin</b> is not compatible with STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE).

## SPILL/LEAKS

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in dry sand, earth, or a similar material and place into sealed containers for disposal.

DO NOT wash into sewer.

**Phenothrin** is very toxic to aquatic organisms.

## PHYSICAL PROPERTIES

<b>Flash Point:</b>	Combustible/Flammable
<b>Vapor Pressure:</b>	1.43 x 10 <sup>-7</sup> mm Hg at 70°F (21°C)
<b>Specific Gravity:</b>	1.06 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	>554°F (>290°C)
<b>Molecular Weight:</b>	350.46

## EXPOSURE LIMITS

 No occupational exposure limits have been established for **Phenothrin**.

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl, Silver Shield®/4H and Barrier® (>1-hr breakthrough for <i>Esters</i> )
<b>Coveralls:</b>	Tychem® BR, CSM and TK (>8-hr breakthrough for <i>Esters</i> )
<b>Respirator:</b>	Spill - full facepiece APR with <i>Organic vapor</i> and <i>P100</i> cartridges Fire - SCBA

## HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation, burns, itching, rash and redness (skin absorbable)
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, wheezing and shortness of breath Headache, dizziness, fatigue, muscle weakness, nausea and vomiting

## FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **m-PHENYLENEDIAMINE**

Synonyms: 3-Aminoaniline; 1,3-Benzenediamine; 1,2-Phenylenediamine

CAS No: 108-45-2

 Molecular Formula: C<sub>6</sub>H<sub>8</sub>N<sub>2</sub>

RTK Substance No: 1316

Description: White, crystalline solid that turns red on exposure to air

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 1673 ERG Guide #: 153 Hazard Class: 6 (Toxic)	<b>m-Phenylenediamine</b> may burn, but does not readily ignite. Use dry chemical or water as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> . Use water spray to keep fire-exposed containers cool.	<b>m-Phenylenediamine</b> reacts with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); ACID ANHYDRIDES; ACID CHLORIDES; and CHLOROFORMATES. Protect from SUNLIGHT.

## SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

DO NOT wash into sewer.

**m-Phenylenediamine** is very toxic to aquatic organisms.

## PHYSICAL PROPERTIES

**Flash Point:** 280° to 369°F (138° to 187°C)

**LEL:** 1.3%

**UEL:** 9.8%

**Auto Ignition Temp:** 1,040°F (560°C)

**Vapor Density:** 3.7 (air = 1)

**Vapor Pressure:** 0.62 mm Hg at 212°F (100°C)

**Specific Gravity:** 1.1 (water = 1)

**Water Solubility:** Very slightly soluble

**Boiling Point:** 540° to 543°F (282° to 284°C)

**Melting Point:** 145° to 147°F (63° to 64°C)

**Molecular Weight:** 108.2

## EXPOSURE LIMITS

**ACGIH:** 0.1 mg/m<sup>3</sup>, 8-hr TWA

The Protective Action Criteria values are:

 PAC-1 = 0.3 mg/m<sup>3</sup>

 PAC-2 = 10 mg/m<sup>3</sup>

 PAC-3 = 125 mg/m<sup>3</sup>

## PROTECTIVE EQUIPMENT

**Gloves:** Butyl, SilverShield®/4H®; Barrier (>8-hr breakthrough for *Amines, aromatic, primary*)

**Coveralls:** Tyvek® (*solid m-Phenylenediamine*); Tychem® BR and TK (>8-hr breakthrough for *Amines, aromatic, primary*)

**Respirator:** >0.1 mg/m<sup>3</sup> - Full facepiece APR with *Organic vapor cartridges and P100 prefilters*  
 >10 mg/m<sup>3</sup> - SCBA

## HEALTH EFFECTS

**Eyes:** Irritation

**Skin:** Irritation

**Inhalation:** Nose, throat and lung irritation, with coughing, wheezing and shortness of breath

Headache, fatigue and blue color to the skin and lips (methemoglobinemia)

## FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **PHENYLMERCURIC ACETATE**

Synonyms: Acetoxyphenylmercury; PMA

CAS No: 62-38-4

 Molecular Formula: C<sub>8</sub>H<sub>8</sub>HgO<sub>2</sub>

RTK Substance No: 1502

Description: Odorless, white to yellow-white, crystalline powder

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>1 (Dry) - Fire</b> <b>2 (Solution) - Fire</b> <b>0 - Reactivity</b>  DOT#: UN 1674 ERG Guide #: 151 Hazard Class: 6.1 (Poison)	Dry <b>Phenylmercuric Acetate</b> is a COMBUSTIBLE SOLID, but it may be dissolved in a FLAMMABLE <i>organic solution</i> . Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. Water may not be effective in fighting fires involving <b>Phenylmercuric Acetate</b> in an <i>organic solution</i> . POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Mercury Oxides</i> . Use water spray to keep fire-exposed containers cool.	<b>Phenylmercuric Acetate</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); SULFUR; AMMONIA; REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); and STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE).

## SPILL/LEAKS

**Isolation Distance:**  
 Small Spill: 30 meters (100 feet)  
 Large Spill: 60 meters (200 feet)  
 Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers.  
 Moisten spilled dry material first or use a vacuum specific for *Mercury* for clean-up and place into sealed containers.  
 Keep **Phenylmercuric Acetate** in *organic solution* out of confined spaces, such as sewers, because of the possibility of an explosion.  
 DO NOT wash into sewer.  
**Phenylmercuric Acetate** is very toxic to aquatic organisms and may be hazardous to the environment.

## PHYSICAL PROPERTIES

**Odor Threshold:** Odorless  
**Flash Point:** >100°F (38°C)  
**Vapor Density:** 11.6 (air = 1)  
**Vapor Pressure:** 6 x 10<sup>-6</sup> mm Hg at 68°F (20°C)  
**Specific Gravity:** 0.24 (water = 1)  
**Water Solubility:** Soluble  
**Melting Point:** 300°F (149°C)  
**Molecular Weight:** 337

## EXPOSURE LIMITS

**OSHA:** 0.1 mg/m<sup>3</sup>, 8-hr TWA  
**NIOSH:** 0.05 mg/m<sup>3</sup>, 10-hr TWA  
**ACGIH:** 0.025 mg/m<sup>3</sup>, 8-hr TWA  
**IDLH:** 10 mg/m<sup>3</sup>  
 (All of the above are for *Mercury vapor*)

## PROTECTIVE EQUIPMENT

**Gloves:** Butyl, Nitrile, Neoprene, Natural Rubber, Polyvinyl Chloride, Silver Shield®/4H® and Viton (>8-hr breakthrough for *Mercury*)  
**Coveralls:** Tychem® SL, CPF 3, F, BR, LV, Responder® and TK (>8-hr breakthrough for *Mercury*)  
**Respirator:** <0.5 mg/m<sup>3</sup> - APR with filter specific for *Mercury*  
 >0.5 mg/m<sup>3</sup> - Supplied air  
 >10 mg/m<sup>3</sup> - SCBA

## HEALTH EFFECTS

**Eyes:** Irritation and burns  
**Skin:** Irritation and burns, skin rash, itching and gray skin color  
**Inhalation:** Nose, throat and lung irritation with coughing, wheezing and severe shortness of breath (pulmonary edema)  
 Nausea, vomiting and tremors  
**Chronic:** *Methylmercury compounds* may cause cancer (kidney) in animals

## FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.  
**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of d water.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** promptly to a medical facility.  
**Medical** observation is recommended as symptoms may be delayed.

Common Name: **o-PHENYLPHENOL**

Synonyms: 2-Biphenylol; 2-Hydroxydiphenyl; 2-Phenylphenol

CAS No: 90-43-7

 Molecular Formula: C<sub>12</sub>H<sub>10</sub>O

RTK Substance No: 1439

Description: White, buff, to light lavender, crystalline solid

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>3- Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b> DOT#: None ERG Guide #: None Hazard Class: None	COMBUSTIBLE SOLID Use dry chemical, CO <sub>2</sub> , water spray or alcohol-resistant foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE. Use water spray to keep fire-exposed containers cool. <b>o-Phenylphenol</b> in <i>powder</i> or <i>granular</i> form may form an ignitable vapor/air mixture in closed tanks or containers.	<b>o-Phenylphenol</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE).

**SPILL/LEAKS**
**Isolation Distance:**

Spill: 25 meters (75 feet)

 Moisten spilled material with *Alcohol* first, or use a HEPA-filter vacuum for clean-up, and place into sealed containers for disposal.

 Wash area with *Alcohol* and then with a strong soap and water solution.

DO NOT wash into sewer.

**o-Phenylphenol** is toxic to aquatic organisms.

**PHYSICAL PROPERTIES**

<b>Flash Point:</b>	255°F (124°C)
<b>Auto Ignition Temp:</b>	986°F (530°C)
<b>Vapor Pressure:</b>	1 mm Hg at 212°F (100°C)
<b>Specific Gravity:</b>	1.2 (water = 1)
<b>Water Solubility:</b>	Very slightly soluble
<b>Boiling Point:</b>	527° to 547°F (275° to 286°C)
<b>Melting Point:</b>	132° to 135°F (56° to 57°C)
<b>pH:</b>	11.2 to 11.6 (1% solution)
<b>Molecular Weight:</b>	170.2

**EXPOSURE LIMITS**

 No occupational exposure limits have been established for **o-Phenylphenol**.

The Protective Action Criteria values are:

 PAC-1 = 75 mg/m<sup>3</sup>

 PAC-2 = 500 mg/m<sup>3</sup>

 PAC-3 = 500 mg/m<sup>3</sup>
**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Butyl and Viton (>8-hr breakthrough for <i>Hydroxyl compounds, aromatic</i> )
<b>Coveralls:</b>	Tyvek®
<b>Respirator:</b>	Small Spill: Full facepiece APR with <i>High efficiency filters</i> Large Spill or Fire: SCBA

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose and throat irritation with coughing and wheezing

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention immediately.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **PHENYTOIN**

Synonyms: 5,5-Diphenylhydantoin

CAS No: 57-41-0

Molecular Formula: C<sub>15</sub>H<sub>12</sub>N<sub>2</sub>O<sub>2</sub>

RTK Substance No: 1507

Description: Fine white or almost white, odorless, crystalline powder

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b> DOT#: None ERG Guide #: None Hazard Class: None	<b>Phenytoin</b> may burn, but does not readily ignite. Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> . Use water spray to keep fire-exposed containers cool.	<b>Phenytoin</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and may react with REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES).

**SPILL/LEAKS**

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

Wash area with 60 to 70% *Ethanol*, followed by soap and water.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	Odorless
<b>Vapor Pressure:</b>	1.2 x 10 <sup>-10</sup> mm Hg at 77 °F (25 °C)
<b>Specific Gravity:</b>	1.29 (water = 1)
<b>Water Solubility:</b>	Very slightly soluble
<b>Boiling Point:</b>	Decomposes
<b>Melting Point:</b>	563 ° to 568 °F (295 ° to 298 °C)
<b>Molecular Weight:</b>	252.28

**EXPOSURE LIMITS**

No occupational exposure limits have been established for **Phenytoin**.

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Nitrile and Neoprene
<b>Coveralls:</b>	Tyvek®
<b>Respirator:</b>	Spill: full facepiece APR with <i>Organic vapor/Acid gas and P100 particulate filter cartridges</i> Fire: SCBA

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Headache, dizziness, drowsiness, weakness, tremors and confusion
<b>Chronic:</b>	Cancer (lymphatic system) in humans and (lymphatic system and liver) animals

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.  
**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** promptly to a medical facility.



# RIGHT TO KNOW

## HAZARDOUS SUBSTANCE FACT SHEET

**Common Name: PHORATE**

Synonyms: Rampart; Thimet; O-O-Diethyl-S-Ethylmercaptomethyl Dithiophosphate  
 CAS Number: 298-02-2  
 Molecular Formula: C<sub>7</sub>H<sub>17</sub>O<sub>2</sub>PS<sub>3</sub>  
 RTK Number: 1508  
 Description: Clear liquid with a skunk-like odor, also available in granular formulations

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>Health:</b> 3 <b>Fire:</b> 1 <b>Reactivity:</b> 1 <b>DOT #:</b> UN 3018 UN 2837 <b>ERG #:</b> 152 <b>DOT Hazard:</b> 6.1 (poison)	Use dry chemical, CO <sub>2</sub> , foam extinguishers or water in flooding quantities as fog. <b>POISONOUS GASES ARE PRODUCED IN FIRE</b> , including <i>Sulfur Oxides</i> and <i>Phosphorus Oxide fumes</i> . <b>CONTAINERS MAY EXPLODE IN FIRE.</b> Use water spray only to keep fire-exposed containers cool. Do not get water inside containers.	<b>Phorate</b> is not compatible with WATER and ALKALIES.

**SPILLS/LEAKS**

**Isolation Distances:**  
**Liquid Spill:** 50 meters (150 feet)  
**Solid Spill:** 25 meters (75 feet)  
**Fire:** 800 meters (1/2 mile)

Evacuate personnel.  
 Secure and control entrance to the area.  
 If it is safe to do so, remove potential ignition sources.  
 Absorb *liquids* in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.  
 Collect *powdered* material in the most convenient and safe manner and deposit in sealed containers.  
 Do not allow this substance to enter waterways, including sewers, as it is very toxic to aquatic life with long-lasting effects.  
 Ventilate area after clean-up is complete.

**PHYSICAL PROPERTIES**

**Melting Point:** -43 °C (-45 °F)  
**Flash Point:** 160 °C (320 °F)  
**Molecular Weight:** 260.39  
**Vapor Pressure:** 0.0008 mm Hg at 20 °C (68 °F)  
**Specific Gravity:** 1.156 at 25 °C (77 °F)  
**Water Solubility:** None  
**Boiling Point:** 125-127 °C (257-261 °F) at 2 mm Hg  
**Relative Density:** 1.2 (water = 1)

**EXPOSURE LIMITS**

The following exposure limits are for **Phorate**:

**NIOSH:** 0.05 mg/m<sup>3</sup>, 10-hour average  
0.2 mg/m<sup>3</sup>, 15-minute maximum

**ACGIH:** 0.05 mg/m<sup>3</sup>, 8-hour average  
0.2 mg/m<sup>3</sup>, short-term exposure limit

**PAC:** PAC-1 = 0.0036 mg/m<sup>3</sup>  
PAC-2 = 0.04 mg/m<sup>3</sup>  
PAC-3 = 0.12 mg/m<sup>3</sup>

**PROTECTIVE EQUIPMENT**

**Gloves:** Nitrile and Neoprene  
**Coverall:** Tychem® BR, CSM and TK, or the equivalent.  
**Respirator:** >0.05 mg/m<sup>3</sup> – supplied-air, full facepiece, pressure-demand or another positive-pressure mode

**ACUTE HEALTH EFFECTS**

**Eyes:** Blurred vision  
**Skin:** Irritation  
**Inhalation:** Headache, dizziness, chest tightness, twitching, loss of coordination, convulsions, coma, death

**FIRST AID AND DECONTAMINATION**

Immediately flush eyes with large amounts of water for at least 15 minutes.  
 Quickly remove contaminated clothing. Immediately wash area with large amounts of soap and water.  
 Shampoo hair immediately if contaminated.  
 Remove the person from exposure.  
 Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.  
 Transfer promptly to a medical facility.  
 Medical observation is recommended for several days as symptoms may be delayed.

Common Name: **PHOSPHOROTHIOIC ACID, O,O-DIMETHYL-S-(2-(METHYLTHIO)ETHYL ESTER)**

Synonyms: Methyl Demeton Methyl; Tinox

CAS No: 2587-90-8

Molecular Formula: C<sub>5</sub>H<sub>13</sub>O<sub>3</sub>PS<sub>2</sub>

RTK Substance No: 2910

Description: Pale yellow, oily liquid

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 3018 ERG Guide #: 152 Hazard Class: 6.1 (Toxic)	COMBUSTIBLE LIQUID Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Phosphorus Oxides</i> and <i>Sulfur Oxides</i> . CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool.	<b>Phosphorothioic Acid, O,O-Dimethyl-S-(2-Methylthio)Ethyl Ester</b> may react with REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES) to produce highly toxic and flammable <i>Phosphine gas</i> . DO NOT place <b>Phosphorothioic Acid, O,O-Dimethyl-S-(2-Methylthio)Ethyl Ester</b> into unlined steel containers.

### SPILL/LEAKS

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in dry sand, earth, or a similar material and place into sealed containers for disposal.

DO NOT wash into sewer.

**Phosphorothioic Acid, O,O-Dimethyl-S-(2-Methylthio)Ethyl Ester** may be toxic to aquatic organisms.

### PHYSICAL PROPERTIES

**Flash Point:** 243°F (117°C)

**Specific Gravity:** 1.2 (water = 1)

**Water Solubility:** Soluble

**Boiling Point:** 446°F (230°C)

**Molecular Weight:** 216.25

### EXPOSURE LIMITS

No occupational exposure limits have been established for **Phosphorothioic Acid, O,O-Dimethyl-S-(2-Methylthio)Ethyl Ester**.

The Protective Action Criteria values are:

PAC-1 = 12.5 mg/m<sup>3</sup>    PAC-2 = 20 mg/m<sup>3</sup>

PAC-3 = 20 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

**Gloves:** Neoprene (>4-hr breakthrough)

**Coveralls:** Tychem® BR, CSM and TK (>8-hr breakthrough)

**Respirator:** Full facepiece APR with cartridges approved for *Pesticides*  
>12.5 mg/m<sup>3</sup> - SCBA

### HEALTH EFFECTS

**Eyes:** No information available

**Skin:** No information available (skin absorbable)

**Inhalation:** Nose, throat and lung irritation with coughing, wheezing and shortness of breath

**Chronic:** Headache, sweating, nausea and vomiting, loss of coordination, and death (*Organophosphate poisoning*)  
High exposure can cause irregular heartbeat (arrhythmia)

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water. Seek medical attention immediately

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **PHTHALIC ANHYDRIDE**

Synonyms: 1,2-Benzendicarboxylic Anhydride; 1,3-Dioxophthalon; 1,3-Isobenzofurandione

CAS No: 85-44-9

Molecular Formula: C<sub>8</sub>H<sub>4</sub>O<sub>3</sub>

RTK Substance No: 1535

Description: Colorless to white, crystalline or needle-shaped solid, or a pale liquid when in *molten form*, with a strong, choking odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>3 - Health</b></p> <p><b>1 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p><b>DOT#:</b> UN 2214</p> <p><b>ERG Guide #:</b> 156</p> <p><b>Hazard Class:</b> 8 (Corrosive)</p>	<p><b>Phthalic Anhydride</b> may burn, but does not readily ignite.</p> <p>Use dry chemical, CO<sub>2</sub>, water spray or alcohol-resistant foam as extinguishing agents.</p> <p>DO NOT use solid streams of water.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE including <i>Phthalic Acid</i>.</p> <p>Use water spray to keep fire-exposed containers cool.</p> <p><b>Phthalic Anhydride</b> may form an ignitable dust/air mixture in closed tanks or containers.</p>	<p><b>Phthalic Anhydride</b> reacts slowly with WATER to form <i>Phthalic Acid</i> and heat. The reaction may be violent.</p> <p><b>Phthalic Anhydride</b> reacts violently on heating with COPPER OXIDE or SODIUM NITRITE causing an explosion hazard.</p> <p><b>Phthalic Anhydride</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES); AMINES; ALCOHOLS; and AMMONIA.</p> <p><b>Phthalic Anhydride</b> is corrosive to metals in the presence of WATER.</p>

### SPILL/LEAKS

**Isolation Distance:**

Spills: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Slightly moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

For *molten (liquid) Phthalic Anhydride*, cover with dry lime, sand or soda ash and place into sealed containers for disposal.

Neutralize water spill with crushed limestone, soda ash or sodium bicarbonate.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	0.053 ppm
<b>Flash Point:</b>	305°F (152°C)
<b>LEL:</b>	1.7%
<b>UEL:</b>	10.5%
<b>Auto Ignition Temp:</b>	1,058°F (570°C)
<b>Vapor Density:</b>	5.1 (air = 1)
<b>Vapor Pressure:</b>	0.0002 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.5 (flake) 1.2 (molten) (water = 1)
<b>Water Solubility:</b>	Slightly soluble (decomposes)
<b>Boiling Point:</b>	563°F (295°C)
<b>Melting Point:</b>	267°F (131°C)
<b>Ionization Potential:</b>	10 eV
<b>Molecular Weight:</b>	148.1

### EXPOSURE LIMITS

**OSHA:** 12 mg/m<sup>3</sup> (2 ppm), 8-hr TWA

**NIOSH:** 6 mg/m<sup>3</sup> (1 ppm), 10-hr TWA

**ACGIH:** 6 mg/m<sup>3</sup> (1 ppm), 8-hr TWA

**IDLH:** 60 mg/m<sup>3</sup>

The Protective Action Criteria values are:

PAC-1 = 12 mg/m<sup>3</sup> PAC-2 = 40 mg/m<sup>3</sup>

PAC-3 = 60 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	SilverShield®/4H® (>4-hr breakthrough)
<b>Coveralls:</b>	Tyvek® (for <i>solid Phthalic Anhydride</i> ) and Tychem® CPF3, BR, Responder® and TK; and Trelchem HPS and VPS (>8-hr breakthrough for <i>liquid Anhydrides, alicyclic</i> )
<b>Respirator:</b>	>6 mg/m <sup>3</sup> - full facepiece APR with <i>Organic vapor and High efficiency particulate</i> cartridges >12 mg/m <sup>3</sup> - SCBA

### HEALTH EFFECTS

**Eyes:** Irritation and burns

**Skin:** Irritation and burns

**Inhalation:** Nose and throat irritation with coughing and wheezing

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **alpha-PINENE**

Synonyms: 2-Pinene; Cyclic Dexadiene

CAS No: 80-56-8

Molecular Formula: C<sub>10</sub>H<sub>16</sub>

RTK Substance No: 0052

Description: Oily, colorless liquid

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>1- Health</b> <b>3- Fire</b> <b>0- Reactivity</b>  <b>DOT#:</b> UN 2368 <b>ERG Guide #:</b> 128 <b>Hazard Class:</b> 3 (Flammable)	<b>alpha-Pinene</b> is a FLAMMABLE LIQUID. Use dry chemical, CO <sub>2</sub> , alcohol-resistant foam or other foam extinguishing agents, as water may not be effective in fighting fires. POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE.  Use water spray to keep fire-exposed containers cool.  Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source or flash back.	<b>alpha-Pinene</b> reacts violently with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); PERCHROMATES; STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); and OXIDIZING ACIDS (such as PEROXYACETIC ACID and PEROXYBENZOIC ACID).

## SPILL/LEAKS

**Isolation Distance:**

Small Spill: 60 meters (200 feet)

Large Spill: 270 meters (900 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.

Keep **alpha-Pinene** out of confined spaces, such as sewers, because of the possibility of an explosion.

DO NOT wash into sewer.

Harmful to aquatic life.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	<i>Turpentine</i> -like
<b>Flash Point:</b>	91°F (33°C)
<b>Auto Ignition Temp:</b>	491°F (255°C)
<b>Vapor Density:</b>	4.7 (air = 1)
<b>Vapor Pressure:</b>	4.9 mm Hg at 81°F (27°C)
<b>Specific Gravity:</b>	0.9 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	313°F (156°C)
<b>Melting Point:</b>	-67°F (-55°C)
<b>Freezing Point:</b>	-81°F (-63°C)
<b>Ionization Potential:</b>	8.07 +/- 0.5 (eV)
<b>Molecular Weight:</b>	136.3

## EXPOSURE LIMITS

<b>OSHA:</b>	100 ppm, 8-hr TWA (as <i>Turpentine</i> )
<b>NIOSH:</b>	100 ppm, 10-hr TWA (as <i>Turpentine</i> )
<b>ACGIH:</b>	20 ppm, 8-hr TWA
<b>IDLH:</b>	800 ppm (as <i>Turpentine</i> )
<b>PAC LEVELS:</b>	PAC-1 = 60 ppm; PAC-2 = 120 ppm; PAC-3 = 1,500 ppm

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Silver Shield®/4H® and Viton (>8-hr breakthrough for <i>Turpentine</i> )
<b>Coveralls:</b>	DuPont Tychem® Responder®; Kappler® Zytron® 500; and Saint-Gobain ONESuit® PRO (>8-hr breakthrough for <i>Turpentine</i> )
<b>Respirator:</b>	>20 ppm – Full facepiece APR with Organic vapor filter >200 ppm – Pressure demand supplied air >800 ppm – Pressure demand SCBA

## HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing and wheezing Headache, dizziness, confusion, nausea and vomiting

## FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.  
**Quickly** remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** promptly to a medical facility.

Common Name: **POLYCHLORINATED BIPHENYLS**

Synonyms: Aroclor; Chlorodiphenyls; PCBs

CAS No: 1336-36-3

 Molecular Formula:  $C_{12}H_{10-n}Cl_n$ 

RTK Substance No: 1554

Description: Light yellow or colorless, thick, oily liquids

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 2315 ERG Guide #: 171 Hazard Class: 9 (Miscellaneous Hazardous Materials)	<b>Polychlorinated Biphenyls</b> may burn, but do not readily ignite. Use dry chemical, CO <sub>2</sub> , water spray or alcohol-resistant foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Polychlorinated Dibenzofurans</i> and <i>Chlorinated Dibenzo-p-dioxins</i> . Use water spray to keep fire-exposed containers cool.	<b>Polychlorinated Biphenyls</b> are not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC).

## SPILL/LEAKS

**Isolation Distance:**

Spills: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers for disposal.

DO NOT wash into sewer.

**Polychlorinated Biphenyls** bioaccumulate and are hazardous to the environment.

## PHYSICAL PROPERTIES

**Flash Point:** 286° to 385°F (141° to 196°C)

**Auto Ignition Temp:** 464°F (240°C)

**Vapor Pressure:** 0.001 mm Hg at 68°F (20°C)

**Specific Gravity:** 1.3 (water = 1)

**Water Solubility:** Insoluble

**Boiling Point:** 617° to 734°F (325° to 390°C)

**Melting Point:** -2° to 50°F (-19° to 10°C)

**Molecular Weight:** 258 to 326

## EXPOSURE LIMITS

**OSHA:** 1 mg/m<sup>3</sup>, 8-hr TWA (42% *Chlorine*) and 0.5 mg/m<sup>3</sup>, 8-hr TWA (54% *Chlorine*)

**NIOSH:** 0.001 mg/m<sup>3</sup>, 10-hr TWA

**ACGIH:** 1 mg/m<sup>3</sup>, 8-hr TWA (42% *Chlorine*) and 0.5 mg/m<sup>3</sup>, 8-hr TWA (54% *Chlorine*)

**IDLH:** 5 mg/m<sup>3</sup>

## PROTECTIVE EQUIPMENT

**Gloves:** Butyl, Neoprene, Polyvinyl Chloride, Silver Shield®/4H® and Viton (>4-hr breakthrough)

**Coveralls:** Tychem® CPF 2, SL, CPF 4 and Responder® (>8-hr breakthrough)

**Respirator:** >0.001 mg/m<sup>3</sup> - Supplied air or SCBA

## HEALTH EFFECTS

**Eyes:** Irritation

**Skin:** Irritation

**Inhalation:** Nose, throat and lung irritation with coughing, wheezing and shortness of breath

Headache, nausea, vomiting, and abdominal pain

**Chronic:** Cancer (skin, brain, pancreas) in humans

## FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility

Common Name: **POTASSIUM ARSENITE**

Synonyms: Potassium Metaarsenite; Potassium Arsonate

CAS No: 10124-50-2

 Molecular Formula:  $A_5H_3K_xO_4$ 

RTK Substance No: 1557

Description: White, odorless powder

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>4 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 1678 ERG Guide #: 154 Hazard Class: 6.1 (Poison)	Extinguish fire using an agent suitable for type of surrounding fire. <b>Potassium Arsenite</b> itself does not burn. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Arsine</i> , <i>Arsenic Oxides</i> and <i>Potassium Oxides</i> . Use water spray to keep fire-exposed containers cool.	<b>Potassium Arsenite</b> reacts with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) to form toxic <i>Arsine gas</i> . <b>Potassium Arsenite</b> attacks many METALS to form flammable and explosive <i>Hydrogen gas</i> . <b>Potassium Arsenite</b> decomposes slowly in AIR and CARBON DIOXIDE.

**SPILL/LEAKS**
**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and deposit into sealed containers.

DO NOT wash into sewer.

Toxic to aquatic plants and animals.

**PHYSICAL PROPERTIES**
**Odor Threshold:** Odorless

**Flash Point:** Noncombustible

**Water Solubility:** Soluble

**Melting Point:** 572°F (300°C) (decomposes slowly in air)

**Molecular Weight:** 254

**EXPOSURE LIMITS**
**OSHA:** 0.01 mg/m<sup>3</sup>, 8-hr TWA

**NIOSH:** 0.002 mg/m<sup>3</sup>, 15-min Ceiling

**ACGIH:** 0.01 mg/m<sup>3</sup>, 8-hr TWA

**IDLH:** 5 mg/m<sup>3</sup>

 (All the above are for *inorganic Arsenic*)

**PROTECTIVE EQUIPMENT**
**Gloves:** Nitrile and Natural Rubber

**Coveralls:** DuPont Tyvek®

**Respirator:** <0.1 mg/m<sup>3</sup> - Full facepiece APR with High efficiency filter  
 <0.5 mg/m<sup>3</sup> - Supplied air

**HEALTH EFFECTS**
**Eyes:** Irritation, burns and red watery eyes

**Skin:** Irritation, burns, rash and loss of pigment

**Inhalation:** Nose and throat irritation with coughing and wheezing, weakness, nausea, vomiting, headache and muscle cramps

**Chronic:** *Inorganic Arsenic compounds* cause skin, liver, and lung cancer in humans

**FIRST AID AND DECONTAMINATION**
**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention immediately.

**Quickly** remove contaminated clothing. Wash contaminated skin with large amounts of water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.



Common Name: **POTASSIUM CHROMATE**

Synonyms: Chromate of Potash; Dipotassium Chromate; Potassium Bichromate

CAS No: 7789-0-6

 Molecular Formula:  $K_2CrO_4$ 

RTK Substance No: 1561

Description: Yellow, odorless, crystalline solid

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>4 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 3086 ERG Guide #: 141 Hazard Class: 6.1 (Toxic)	<b>Potassium Chromate</b> is not combustible, but it is a STRONG OXIDIZER that enhances the combustion of other substances. Extinguish fire using an agent suitable for type of surrounding fire. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Chromic Oxides</i> and <i>Potassium Oxides</i> . Use water spray to keep fire-exposed containers cool.	<b>Potassium Chromate</b> may react violently with REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES) and COMBUSTIBLES (such as PAPER, WOOD and OILS). <b>Potassium Chromate</b> reacts with METALS to release flammable <i>Hydrogen gas</i> . <b>Potassium Chromate</b> is not compatible with MINERAL ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC).

## SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

Absorb liquids in dry sand, earth, or a noncombustible material and place into sealed containers for disposal.

DO NOT wash into sewer.

**Potassium Chromate** is very toxic to aquatic organisms and may cause long-term effects in the aquatic environment.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Nonflammable
<b>Vapor Pressure:</b>	0 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	2.73 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	Decomposes
<b>Melting Point:</b>	1,787°F (975°C)
<b>Molecular Weight:</b>	194.2

## EXPOSURE LIMITS

**OSHA:** 0.005 mg/m<sup>3</sup>, 8-hr TWA

**NIOSH:** 0.001 mg/m<sup>3</sup>, 10-hr Ceiling

**ACGIH:** 0.05 mg/m<sup>3</sup>, 8-hr

**IDLH:** 15 mg/m<sup>3</sup>

 (All the above are for *Chromium VI*)

The Protective Action Criteria values are:

 PAC-1 = 2 mg/m<sup>3</sup>    PAC-2 = 12.5 mg/m<sup>3</sup>

 PAC-3 = 56 mg/m<sup>3</sup>

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Nitrile and Neoprene (for <i>solid Potassium Chromate</i> )
<b>Coveralls:</b>	Tyvek® (for <i>solid Potassium Chromate</i> ) and Tychem® SL, BR, CSM, and TK (>8-hr breakthrough for <b>Potassium Chromate</b> in <i>solution</i> )
<b>Respirator:</b>	>0.001 mg/m <sup>3</sup> - full facepiece APR with <i>P100 filters</i> >2 mg/m <sup>3</sup> - SCBA

## HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns
<b>Inhalation:</b>	Nose, throat and lung irritation causing coughing, wheezing and shortness of breath
<b>Chronic:</b>	Cancer (lung, sinonasal cavity) in humans

## FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention.

**Quickly** remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary. Transfer promptly to a medical facility.

Common Name: **POTASSIUM DICHROMATE**

Synonyms: Dipotassium Dichromate; Potassium Bichromate

CAS No: 7778-50-9

 Molecular Formula:  $K_2Cr_2O_7$ 

RTK Substance No: 1564

Description: Odorless, orange to red, crystalline solid or powder

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>4 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 3085 ERG Guide #: 140 Hazard Class: 5.1 (Oxidizer)	<b>Potassium Dichromate</b> is not combustible, but it is a STRONG OXIDIZER that enhances the combustion of other substances. Use water only. DO NOT USE CHEMICAL or CO <sub>2</sub> as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Potassium Oxides</i> . Use water spray to keep fire-exposed containers cool. <b>Potassium Dichromate</b> may ignite combustibles (wood, paper and oil).	<b>Potassium Dichromate</b> reacts violently with HYDRAZINE; ANHYDROUS HYDROXYLAMINE; ETHYLENE GLYCOL; and mixtures of SULFURIC ACID and ACETONE. Combinations of <b>Potassium Dichromate</b> with BORON and SILICON, IRON or TUNGSTEN form explosive pyrotechnic mixtures. <b>Potassium Dichromate</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); and METALS.

## SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

DO NOT wash into sewer.

**Potassium Dichromate** is dangerous to aquatic life and is a hazardous air pollutant.

## PHYSICAL PROPERTIES

**Odor Threshold:** Odorless

**Flash Point:** Noncombustible

**Specific Gravity:** 2.7 (water = 1)

**Water Solubility:** Soluble

**Boiling Point:** Decomposes at 932°F (500°C)

**Melting Point:** 748°F (398°C)

**Molecular Weight:** 294.2

**pH:** 4 (1% solution)

## EXPOSURE LIMITS

**OSHA:** 0.005 mg/m<sup>3</sup>, 8-hr TWA

**NIOSH:** 0.001 mg/m<sup>3</sup>, 10-hr TWA

**ACGIH:** 0.05 mg/m<sup>3</sup>, 8-hr TWA

**IDLH:** 15 mg/m<sup>3</sup>

 (all of the above are for *Chromium VI*)

The Protective Action Criteria values are:

 PAC-1 = 1.5 mg/m<sup>3</sup> PAC-2 = 10 mg/m<sup>3</sup> PAC-3 = 42.4 mg/m<sup>3</sup>

## PROTECTIVE EQUIPMENT

**Gloves:** Neoprene and Polyvinyl Chloride (>8-hr breakthrough)

**Coveralls:** Tychem® BR, Responder® and TK (>8-hr breakthrough for *Potassium Dichromate, (saturated)*)

**Respirator:** >0.001 mg/m<sup>3</sup> - full facepiece APR with *High efficiency filters*  
 >1 mg/m<sup>3</sup> - Supplied air  
 >15 mg/m<sup>3</sup> - SCBA

## HEALTH EFFECTS

**Eyes:** Irritation, burns and possible eye damage

**Skin:** Irritation, burns, itching, rash and skin ulcers

**Inhalation:** Nose and throat irritation with coughing, wheezing

**Chronic:** *Hexavalent Chromium or Chromium VI Compounds* cause lung cancer in humans.

## FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention immediately

**Quickly** remove contaminated clothing. Immediately wash contaminated skin with large amounts of water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility

Common Name: **POTASSIUM HYDROGEN FLUORIDE**

Synonyms: Potassium Bifluoride

CAS No: 7789-29-9

 Molecular Formula: F<sub>2</sub>HK

RTK Substance No: 1568

Description: Colorless to white, crystalline substance

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 1811 ERG Guide #: 154 Hazard Class: 8 (Corrosive)	Extinguish fire using an agent suitable for type of surrounding fire. <b>Potassium Hydrogen Fluoride</b> itself does not burn. Use WATER with care as heat will be released. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Hydrogen Fluoride</i> , <i>Potassium Hydroxide</i> and <i>Potassium Fluoride</i> . Use water spray to keep fire-exposed containers cool. DO NOT get water inside containers. <b>Potassium Hydrogen Fluoride</b> may ignite combustibles (wood, paper and oil).	<b>Potassium Hydrogen Fluoride</b> may be corrosive to METALS in the presence of WATER, MOISTURE or HIGH HUMIDITY and may release flammable and explosive <i>Hydrogen gas</i> . <b>Potassium Hydrogen Fluoride</b> is not compatible with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) and STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE). Do not allow <b>Potassium Hydrogen Fluoride</b> to contact SILICA-CONTAINING MATERIALS (such as GLASS, CEMENT and PORCELAIN).

## SPILL/LEAKS

**Isolation Distance:**

Spills: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Collect powdered material in the most convenient and safe manner and deposit in sealed containers.

DO NOT wash into sewer.

May affect aquatic life.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Slightly pungent
<b>Flash Point:</b>	Nonflammable
<b>Vapor Pressure:</b>	1 mm Hg at 1,625°F (885°C)
<b>Specific Gravity:</b>	2.37 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	Decomposes
<b>Melting Point:</b>	437°F (225°C)
<b>Molecular Weight:</b>	78.1

## EXPOSURE LIMITS

<b>OSHA:</b>	2.5 mg/m <sup>3</sup> , 8-hr TWA
<b>NIOSH:</b>	2.5 mg/m <sup>3</sup> , 10-hr TWA; 5 mg/m <sup>3</sup> , 15-min Ceiling
<b>ACGIH:</b>	0.4 mg/m <sup>3</sup> , 8-hr TWA; 1.7 mg/m <sup>3</sup> , 15-min STEL
<b>IDLH:</b>	25 mg/m <sup>3</sup> (All of the above are for <i>Hydrogen Fluoride</i> )

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Neoprene and Polyvinyl Chloride for <i>solid Potassium Hydroxide Fluoride</i> and Silver Shield®/4H® for <i>Hydrogen Fluoride gas</i>
<b>Coveralls:</b>	DuPont Tychem® Polycoat, CPF 1, QC, CPF 2 and SL, for <i>solid Potassium Hydrogen Fluoride</i> ; DuPont Tychem® Responder® and TK and Saint-Gobain CHALLENGE ULTRAPRO® Vapor for <i>Hydrogen Fluoride gas</i>
<b>Respirator:</b>	For <i>solid Potassium Hydrogen Fluoride</i> - full facepiece APR with cartridges specific for <i>Hydrogen Fluoride</i> with High efficiency particulate pre-filters Use Supplied Air or SCBA if there is a potential for exposure to <i>Fluorine</i> or <i>Hydrogen Fluoride</i> .

## HEALTH EFFECTS

<b>Eyes:</b>	Severe irritation and burns
<b>Skin:</b>	Severe irritation and burns
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing and shortness of breath (pulmonary edema) Headache, nausea and vomiting

## FIRST AID AND DECONTAMINATION

<b>Remove</b> the person from exposure.
<b>Flush</b> eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention immediately.
<b>Immediately</b> flush with large amounts of water. Continue flushing while removing clothing. Apply 2.5% <i>Calcium Gluconate</i> gel to the affected skin. Seek medical assistance immediately.
<b>Begin</b> artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b> to a medical facility.
<b>Medical</b> observation is recommended as symptoms may be delayed.

Common Name: **POTASSIUM HYDROXIDE**

Synonyms: Caustic Potash; Lye; Potassium Hydrate

CAS No: 1310-58-3

Molecular Formula: KOH

RTK Substance No: 1571

Description: Odorless, white or slightly yellow, flakey or lumpy solid which is often in a water solution

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>0 - Fire</b> <b>1 - Reactivity</b> <b>DOT#:</b> UN 1813 <b>ERG Guide #:</b> 154 <b>Hazard Class:</b> 8 (Corrosive)	Extinguish fire using an agent suitable for type of surrounding fire. <b>Potassium Hydroxide</b> itself does not burn. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Potassium Oxides</i> . DO NOT get water inside containers as contact with moisture or water may generate enough heat to ignite combustibles (wood, paper and oil).	<b>Potassium Hydroxide</b> reacts violently with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC). <b>Potassium Hydroxide</b> is CORROSIVE in MOIST AIR to METALS (such as ALUMINUM, ZINC, TIN and LEAD) and forms flammable and explosive <i>Hydrogen gas</i> . <b>Potassium Hydroxide</b> is not compatible with REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES); WATER; HALOGENATED HYDROCARBONS (such as METHYLENE CHLORIDE and TRICHLOROETHYLENE); ORGANICS; NITROCARBONS; and AMMONIUM SALTS.

### SPILL/LEAKS

**Isolation Distance:**

Solid Spills: 25 meters (75 feet)

Liquid Spills: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Collect powdered material in the most convenient and safe manner and place into sealed containers for disposal.

For **Potassium Hydroxide** in *solution* absorb liquids in dry sand, earth, or a similar material and place into sealed containers for disposal.

DO NOT wash into sewer.

For water spills, neutralize with dilute acid (such as Acetic Acid).

**Potassium Hydroxide** is harmful to aquatic life in very low concentrations.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Noncombustible
<b>Vapor Pressure:</b>	1 mm Hg at 1,317°F (714°C)
<b>Specific Gravity:</b>	2.04 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	2,408°F (1,320°C)
<b>Melting Point:</b>	761°F (405°C)
<b>Molecular Weight:</b>	56.1

### EXPOSURE LIMITS

**NIOSH:** 2 mg/m<sup>3</sup>, Ceiling

**ACGIH:** 2 mg/m<sup>3</sup>, Ceiling

The Protective Action Criteria values are:

PAC-1 = 0.3 mg/m<sup>3</sup>

PAC-2 = 2 mg/m<sup>3</sup>

PAC-3 = 125 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl, Nitrile, Neoprene, Polyvinyl Chloride, Viton and Barrier® (>8-hr breakthrough for <b>Potassium Hydroxide</b> in <i>solution</i> )
<b>Coveralls:</b>	Tychem® BR, Responder® and TK (>8-hr breakthrough for <b>Potassium Hydroxide</b> in <i>solution</i> )
<b>Respirator:</b>	>2 mg/m <sup>3</sup> - full facepiece APR with High efficiency filters >20 mg/m <sup>3</sup> - SCBA

### HEALTH EFFECTS

**Eyes:** Severe irritation, burns and possible eye damage

**Skin:** Irritation and severe burns

**Inhalation:** Nose, throat and lung irritation with coughing and severe shortness of breath (pulmonary edema)

Headache, dizziness, nausea and vomiting

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Quickly** brush off excess chemical from the face. Flush with large amounts of water for at least 30 minutes. Remove contact lenses, if worn. Seek medical attention immediately.

**Quickly** remove contaminated clothing. Immediately blot or brush off excess chemical and wash with amounts of soap and water. Seek medical attention immediately.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility. Medical observation is recommended as symptoms may be delayed.

Common Name: **POTASSIUM OXIDE**

Synonyms: Potassium Monoxide; Dipotassium Oxide

CAS No: 12136-45-7

Molecular Formula: K<sub>2</sub>O

RTK Substance No: 1576

Description: Yellowish white to gray, crystalline powder

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>0 - Fire</b> <b>2 - Reactivity</b> <b>DOT#:</b> UN 2033 <b>ERG Guide #:</b> 154 <b>Hazard Class:</b> 8 (Corrosive)	<b>DOES NOT BURN</b> Use dry chemical, CO <sub>2</sub> , alcohol-resistant foam or other foam as extinguishing agents. <b>DO NOT USE WATER</b> as violent reaction may occur. <b>POISONOUS GASES ARE PRODUCED IN FIRE.</b> <b>Potassium Oxide</b> may ignite combustibles (wood, paper and oil).	<b>Potassium Oxide</b> may react violently with <b>WATER</b> to release heat and <i>Potassium Hydroxide</i> . <b>Potassium Oxide</b> is not compatible with <b>STRONG ACIDS</b> (such as <b>HYDROCHLORIC, SULFURIC</b> and <b>NITRIC</b> ).

**SPILL/LEAKS**

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Use a HEPA-filter vacuum for clean-up.

DO NOT wash into sewer.

No information about environmental impact.

**PHYSICAL PROPERTIES**

**Odor Threshold:** No information

**Flash Point:** Noncombustible

**Water Solubility:** Reactive and Soluble

**Melting Point:** 662°F (350°C)

**Molecular Weight:** 94.2

**EXPOSURE LIMITS**

No occupational exposure limits have been established for **Potassium Oxide**.

**PROTECTIVE EQUIPMENT**

**Gloves:** Neoprene (>8-hr breakthrough for *Potassium Hydroxide*)

**Coveralls:** DuPont Tychem® Polycoat, CPF 1, QC, CPF 2, and SL; Kappler Zytron® 200; and Saint-Gobain ONESuit® TEC for *hazardous dry powders and solids*

**Respirator:** Supplied air

**HEALTH EFFECTS**

**Eyes:** Severe irritation and burns

**Skin:** Severe irritation and burns

**Inhalation:** Nose, throat and lung irritation with coughing, wheezing and shortness of breath

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention immediately.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water. Seek medical attention.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** to a medical facility.



Common Name: **PROPANE**

Synonyms: Dimethylmethane; Propyl Hydride

CAS No: 74-98-6

 Molecular Formula: C<sub>3</sub>H<sub>8</sub>

RTK Substance No: 1594

Description: Colorless, odorless gas when pure, or may have a faint petroleum-like odor, and is usually shipped as a liquefied gas with a foul-smelling odorant added

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>4 - Fire</b> <b>0 - Reactivity</b>  DOT#: UN 1978 ERG Guide #: 115 Hazard Class: 2.1 (Flammable gas)	<b>FLAMMABLE GAS</b> Stop flow of gas and use water spray to disperse vapors. <b>POISONOUS GASES ARE PRODUCED IN FIRE.</b> <b>CONTAINERS MAY EXPLODE IN FIRE.</b> Use water spray to keep fire-exposed containers cool. Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source or flash back. Flow, agitation, low humidity and other factors may generate electrostatic charges resulting in fire and/or explosion. <b>Propane</b> may form an ignitable vapor/air mixture in closed tanks or containers.	<b>Propane</b> may react violently with CHLORINE DIOXIDE and other OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).

### SPILL/LEAKS

**Isolation Distance:**

Spill: 100 meters (330 feet)    Fire: 1,600 meters (1 mile)

Stop flow of gas. If source of leak is a cylinder and the leak cannot be stopped in place, remove the leaking cylinder to a safe place in the open air, and repair leak or allow cylinder to empty.

 Conduct air monitoring to determine that *Oxygen* levels are above 19.5% and the Lower Explosive Limit (LEL) is not being exceeded.

 Use only non-sparking tools and equipment, especially when opening and closing containers of **Propane**.

**Propane** may "pool" or "settle" in low areas and may remain in a fixed location for a long period of time.

 Keep **Propane** out of confined spaces, such as sewers, because of the possibility of an explosion.

Turn leaking cylinder with leak up to prevent escape of gas in liquid state.

**Propane** is not harmful to aquatic life.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	20,000 ppm
<b>Flash Point:</b>	-155°F (-104°C)
<b>LEL:</b>	2.1%
<b>UEL:</b>	9.5%
<b>Auto Ignition Temp:</b>	842°F (450°C)
<b>Vapor Density:</b>	1.6 (air = 1)
<b>Vapor Pressure:</b>	>760 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	0.58 (water = 1)
<b>Water Solubility:</b>	Slightly soluble
<b>Boiling Point:</b>	-44°F (-42°C)
<b>Freezing Point:</b>	-305.9°F (-187.7°C)
<b>Critical Temperature:</b>	207°F (97°C)
<b>Ionization Potential:</b>	11.07 eV
<b>Molecular Weight:</b>	44.09

### EXPOSURE LIMITS

**OSHA:** 1,000 ppm, 8-hr TWA  
**NIOSH:** 1,000 ppm, 10-hr TWA  
**ACGIH:** 1,000 ppm, 8-hr TWA  
**IDLH:** 2,100 ppm

The Protective Action Criteria values are:

PAC-1 = 5,500 ppm    PAC-2 = 17,000 ppm  
 PAC-3 = 33,000 ppm

### PROTECTIVE EQUIPMENT

**Gloves:**        *Insulated* Nitrile or Neoprene (>8-hr breakthrough)  
**Coveralls:**    **Use turn out gear or flash protection if ignition/fire is the greatest hazard!**  
                      Tychem® Responder® (>8-hr breakthrough)  
**Respirator:**    >1,000 ppm or <19.5% *Oxygen* - SCBA

### HEALTH EFFECTS

**Eyes:**        Contact with liquefied gas may cause frostbite  
**Skin:**        Contact with liquefied gas may cause frostbite  
**Inhalation:**    Headache, dizziness, lightheadedness, passing out, and death

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.  
**Immerse** affected part in warm water. Seek medical attention.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** promptly to a medical facility.



Common Name: **1-PROPANETHIOL**

Synonyms: n-Propyl Mercaptan; 1-Mercaptopropane

CAS No: 107-03-9

 Molecular Formula: C<sub>3</sub>H<sub>8</sub>S

RTK Substance No: 1595

Description: Colorless liquid with a skunk or cabbage-like odor

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>3 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 2402 ERG Guide #: 130 Hazard Class: 3 (Flammable)	FLAMMABLE LIQUID Use dry chemical, CO <sub>2</sub> , water spray, alcohol-resistant foam or other foam as extinguishing agents. Water may not be effective in fighting fires. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Hydrogen Sulfide</i> and <i>Sulfur Oxides</i> . CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool. Vapors may travel to a source of ignition and flash back. Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source. Flow or agitation may generate electrostatic discharges.	<b>1-Propanethiol</b> may react violently or explosively with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); ALKALI METALS (such as LITHIUM, SODIUM and POTASSIUM); and CALCIUM HYPOCHLORITE. <b>1-Propanethiol</b> is not compatible with AMINES; ETHYLENE OXIDE; and ISOCYANATES.

## SPILL/LEAKS

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers for disposal.

 Use only non-sparking tools and equipment, especially when opening and closing containers of **1-Propanethiol**.

 Keep **1-Propanethiol** out of confined spaces, such as sewers, because of the possibility of an explosion.

DO NOT wash into sewer.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	0.00075 to 0.0016 ppm
<b>Flash Point:</b>	-6°F (-21°C)
<b>Vapor Density:</b>	2.6 (air = 1)
<b>Vapor Pressure:</b>	155 mm Hg at 77°F (25°C)
<b>Specific Gravity:</b>	0.84 (water = 1)
<b>Water Solubility:</b>	Slightly soluble
<b>Boiling Point:</b>	154°F (68°C)
<b>Freezing Point:</b>	-172°F (-113.3°C)
<b>Ionization Potential:</b>	9.2 eV
<b>Molecular Weight:</b>	76.2

## EXPOSURE LIMITS

**NIOSH:** 0.5 ppm, 15-min Ceiling

The Protective Action Criteria values are:

PAC-1 = 0.075 ppm

PAC-2 = 0.5 ppm

PAC-3 = 750 ppm

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl, Viton and Barrier® (>8-hr breakthrough for <i>Sulfur compounds</i> )
<b>Coveralls:</b>	Tychem® BR, LV, Responder®, and TK (>8-hr breakthrough for <i>Sulfur compounds</i> )
<b>Respirator:</b>	<5 ppm - Full facepiece APR with <i>Organic vapor</i> cartridges >5 ppm - SCBA

## HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation and rash
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, wheezing and/or shortness of breath Headache, dizziness, convulsions and unconsciousness

## FIRST AID AND DECONTAMINATION

<b>Remove</b>	the person from exposure.
<b>Flush</b>	eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
<b>Quickly</b>	remove contaminated clothing and wash contaminated skin with large amounts of soap and water.
<b>Begin</b>	artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b>	promptly to a medical facility.

Common Name: **PROPIONIC ACID**

Synonyms: Ethylformic Acid; Methylacetic Acid; Propanoic Acid

CAS No: 79-09-4

 Molecular Formula: C<sub>3</sub>H<sub>6</sub>O<sub>2</sub>

RTK Substance No: 1599

Description: Colorless, oily liquid with a strong, unpleasant odor

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>2 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 1848 ERG Guide #: 132 Hazard Class: 8 (Corrosive)	COMBUSTIBLE LIQUID Use dry chemical, CO <sub>2</sub> , water spray or alcohol-resistant foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE. Use water spray to keep fire-exposed containers cool. Flow or agitation may generate electrostatic charges. <b>Propionic Acid</b> may form an ignitable vapor/air mixture in closed tanks or containers.	<b>Propionic Acid</b> reacts violently and explosively with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and PHOSPHORUS TRICHLORIDE. <b>Propionic Acid</b> may react violently with STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES); and AMINES. <b>Propionic Acid</b> reacts with POWDERED METALS (such as ALUMINUM and ZINC) to produce flammable and explosive <i>Hydrogen gas</i> .

## SPILL/LEAKS

## Isolation Distance:

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in dry sand, earth, or a similar material and place into sealed containers for disposal.

 Keep **Propionic Acid** out of confined spaces, such as sewers, because of the possibility of an explosion.

DO NOT wash into sewer.

Neutralize water spills with lime or soda ash.

**Propionic Acid** is harmful to aquatic organisms.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	0.026 to 0.17 ppm
<b>Flash Point:</b>	126°F (52°C)
<b>LEL:</b>	2.9%
<b>UEL:</b>	12.1%
<b>Auto Ignition Temp:</b>	869° to 955°F (465° to 513°C)
<b>Vapor Density:</b>	2.6 (air = 1)
<b>Vapor Pressure:</b>	2 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	286°F (141°C)
<b>Freezing Point:</b>	-60°F (-21°C)
<b>Ionization Potential:</b>	10.24 eV
<b>Molecular Weight:</b>	74.08

## EXPOSURE LIMITS

**NIOSH:** 10 ppm, 10-hr TWA; 15 ppm STEL

**ACGIH:** 10 ppm, 8-hr TWA

The Protective Action Criteria values are:

PAC-1 = 15 ppm PAC-2 = 15 ppm PAC-3 = 350 ppm

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl and Teflon® (>4-hr breakthrough)
<b>Coveralls:</b>	Tychem® Responder® (>8-hr breakthrough)
<b>Respirator:</b>	>10 ppm - full facepiece APR with <i>Organic Vapor filters</i> >100 ppm - SCBA

## HEALTH EFFECTS

**Eyes:** Severe irritation, burns and possible eye damage

**Skin:** Severe irritation and burns

**Inhalation:** Nose, throat and lung irritation, with coughing, wheezing and shortness of breath

Headache, nausea and abdominal pain

## FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water. Seek medical attention.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **n-PROPYL ACETATE**

Synonyms: 1-Acetoxypropane; Propyl Ethanoate

CAS No: 109-60-4

Molecular Formula: C<sub>5</sub>H<sub>10</sub>O<sub>2</sub>

RTK Substance No: 1419

Description: Clear, colorless liquid with a pleasant, fruity odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>1 - Health</b></p> <p><b>3 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p><b>DOT#:</b> UN 1276</p> <p><b>ERG Guide #:</b> 129</p> <p><b>Hazard Class:</b> 3 (Flammable)</p>	<p><b>FLAMMABLE LIQUID</b></p> <p>Use dry chemical, CO<sub>2</sub>, water spray or alcohol-resistant foam as extinguishing agents.</p> <p>Solid streams of water may be ineffective in fighting fire. <b>POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE.</b></p> <p>Use water spray to keep fire-exposed containers cool.</p> <p>Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source or flash back.</p> <p><b>n-Propyl Acetate</b> may form an ignitable vapor/air mixture in closed tanks or containers.</p>	<p><b>n-Propyl Acetate</b> may react with <b>OXIDIZING AGENTS</b> (such as <b>PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE</b>); <b>STRONG ACIDS</b> (such as <b>HYDROCHLORIC, SULFURIC and NITRIC</b>); and <b>STRONG BASES</b> (such as <b>SODIUM HYDROXIDE and POTASSIUM HYDROXIDE</b>) to cause fires and explosions.</p> <p><b>n-Propyl Acetate</b> is not compatible with <b>ALKALI METAL HYDROXIDES</b> (such as <b>LITHIUM HYDROXIDE</b>) and <b>HYDRAZINES</b>.</p>

### SPILL/LEAKS

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in dry sand, earth, or a similar material and place into sealed containers for disposal.

Use only non-sparking tools and equipment, especially when opening and closing containers of **n-Propyl Acetate**.

Metal containers involving the transfer of **n-Propyl Acetate** should be grounded and bonded.

Keep **n-Propyl Acetate** out of confined spaces, such as sewers, because of the possibility of an explosion.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	0.18 to 0.67 ppm
<b>Flash Point:</b>	55°F (13°C)
<b>LEL:</b>	1.7%
<b>UEL:</b>	8%
<b>Auto Ignition Temp:</b>	842°F (450°C)
<b>Vapor Density:</b>	3.5 (air = 1)
<b>Vapor Pressure:</b>	36 mm Hg at 77°F (25°C)
<b>Specific Gravity:</b>	0.83 (water = 1)
<b>Water Solubility:</b>	Slightly soluble
<b>Boiling Point:</b>	215°F (102°C)
<b>Freezing Point:</b>	-134°F (-92°C)
<b>Ionization Potential:</b>	10.04 eV
<b>Molecular Weight:</b>	102.13

### EXPOSURE LIMITS

**OSHA:** 200 ppm, 8-hr TWA

**NIOSH:** 200 ppm, 10-hr TWA; 250 ppm, STEL

**ACGIH:** 200 ppm, 8-hr TWA; 250 ppm, STEL

**IDLH:** 1,700 ppm

The Protective Action Criteria values are:

PAC-1 = 250 ppm PAC-2 = 250 ppm PAC-3 = 1,700 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Silver Shield®4/H® (>8-hr breakthrough)
<b>Coveralls:</b>	Tychem® F, BR and TK; Trelchem® HPS and VPS (>8-hr breakthrough for <i>Esters, carboxylic, acetate</i> )
<b>Respirator:</b>	>200 ppm - full facepiece APR with <i>Organic vapor filters</i> >250 ppm - SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose and throat irritation with coughing and wheezing  Headache, dizziness, nausea and vomiting, confusion, lightheadedness and loss of consciousness

### FIRST AID AND DECONTAMINATION

<b>Remove</b> the person from exposure.
<b>Flush</b> eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
<b>Quickly</b> remove contaminated clothing and wash contaminated skin with large amounts of soap and water.
<b>Begin</b> artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b> promptly to a medical facility.

Common Name: **PROPYLENE**

Synonyms: Propene; 1-Propylene; Methylene

CAS No: 115-07-1

Molecular Formula: C<sub>3</sub>H<sub>6</sub>

RTK Substance No: 1609

Description: Colorless gas with a slight odor or a liquid under pressure

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>1 - Health</b> <b>4 - Fire</b> <b>1 - Reactivity</b> <b>DOT#:</b> UN 1077 <b>ERG Guide #:</b> 115 <b>Hazard Class:</b> 2.1 (Flammable Gas)	<b>FLAMMABLE GAS</b> Stop flow of gas and use water spray to disperse vapors. <b>POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE.</b> Use water spray to keep fire-exposed containers cool. Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source or flash back. Flow, agitation, low humidity and other factors may generate electrostatic charges resulting in fire and/or explosion. <b>Propylene</b> may form an ignitable vapor/air mixture in closed tanks or containers.	<b>Propylene</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); SULFUR DIOXIDE; NITROGEN OXIDE; and TRIFLUOROMETHYL HYPOFLUORITE.

### SPILL/LEAKS

**Isolation Distance:**

Small Spill: 100 meters (330 feet)

Large Spill: 800 meters (1/2 mile)

Fire: 1,600 meters (1 mile)

Stop flow of gas. If source of leak is a cylinder and the leak cannot be stopped in place, remove the leaking cylinder to a safe place in the open air, and repair leak or allow cylinder to empty.

Conduct air monitoring to determine that Oxygen levels are above 19.5% and the Lower Explosive Limit (LEL) is not being exceeded.

Use only non-sparking tools and equipment, especially when opening and closing containers of **Propylene**.

**Propylene** may "pool" or "settle" in low areas and may remain in a fixed location for a long period of time.

Keep **Propylene** out of confined spaces, such as sewers, because of the possibility of an explosion.

Turn leaking cylinder with leak up to prevent escape of gas in liquid state.

**Propylene** is not harmful to aquatic life.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	23 ppm
<b>Flash Point:</b>	-162°F (-108°C)
<b>LEL:</b>	2%
<b>UEL:</b>	11.1%
<b>Auto Ignition Temp:</b>	851°F (455°C)
<b>Vapor Density:</b>	1.46 (air = 1)
<b>Vapor Pressure:</b>	760 mm Hg at -53.9°F (-47.7°C)
<b>Specific Gravity:</b>	0.609 at -52.6°F (-47°C) (liquid)
<b>Water Solubility:</b>	Slightly soluble
<b>Boiling Point:</b>	-53.9°F (-47.7°C)
<b>Melting Point:</b>	-301.4°F (-185°C)
<b>Critical Temp:</b>	197.5°F (92°C)
<b>Critical Pressure:</b>	666.3 psia
<b>Molecular Weight:</b>	42.08

### EXPOSURE LIMITS

**ACGIH:** 500 ppm, 8-hr TWA

**PAC**

**LEVELS:** PAC-1: 1,500 ppm; PAC-2: 2,800 ppm  
 PAC-3: 17,000 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	<i>Insulated</i> Nitrile or Neoprene (>8-hr breakthrough)
<b>Coveralls:</b>	<b>Use turn out gear or flash protection if ignition/fire is the greatest hazard!</b> Tychem® 10000® (>8-hr breakthrough) Trelchem® Super® (4-hr breakthrough)
<b>Respirator:</b>	>500 ppm or <19.5% <i>Oxygen</i> - SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Contact with liquefied gas may cause frostbite
<b>Skin:</b>	Contact with liquefied gas may cause frostbite
<b>Inhalation:</b>	Headache, dizziness, lightheadedness, passing out, and death

### FIRST AID AND DECONTAMINATION

<b>Remove</b> the person from exposure.
<b>Flush</b> eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
<b>Quickly</b> remove contaminated clothing and wash contaminated skin with large amounts of soap and water.
<b>Begin</b> artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b> promptly to a medical facility.

Common Name: **PROPYLENE GLYCOL**

Synonyms: 1,2-Dihydroxypropane; Methyl Ethylene Glycol; 1,2-Propanediol

CAS No: 57-55-6

Molecular Formula: C<sub>3</sub>H<sub>8</sub>O<sub>2</sub>

RTK Substance No: 3595

Description: Colorless, odorless, thick liquid

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>1 - Health</b> <b>2 - Fire</b> <b>0 - Reactivity</b> <b>DOT#:</b> None <b>ERG Guide #:</b> 153 <b>Hazard Class:</b> None	<b>COMBUSTIBLE LIQUID</b> Use dry chemical, CO <sub>2</sub> , water spray or alcohol-resistant foam as extinguishing agents. <b>POISONOUS GASES ARE PRODUCED IN FIRE.</b> <b>CONTAINERS MAY EXPLODE IN FIRE.</b> Use water spray to keep fire-exposed containers cool.	<b>Propylene Glycol</b> is not compatible with <b>OXIDIZING AGENTS</b> (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); <b>ACID CHLORIDES</b> (such as HYDROCHLORIC ACID); <b>ACID ANHYDRIDES</b> (such as ACETIC ANHYDRIDE); <b>CHLOROFORMATES</b> ; and <b>REDUCING AGENTS</b> (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES).

### SPILL/LEAKS

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers for disposal.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	210°F (99°C)
<b>LEL:</b>	2.6%
<b>UEL:</b>	12.5%
<b>Auto Ignition Temp:</b>	700°F (371°C)
<b>Vapor Density:</b>	2.62 (air = 1)
<b>Vapor Pressure:</b>	<0.1 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.04 (water = 1)
<b>Water Solubility:</b>	Miscible
<b>Boiling Point:</b>	370°F (188°C)
<b>Freezing Point:</b>	-74°F (-59°C)
<b>Molecular Weight:</b>	76.09

### EXPOSURE LIMITS

No occupational exposure limits have been established for **Propylene Glycol**.

The Protective Action Criteria values are:

PAC-1 = 10 mg/m<sup>3</sup> (3.2 ppm)

PAC-2 = 10 mg/m<sup>3</sup> (3.2 ppm)

PAC-3 = 500 mg/m<sup>3</sup> (160.6 ppm)

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl, Nitrile and Neoprene (>8-hr breakthrough)
<b>Coveralls:</b>	Tychem® BR, Responder® and TK; and Trelchem® HPS and VPS (>8-hr breakthrough for <i>Hydroxyl compounds</i> )
<b>Respirator:</b>	>10 mg/m <sup>3</sup> (3 ppm) - SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Exposure can cause headache, nausea and vomiting, dizziness, lightheadedness, and passing out

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.  
**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** promptly to a medical facility.



Common Name: **PROPYLENE GLYCOL MONOMETHYL ETHER**

Synonyms: Dowanol®; 1-Methoxy-2-Propanol; PGME

CAS No: 107-98-2

Molecular Formula: C<sub>4</sub>H<sub>10</sub>O<sub>2</sub>

RTK Substance No: 1613

Description: Colorless liquid with a sweet *Ether*-like odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>1 - Health</b></p> <p><b>3 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p><b>DOT#:</b> UN 3092</p> <p><b>ERG Guide #:</b> 129</p> <p><b>Hazard Class:</b> 3 (Flammable)</p>	<p>FLAMMABLE LIQUID</p> <p>Use dry chemical, CO<sub>2</sub>, water spray or alcohol-resistant foam as extinguishing agents.</p> <p>Water may not be effective in fighting fires.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE.</p> <p>Use water spray to keep fire-exposed containers cool.</p> <p>Vapors may travel to a source of ignition and flash back.</p> <p><b>Propylene Glycol Monomethyl Ether</b> may form an ignitable vapor/air mixture in closed tanks or containers.</p>	<p><b>Propylene Glycol Monomethyl Ether</b> may form explosive <i>Peroxides</i> during prolonged storage.</p> <p><b>Propylene Glycol Monomethyl Ether</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); ACID CHLORIDES; ACID ANHYDRIDES; ALUMINUM; COPPER; and ISOCYANATES.</p>

### SPILL/LEAKS

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers for disposal.

Use only non-sparking tools and equipment, especially when opening and closing containers of **Propylene Glycol Monoethyl Ether**.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	10 ppm
<b>Flash Point:</b>	90°F (32°C)
<b>LEL:</b>	1.6%
<b>UEL:</b>	18.8%
<b>Auto Ignition Temp:</b>	518°F (270°C)
<b>Vapor Density:</b>	3.1 (air = 1)
<b>Vapor Pressure:</b>	11.8 mm Hg at 77°F (25°C)
<b>Specific Gravity:</b>	0.92 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	248°F (120°C)
<b>Freezing Point:</b>	-139°F (-95°C)
<b>Molecular Weight:</b>	90.12

### EXPOSURE LIMITS

**NIOSH:** 100 ppm, 10-hr TWA; 150 ppm, STEL

**ACGIH:** 100 ppm, 8-hr TWA; 150 ppm, STEL

The Protective Action Criteria values are:

PAC-1 = 150 ppm PAC-2 = 300 ppm PAC-3 = 750 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl, Nitrile and Neoprene (>8-hr breakthrough)
<b>Coveralls:</b>	Tychem® BR, Responder® and TK; Trelchem® HPS and VPS (>8-hr breakthrough for <i>Dipropylene Glycol</i> )
<b>Respirator:</b>	>100 ppm - SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, wheezing and shortness of breath
	Headache, dizziness, lightheadedness, and passing out

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Remove** contaminated clothing and wash contaminated skin with water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.



Common Name: **PROPYLENE OXIDE**

Synonyms: Epoxypropane; Methyl Ethylene Oxide

CAS No: 75-56-9

Molecular Formula: C<sub>3</sub>H<sub>6</sub>O

RTK Substance No: 1615

Description: Clear, colorless liquid with an *Ether*-like odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>3 - Health</b></p> <p><b>4 - Fire</b></p> <p><b>2 - Reactivity</b></p> <p><b>DOT#:</b> UN 1280</p> <p><b>ERG Guide #:</b> 127P</p> <p><b>Hazard Class:</b> 3 (Flammable)</p>	<p>FLAMMABLE and REACTIVE</p> <p>Use dry chemical, CO<sub>2</sub>, water spray or alcohol-resistant foam as extinguishing agents.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE.</p> <p>Use water spray to keep fire-exposed containers cool and reduce vapors.</p> <p>Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source or flash back.</p> <p><b>Propylene Oxide</b> may polymerize (self-react) due to high heat or contamination resulting in container ruptures and explosions.</p>	<p><b>Propylene Oxide</b> may polymerize (self react) when exposed to HEAT; OXYGEN; AIR or FLAMES resulting in an explosion hazard.</p> <p><b>Propylene Oxide</b> reacts violently with METALS (such as IRON, TIN, ALUMINUM and COPPER); METAL ALLOYS; METAL PEROXIDES; METAL CHLORIDES; METAL HYDROXIDES; STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); and OLEUM.</p> <p><b>Propylene Oxide</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); AMINES; ACIDIC ALCOHOLS; ETHYLENE OXIDE; EPOXY RESIN; and CLAY-BASED ABSORBENTS.</p>

### SPILL/LEAKS

**Isolation Distance:**

**Small Spill:** 30 meters (100 feet)

**Large Spill:** 60 meters (200 feet)

**Fire:** 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers for disposal.

Keep **Propylene Oxide** out of confined spaces, such as sewers, because of the possibility of an explosion. DO NOT wash into sewer.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	35 to 200 ppm
<b>Flash Point:</b>	-35°F (-37°C)
<b>LEL:</b>	2%
<b>UEL:</b>	37%
<b>Auto Ignition Temp:</b>	869°F (465°C)
<b>Vapor Density:</b>	2 (air = 1)
<b>Vapor Pressure:</b>	445 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	0.83 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	94°F (34°C)
<b>Freezing Point:</b>	-170°F (-112°C)
<b>Ionization Potential:</b>	9.8
<b>Molecular Weight:</b>	58

### EXPOSURE LIMITS

**OSHA:** 100 ppm, 8-hr TWA

**NIOSH:** Lowest feasible concentration

**ACGIH:** 2 ppm, 8-hr TWA

**IDLH:** 400 ppm

ERPG-1 = 50 ppm; ERPG-2 = 250 ppm;  
ERPG-3 = 750 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Laminate Film and Barrier® (>8-hr breakthrough)
<b>Coveralls:</b>	Tychem® CPF 4, BR, LV, Responder® and TK (>8-hr breakthrough)
<b>Respirator:</b>	>2 ppm - Supplied air or SCBA

### HEALTH EFFECTS

**Eyes:** Irritation and burns

**Skin:** Irritation and burns

**Inhalation:** Nose, throat and lung irritation with coughing and severe shortness of breath (pulmonary edema)

Headache, dizziness, incoordination and passing out

**Chronic:** Cancer (nose and stomach) in animals

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

**Medical** observation is recommended as symptoms may be delayed.

# RIGHT TO KNOW

## HAZARDOUS SUBSTANCE FACT SHEET

**Common Name:** PROTHOATE

Synonyms: Trimethoate; Telefos; Fostion  
 CAS Number: 2275-18-5  
 Molecular Formula: C<sub>9</sub>H<sub>20</sub>NO<sub>3</sub>PS<sub>2</sub>  
 RTK Number: 2715  
 Description: Colorless, sand-like solid with a *Camphor*-like odor; commercial products may be mixed with organic solvents for liquid application

HAZARD DATA		
Hazard Rating	Firefighting	Reactivity
<b>Health:</b> 3 <b>Fire:</b> 1 <b>Reactivity:</b> 1 <b>DOT #:</b> UN 2783/UN 3018 <b>ERG #:</b> 152 <b>DOT Hazard:</b> 6.1 (poison)	<b>Prothoate</b> may burn but does not readily ignite. Use dry chemical, CO <sub>2</sub> , water spray, or foam extinguishers. <b>POISONOUS GASES ARE PRODUCED IN FIRE,</b> including <i>Nitrogen Oxides, Sulfur Oxides and Phosphorus Oxide fumes.</i> <b>CONTAINERS MAY EXPLODE IN FIRE.</b> Use water spray to keep fire-exposed containers cool.	<b>Prothoate</b> is not compatible with <b>STRONG BASES</b> (such as <b>SODIUM HYDROXIDE</b> and <b>POTASSIUM HYDROXIDE</b> ).

SPILLS/LEAKS
<b>Isolation Distances:</b> <b>Liquid Spill:</b> 50 meters (150 feet) <b>Solid Spill:</b> 25 meters (75 feet) <b>Fire:</b> 800 meters (1/2 mile)
Evacuate personnel. Secure and control entrance to the area. If it is safe to do so, remove potential ignition sources. Collect <i>powdered</i> material in the most convenient and safe manner and deposit in sealed containers. <b>DO NOT DRY SWEEP.</b> Absorb <i>liquids</i> in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers. Ventilate and wash area after clean-up is complete.

PHYSICAL PROPERTIES
<b>Molecular Weight:</b> 285.4 <b>Specific Gravity:</b> 1.151 at 32 °C (89.6 °F) <b>Vapor Pressure:</b> 0.0001 mm Hg at 40 °C (104 °F) <b>Water Solubility:</b> Slightly soluble <b>Melting Point</b> 28.5 °C (83.3 °F)

EXPOSURE LIMITS
There are no occupational exposure limits for this substance. <b>PAC:</b> PAC-1 = 0.15 mg/m <sup>3</sup> PAC-2 = 1.7 mg/m <sup>3</sup> PAC-3 = 10 mg/m <sup>3</sup>

PROTECTIVE EQUIPMENT	
<b>Gloves:</b>	Nitrile and Neoprene
<b>Coverall:</b>	Tychem® BR, CSM and TK, or the equivalent
<b>Respirator:</b>	High exposure – full facepiece, pressure-demand or another positive-pressure mode

ACUTE HEALTH EFFECTS
<b>Eyes:</b> Blurred vision <b>Skin:</b> Sensitization <b>Inhalation:</b> Headache, dizziness, chest tightness, twitching, loss of coordination, convulsions, coma, death

FIRST AID AND DECONTAMINATION
Immediately flush with large amounts of water for at least 15 minutes. Quickly remove contaminated clothing. Immediately wash area with large amounts of soap and water. Shampoo hair promptly if contaminated. Remove the person from exposure. Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped. Transfer promptly to a medical facility. Medical observation is required for several days as symptoms may be delayed.

Common Name: **PSEUDOCUMENE**

Synonyms: 1,2,4-Trimethylbenzene; Psicumene; Pseudocumol

CAS No: 95-63-6

 Molecular Formula: C<sub>9</sub>H<sub>12</sub>

RTK Substance No: 2716

Description: Clear, colorless liquid with a distinctive, sweet odor

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>1 - Health</b> <b>2 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 2325 ERG Guide #: 129 Hazard Class: 3 (Flammable)	<b>Pseudocumene</b> is a COMBUSTIBLE LIQUID. Use dry chemical, CO <sub>2</sub> , water spray, alcohol-resistant foam or other foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE. Use water spray to keep fire-exposed containers cool. Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source	<b>Pseudocumene</b> may react violently with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and NITRIC ACID to cause fires and explosions.

**SPILL/LEAKS**
**Isolation Distance:**

Small Spill: 60 meters (200 feet)

Large Spill: 300 meters (1,000 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.

DO NOT wash into sewer.

This substance is toxic to aquatic organisms and may bioaccumulate in fish.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	0.4 ppm
<b>Flash Point:</b>	112°F (44°C)
<b>LEL:</b>	0.9%
<b>UEL:</b>	6.4%
<b>Vapor Density:</b>	4.15 (air = 1)
<b>Vapor Pressure:</b>	2.1 mm Hg at 77°F (25°C)
<b>Specific Gravity:</b>	0.88 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	329°F (165°C)
<b>Ionization Potential:</b>	8.27 eV
<b>Molecular Weight:</b>	120.2

**EXPOSURE LIMITS**

<b>OSHA:</b>	None
<b>NIOSH:</b>	25 ppm, 10-hr TWA
<b>ACGIH:</b>	25 ppm, 8-hr TWA
<b>IDLH:</b>	None

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	NITRI-SOLVE® (<6-hr breakthrough)
<b>Coveralls:</b>	DuPont Tychem® Polycoat and Responder®; Kappler® Zytron® 500; and Saint-Gobain ONESuit® TEC for <i>Aromatic Hydrocarbons</i> (>8-hr breakthrough)
<b>Respirator:</b>	<25 ppm - Full facepiece APR with Organic vapor cartridge >250 ppm - Supplied air

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, wheezing and shortness of breath  Headache, nausea, vomiting, dizziness, lack of coordination and confusion

**FIRST AID AND DECONTAMINATION**

<b>Remove</b> the person from exposure.
<b>Flush</b> eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
<b>Quickly</b> remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water.
<b>Begin</b> artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b> to a medical facility.

Common Name: **QUINOLINE**

Synonyms: Benzo(b)Pyridine; Chinoline; Leukol

CAS No: 91-22-5

 Molecular Formula: C<sub>9</sub>H<sub>7</sub>N

RTK Substance No: 1628

Description: Colorless liquid with a strong, characteristic odor, which turns brown when exposed to light

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>2 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 2656 ERG Guide #: 154 Hazard Class: 6.1 (Poisonous material)	<b>COMBUSTIBLE LIQUID</b> Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. <b>POISONOUS GASES ARE PRODUCED IN FIRE, including Nitrogen Oxides.</b> <b>CONTAINERS MAY EXPLODE IN FIRE.</b> Use water spray to keep fire-exposed containers cool.	<b>Quinoline</b> may explode and/or react violently with HYDROGEN PEROXIDE; PERCHROMATES; DINITROGEN TETROXIDE; and MALEIC ANHYDRIDE. Reactions with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) may be violent. <b>Quinoline</b> is not compatible with ORGANIC ANHYDRIDES; ALKYLENE OXIDES; EPICHLOROHYDRIN; ALDEHYDES; ALCOHOLS; GLYCOLS; PHENOLS; CRESOLS; CAPROLACTAM SOLUTION; and mixtures of LINSEED OIL and THIONYL CHLORIDE. <b>Quinoline</b> is hygroscopic.

**SPILL/LEAKS**
**Isolation Distance:**

Spills: 50 meters (150 feet)

Fires: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers for disposal.

DO NOT wash into sewer.

**Quinoline** is harmful to aquatic life in very low concentrations.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	0.015 to 71 ppm
<b>Flash Point:</b>	138° to 214°F (59° to 101°C)
<b>LEL:</b>	1.2%
<b>Auto Ignition Temp:</b>	896°F (480°C)
<b>Vapor Density:</b>	4.5 (air = 1)
<b>Vapor Pressure:</b>	5 mm Hg at 194°F (90°C)
<b>Specific Gravity:</b>	1.1 (water = 1)
<b>Water Solubility:</b>	Slightly soluble
<b>Boiling Point:</b>	460°F (238°C)
<b>Melting Point:</b>	5°F (-15°C)
<b>Molecular Weight:</b>	129

**EXPOSURE LIMITS**

AIHA: 0.001 ppm, 8-hr TWA WEEL

The Protective Action Criteria values are:

PAC-1 = 0.6 ppm

PAC-2 = 5 ppm

PAC-3 = 25 ppm

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Silver Shield®/4H® (>4-hr breakthrough)
<b>Coveralls:</b>	Tychem® BR, LV, Responder®, and TK (>4-hr breakthrough for <i>Heterocyclic compounds, Nitrogen</i> )
<b>Respirator:</b>	<0.01 - Full facepiece APR with Organic vapor cartridge >0.01 - Supplied air >0.6 - SCBA

**HEALTH EFFECTS**
**Eyes:** Irritation and burns

**Skin:** Irritation and burns

**Inhalation:** Nose, throat and lung irritation with coughing, wheezing and shortness of breath

Headache, nausea, vomiting, fever, fatigue and dizziness

**Chronic:** Cancer (liver) in animals

**FIRST AID AND DECONTAMINATION**
**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility

Common Name: **QUINTOZENE**

Synonyms: Avicol®; Pentachloronitrobenzene; PCNB; Terraclor®

CAS No: 82-68-8

 Molecular Formula: C<sub>6</sub>Cl<sub>5</sub>NO<sub>2</sub>

RTK Substance No: 1630

Description: Colorless, crystalline solid when pure, or a yellow to cream-colored powder, with a musty odor

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 3077 ERG Guide #: 171 Hazard Class: 9 (Environmentally Hazardous Material)	<b>Quintozene</b> can burn, and may also be dissolved in a liquid carrier that is flammable or combustible. Use dry chemical, CO <sub>2</sub> , water fog or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Hydrogen Chloride</i> and <i>Nitrogen Oxides</i> . Use water spray to keep fire-exposed containers cool.	<b>Quintozene</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); and STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE).

**SPILL/LEAKS**
**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

DO NOT wash into sewer.

**Quintozene** is very toxic to aquatic organisms and bioaccumulation may occur.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	Musty odor
<b>Vapor Density:</b>	10.2 (air = 1)
<b>Vapor Pressure:</b>	0.013 mm Hg at 77°F (25°C)
<b>Specific Gravity:</b>	1.72 (water = 1)
<b>Water Solubility:</b>	Very slightly soluble
<b>Boiling Point:</b>	622°F (328°C)
<b>Melting Point:</b>	291°F (144°C)
<b>Molecular Weight:</b>	295.3

**EXPOSURE LIMITS**
**ACGIH:** 0.5 mg/m<sup>3</sup>, 8-hr TWA

The Protective Action Criteria values are:

 PAC-1 = 1.5 mg/m<sup>3</sup>

 PAC-2 = 300 mg/m<sup>3</sup>

 PAC-3 = 500 mg/m<sup>3</sup>
**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Viton or Barrier® (>8-hr breakthrough for <i>Halogen compounds, aromatic</i> )
<b>Coveralls:</b>	Tyvek®
<b>Respirator:</b>	>0.5 mg/m <sup>3</sup> - Full facepiece APR with Organic vapor/Acid gas cartridges and High efficiency particulate prefilters >1.5 mg/m <sup>3</sup> - SCBA

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation and corneal injury
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Dizziness, convulsions, nausea and vomiting  Headache, fatigue and blue color to the skin and lips ( <i>Methemoglobinemia</i> )

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.  
**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** promptly to a medical facility.

Common Name: **RESMETHRIN**

Synonyms: Benzofuroline; Chryson; Vectrin

CAS No: 10453-86-8

Molecular Formula: C<sub>22</sub>H<sub>26</sub>O<sub>3</sub>

RTK Substance No: 3450

Description: Waxy, white to tan solid or colorless crystal, *Pyrethroid* insecticide

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>2 - Health</b></p> <p><b>1 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p><b>DOT#:</b> UN 2902</p> <p><b>ERG Guide #:</b> 151</p> <p><b>Hazard Class:</b> 6.1 (Poison)</p>	<p><b>Resmethrin</b> does not burn, however, it is often dissolved in a liquid carrier which may be flammable or combustible.</p> <p>Use dry chemical, CO<sub>2</sub>, water spray or foam as extinguishing agents.</p> <p><b>POISONOUS GASES ARE PRODUCED IN FIRE.</b></p> <p>Use water spray to keep fire-exposed containers cool.</p>	<p><b>Resmethrin</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and STRONG BASES (such as SODIUM HYDROXIDE, POTASSIUM HYDROXIDE and LIME).</p>

### SPILL/LEAKS

**Isolation Distance:**

Spill (solid): 25 meters (75 feet)

(liquid): 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb **Resmethrin** in *solution* in dry sand, earth, or a similar material and place into sealed containers for disposal.

Moisten *solid* spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

**Resmethrin** is very toxic to honeybees and potentially toxic to fish.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Chrysanthemum-like
<b>Flash Point:</b>	Flammable/Combustible
<b>Vapor Pressure:</b>	1.13 x 10 <sup>-8</sup> mm Hg at 86°F (30°C)
<b>Water Solubility:</b>	Insoluble
<b>Melting Point:</b>	43° to 48°F (6° to 9°C)
<b>Molecular Weight:</b>	338.4

### EXPOSURE LIMITS

No occupational exposure limits have been established for **Resmethrin**.

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Nitrile (for <i>solid Resmethrin</i> ) Silver Shield®/4H® and Barrier® (>8-hr breakthrough for <b>Resmethrin</b> in <i>solution</i> )
<b>Coveralls:</b>	Tyvek® (for <i>solid Resmethrin</i> ) Tychem® BR, CSM and TK (>8-hr breakthrough for <b>Resmethrin</b> in <i>solution</i> )
<b>Respirator:</b>	Spill: full facepiece APR with <i>Organic vapor</i> and <i>P100</i> cartridges Fire: SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation, burns, itching, rash and redness (skin absorbable)
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, wheezing and shortness of breath  Headache, dizziness, fatigue, muscle weakness, nausea and vomiting

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.



Common Name: **RESORCINOL**

Synonyms: 1,3-Dihydroxybenzene; 3-Hydroxyphenol; 1,3-Benzenediol

CAS No: 108-46-3

 Molecular Formula: C<sub>6</sub>H<sub>4</sub>(OH)<sub>2</sub>

RTK Substance No: 1634

Description: White, crystalline solid that turns pink on exposure to light and air

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 2876 ERG Guide #: 153 Hazard Class: 6.1 (Poison)	<b>COMBUSTIBLE SOLID</b> Use dry chemical, CO <sub>2</sub> , alcohol-resistant foam or other foam extinguishing agents, as water may not be effective in fighting fires. <b>POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE.</b> Use water spray to keep fire-exposed containers cool.	<b>Resorcinol</b> may react explosively with NITRIC ACID. <b>Resorcinol</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); ACIDS (such as HYDROCHLORIC, SULFURIC and ACETIC); ACID CHLORIDES; ACID ANHYDRIDES; IRON and IRON SALTS; ALBUMIN; CAMPHOR; URETHANE; MENTHOL; ACETANILIDE; and ANTIPYRINE. <b>Resorcinol</b> absorbs moisture from the air.

**SPILL/LEAKS**
**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

 Cover *liquid* spills with dry lime, sand or soda ash and place into sealed containers for disposal.

DO NOT wash into sewer.

**Resorcinol** is harmful to aquatic life at very low concentrations.

**PHYSICAL PROPERTIES**

<b>Flash Point:</b>	261°F (127°C)
<b>LEL:</b>	1.4%
<b>Auto Ignition Temp:</b>	1,125°F (607°C)
<b>Vapor Density:</b>	3.79 (air = 1)
<b>Vapor Pressure:</b>	1 mm Hg at 227°F (108°C)
<b>Specific Gravity:</b>	1.2 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	531° to 536°F (277° to 280°C)
<b>Melting Point:</b>	228° to 232°F (109° to 111°C)
<b>Ionization Potential:</b>	8.63 eV
<b>Molecular Weight:</b>	110.18
<b>pH:</b>	5.2

**EXPOSURE LIMITS**
**NIOSH:** 45 mg/m<sup>3</sup> (10 ppm), 10-hr TWA; 90 mg/m<sup>3</sup> (20 ppm), STEL

**ACGIH:** 45 mg/m<sup>3</sup> (10 ppm), 8-hr TWA; 90 mg/m<sup>3</sup> (20 ppm), STEL

The Protective Action Criteria values are:

 PAC-1 = 75 mg/m<sup>3</sup>    PAC-2 = 75 mg/m<sup>3</sup>

 PAC-3 = 75 mg/m<sup>3</sup>
**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Nitrile and Natural Rubber
<b>Coveralls:</b>	Tyvek®
<b>Respirator:</b>	>45 mg/m <sup>3</sup> - full facepiece APR with <i>Organic vapor cartridges</i> and <i>P100 prefilters</i> >75 mg/m <sup>3</sup> - SCBA

**HEALTH EFFECTS**
**Eyes:** Irritation and burns

**Skin:** Irritation and burns

**Inhalation:** Nose, throat and lung irritation, with coughing, wheezing and shortness of breath

Headache, fatigue and blue color to the skin and lips (methemoglobinemia)

**FIRST AID AND DECONTAMINATION**
**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

# RIGHT TO KNOW

## HAZARDOUS SUBSTANCE FACT SHEET

**Common Name: RONNEL**

Synonyms: Fenchlorophos; Dimethyl Trichlorophenyl Thiophosphate; Trolene; Etrolene; Nankor; Korlan; Viozene; Ectoral

CAS Number: 299-84-3

Molecular Formula:  $(\text{CH}_3\text{O})_2\text{P}(\text{S})\text{OC}_6\text{H}_2\text{Cl}_3$

RTK Number: 1637

Description: White to tan powder or waxy solid, commercial preparations included liquid and granular forms

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>Health:</b> 3 <b>Fire:</b> 1 <b>Reactivity:</b> 1 <b>DOT #:</b> UN 2783/UN3018 <b>ERG #:</b> 152 <b>DOT Hazard:</b> 6.1 (toxic)	Use dry chemical, CO <sub>2</sub> , water spray, or a foaming agent. <b>POISONOUS GASES ARE PRODUCED IN FIRE, including Sulfur Oxides, Dimethyl Sulfide, Trichlorophenol, Phosphorous Oxides and Chlorine.</b>	<b>Ronnel is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and ALKALINE PESTICIDES.</b>

### SPILLS/LEAKS

**Isolation Distances:**

**Liquid Spill:** 50 meters (150 feet)  
**Solid Spill:** 25 meters (75 feet)  
**Fire:** 800 meters (1/2 miles)

Evacuate personnel.  
 Secure and control entrance to the area.  
 If it is safe to do so, remove potential ignition sources.  
 Collect *powdered* material in the most convenient and safe manner and deposit in sealed containers.  
**DO NOT DRY SWEEP.**  
 Absorb *liquids* in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.  
 Do not allow this substance to enter waterways, including sewers, as it is very hazardous to aquatic life with long-lasting effects.  
 Ventilate and wash area after clean-up is complete.

### PHYSICAL PROPERTIES

**Melting Point:** 41 °C (106 °F)  
**Specific Gravity:** 1.49 at 25 °C (77 °F)  
**Molecular Weight:** 321.6  
**Vapor Pressure:** 0.0008 mm Hg at 25 °C (77 °F)  
**Water Solubility:** Insoluble

### EXPOSURE LIMITS

The following exposure limits are for **Ronnel**:

**OSHA:** 15 mg/m<sup>3</sup> – 8-hour average  
**NIOSH:** 10 mg/m<sup>3</sup> – 10-hour average  
**ACGIH:** 5 mg/m<sup>3</sup> (*inhalable fraction*) – 8-hour average  
**IDLH:** 300 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Nitrile and Neoprene
<b>Coverall:</b>	Tychem® BR, CSM and TK, or the equivalent
<b>Respirator:</b>	<b>&gt;5 mg/m<sup>3</sup></b> - full facepiece respirator, organic vapor cartridge, particulate prefilters <b>&gt;15 mg/m<sup>3</sup></b> - supplied-air respirator, full facepiece pressure-demand or other positive-pressure mode <b>≥300 mg/m<sup>3</sup></b> - SCBA, full facepiece, pressure-demand or another positive-pressure mode

### ACUTE HEALTH EFFECTS

**Eyes:** Irritation  
**Skin:** Irritation  
**Inhalation:** Irritation, headache, dizziness, blurred vision, chest tightness, twitching, loss of coordination, convulsions, coma, death

### FIRST AID AND DECONTAMINATION

Immediately flush eyes with large amounts of water for at least 15 minutes.  
 Quickly remove contaminated clothing. Immediately wash area with large amounts of soap and water.  
 Shampoo hair promptly if contaminated.  
 Remove the person from exposure.  
 Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.  
 Medical observation is recommended for several days following exposure as symptoms may be delayed.  
 Transfer promptly to a medical facility.

Common Name: **SAFROLE**

Synonyms: 5-Allyl-1,3-Benzodioxole; 1,2-Methylenedioxy-4-Allylbenzene

CAS No: 94-59-7

 Molecular Formula: C<sub>10</sub>H<sub>10</sub>O<sub>2</sub>

RTK Substance No: 1642

Description: Clear, colorless or slightly yellow liquid with a sassafras odor

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 3082 ERG Guide #: 171 Hazard Class: 9 (Miscellaneous Hazardous Material)	COMBUSTIBLE LIQUID Use dry chemical or CO <sub>2</sub> as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE. Use water spray to keep fire-exposed containers cool.	<b>Safrole</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).

**SPILL/LEAKS**
**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers for disposal.

 Wash spill area with 60 to 70% *Ethanol* followed by a soap and water solution.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	Sassafras odor
<b>Flash Point:</b>	207° to 212°F (97° to 100°C)
<b>Vapor Pressure:</b>	1 mm Hg at 147°F (64°C)
<b>Specific Gravity:</b>	1.09 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	450° to 453°F (232° to 234°C)
<b>Freezing Point:</b>	52.2°F (11.2°C)
<b>Molecular Weight:</b>	162.12

**EXPOSURE LIMITS**

 No occupational exposure limits have been established for **Safrole**.

The Protective Action Criteria values are:

 PAC-1 = 15 mg/m<sup>3</sup>

 PAC-2 = 100 mg/m<sup>3</sup>

 PAC-3 = 500 mg/m<sup>3</sup>
**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	SilverShield®/4H® and Viton (>8-hr breakthrough for <i>Hydrocarbons, aliphatic, unsaturated</i> )
<b>Coveralls:</b>	Tychem® F, BR, Responder® and TK, and Trelchem® HPS and VPS (>8-hr breakthrough for <i>Hydrocarbons, aliphatic, unsaturated</i> )
<b>Respirator:</b>	<15 mg/m <sup>3</sup> - full facepiece APR with <i>Organic vapor/Acid gas</i> cartridges and <i>High efficiency prefilters</i> >15 mg/m <sup>3</sup> - SCBA

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Headache, dizziness, convulsions, excitement and even unconsciousness
<b>Chronic:</b>	Cancer (liver) in animals

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.  
**Remove** contaminated clothing and wash contaminated skin with soap and water.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** promptly to a medical facility.

Common Name: **SILICA, CRISTOBALITE**

Synonyms: Calcined Diatomaceous Earth; Crystalline Silicon Dioxide, Crystobalite

CAS No: 14464-46-1

Molecular Formula: SiO<sub>2</sub>

RTK Substance No: 1657

Description: Colorless, odorless, crystalline solid

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>4 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b>  DOT#: None ERG Guide #: None Hazard Class: None	Extinguish fire using an agent suitable for type of surrounding fire. <b>Silica, Cristobalite</b> itself does not burn.	<b>Silica, Cristobalite</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); ACETYLENE; and AMMONIA.

**SPILL/LEAKS**

**Isolation Distance:**

Spill: 25 meters (75 feet)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Noncombustible
<b>Vapor Pressure:</b>	0 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	2.32 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	4,046°F (2,230°C)
<b>Melting Point:</b>	3,133°F (1,723°C)
<b>Molecular Weight:</b>	60.08

**EXPOSURE LIMITS**

**NIOSH:** 0.05 mg/m<sup>3</sup>, 10-hr TWA

**ACGIH:** 0.025 mg/m<sup>3</sup>, 8-hr TWA

**IDLH:** 25 mg/m<sup>3</sup>

The Protective Action Criteria values are:

PAC-1 = 0.075 mg/m<sup>3</sup>

PAC-2 = 25 mg/m<sup>3</sup>

PAC-3 = 25 mg/m<sup>3</sup>

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Nitrile and Natural Rubber
<b>Coveralls:</b>	Tyvek®
<b>Respirator:</b>	<0.5 mg/m <sup>3</sup> - Full facepiece APR with <i>High efficiency filter</i> >0.5 mg/m <sup>3</sup> - SCBA

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose and lung irritation with cough and shortness of breath ( <i>Silicosis</i> )
<b>Chronic:</b>	<i>Crystalline Silica</i> causes cancer (lung) in humans.

**FIRST AID AND DECONTAMINATION**

<b>Remove</b> the person from exposure.
<b>Flush</b> eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
<b>Remove</b> contaminated clothing and wash contaminated skin with soap and water.
<b>Begin</b> artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b> promptly to a medical facility.

Common Name: **SILICA, QUARTZ**

Synonyms: Silica, Crystalline; Crystallized Silicon Dioxide

CAS No: 14808-60-7

Molecular Formula: SiO<sub>2</sub>

RTK Substance No: 1660

Description: Odorless, colorless, white or reddish crystalline solid

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>4 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> <b>DOT#: None</b> <b>ERG Guide #: None</b> <b>Hazard Class: None</b>	Extinguish fire using an agent suitable for type of surrounding fire. <b>Silica, Quartz</b> itself does not burn.	<b>Silica, Quartz</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); ACETYLENE; AMMONIA; HYDROGEN FLUORIDE; and CATECHOL.

**SPILL/LEAKS**

**Isolation Distance:**

Spill: 25 meters (75 feet)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Noncombustible
<b>Vapor Pressure:</b>	0 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	2.6 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	4,046°F (2,230°C)
<b>Melting Point:</b>	3,110°F (1,719°C)
<b>Molecular Weight:</b>	60.09

**EXPOSURE LIMITS**

**NIOSH:** 0.1 mg/m<sup>3</sup>, 10-hr TWA

**ACGIH:** 0.025 mg/m<sup>3</sup>, 8-hr TWA

**IDLH:** 50 mg/m<sup>3</sup>

The Protective Action Criteria values are:

PAC-1 = 0.075 mg/m<sup>3</sup> PAC-2 = 33 mg/m<sup>3</sup>

PAC-3 = 200 mg/m<sup>3</sup>

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Nitrile and Natural Rubber
<b>Coveralls:</b>	Tyvek®
<b>Respirator:</b>	<1 mg/m <sup>3</sup> - Full facepiece APR with <i>High efficiency filter</i> >1 mg/m <sup>3</sup> - SCBA

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose and lung irritation with cough, and shortness of breath ( <i>Silicosis</i> )
<b>Chronic:</b>	<i>Crystalline Silica</i> causes cancer (lung) in humans.

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.  
**Remove** contaminated clothing and wash contaminated skin with soap and water.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** promptly to a medical facility.

Common Name: **SILICA, TRIDYMITE**

Synonyms: Crystalline Silica, Tridymite; Crystalline Silicon Dioxide, Tridymite

CAS No: 15468-32-3

Molecular Formula: SiO<sub>2</sub>

RTK Substance No: 1663

Description: White or colorless, crystalline solid

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<p><b>4 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b></p> <p>DOT#: None ERG Guide #: None Hazard Class: None</p>	<p>Extinguish fire using an agent suitable for type of surrounding fire. <b>Silica, Tridymite</b> itself does not burn.</p>	<p><b>Silica, Tridymite</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); ACETYLENE; AMMONIA; HYDROGEN FLUORIDE; and CATECHOL.</p>

**SPILL/LEAKS**

**Isolation Distance:**

Spill: 25 meters (75 feet)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Noncombustible
<b>Vapor Pressure:</b>	0 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	2.3 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	4,046°F (2,230°C)
<b>Melting Point:</b>	3,097°F (1,703°C)
<b>Molecular Weight:</b>	60.09

**EXPOSURE LIMITS**

**NIOSH:** 0.05 mg/m<sup>3</sup>; 10-hr TWA

**IDLH:** 25 mg/m<sup>3</sup>

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Nitrile and Natural Rubber
<b>Coveralls:</b>	Tyvek®
<b>Respirator:</b>	<0.5 mg/m <sup>3</sup> - full facepiece APR with <i>High efficiency filter</i> >0.05 mg/m <sup>3</sup> - SCBA

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose and lung irritation with cough and shortness of breath ( <i>Silicosis</i> )
<b>Chronic:</b>	<i>Crystalline Silica</i> causes cancer (lung) in humans.

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.  
**Remove** contaminated clothing and wash contaminated skin with soap and water.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** promptly to a medical facility.



Common Name: **SILICA, TRIPOLI**

Synonyms: Silica, Crystalline-Tripoli; alpha-Quartz

CAS No: 1317-95-9

Molecular Formula: SiO<sub>2</sub>

RTK Substance No: 1664

Description: Colorless, odorless mineral solid

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>4 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b>  DOT#: None ERG Guide #: None Hazard Class: None	Extinguish fire using an agent suitable for type of surrounding fire. <b>Silica, Tripoli</b> itself does not burn.	<b>Silica, Tripoli</b> reacts with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).  <b>Silica, Tripoli</b> is not compatible with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); ACETYLENE; and AMMONIA.

**SPILL/LEAKS**

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Nonflammable
<b>Vapor Pressure:</b>	0 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	2.2 to 2.65 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	4,046°F (2,230°C)
<b>Melting Point:</b>	2,984° to 3,105°F (1,640° to 1,707°C)
<b>Molecular Weight:</b>	60.1

**EXPOSURE LIMITS**

**ACGIH:** 0.025 mg/m<sup>3</sup> (as the *respirable fraction*)

The Protective Action Criteria values are:

PAC-1 = 0.3 mg/m<sup>3</sup>

PAC-2 = 0.3 mg/m<sup>3</sup>

PAC-3 = 50 mg/m<sup>3</sup>

(All of the above as *Silica, Crystalline-Quartz*)

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Nitrile and Natural Rubber
<b>Coveralls:</b>	Tyvek®
<b>Respirator:</b>	APR with high <i>efficiency filters</i> >25 mg/m <sup>3</sup> - SCBA

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation
<b>Skin:</b>	No information
<b>Inhalation:</b>	Nose and lung irritation with cough, and shortness of breath ( <i>Silicosis</i> )
<b>Chronic:</b>	<i>Crystalline Silica</i> causes cancer (lung) in humans

**FIRST AID AND DECONTAMINATION**

<b>Remove</b> the person from exposure.
<b>Flush</b> eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
<b>Remove</b> contaminated clothing and wash contaminated skin with soap and water.
<b>Begin</b> artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b> promptly to a medical facility.

Common Name: **SILICOFLUORIC ACID**

Synonyms: Fluorosilicic Acid; Hydrofluorosilicic Acid; Sand Acid

CAS No: 16961-83-4

 Molecular Formula: H<sub>2</sub>SiF<sub>6</sub>

RTK Substance No: 1665

Description: Fuming, colorless to pale, straw-colored liquid with a sharp, irritating odor

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>0 - Fire</b> <b>1 - Reactivity</b> DOT#: UN 1778 ERG Guide #: 154 Hazard Class: 8 (Corrosive)	Extinguish fire using an agent suitable for type of surrounding fire. <b>Silicofluoric Acid</b> itself does not burn. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Hydrogen Fluoride</i> and <i>Silicon Tetrafluoride</i> . CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool.	<b>Silicofluoric Acid</b> may react with WATER and MOIST AIR to form toxic and/or flammable <i>Hydrogen Fluoride</i> and <i>Hydrogen</i> gases, especially in confined spaces. <b>Silicofluoric Acid</b> reacts violently with STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); AMINES; ACTIVE METALS (such as POTASSIUM, SODIUM, MAGNESIUM and ZINC); AMIDES; and CYANIDES to produce flammable and explosive <i>Hydrogen</i> gas, toxic gases (such as <i>Hydrogen Cyanide</i> ) and heat. <b>Silicofluoric Acid</b> is not compatible with COMBUSTIBLE MATERIALS; OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); and STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC). <i>Anhydrous Silicofluoric Acid</i> will separate quickly in AIR to form <i>Silicon Tetrafluoride</i> and <i>Hydrogen Fluoride</i> .

## SPILL/LEAKS

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers for disposal.

 Keep **Silicofluoric Acid** out of confined spaces, such as sewers, because of the possibility of an explosion.

DO NOT wash into sewer.

May be hazardous to the environment and aquatic organisms.

## PHYSICAL PROPERTIES

**Odor Threshold:** Sharp, irritating odor

**Flash Point:** Noncombustible

**Specific Gravity:** 1.3 (water = 1)

**Water Solubility:** Soluble (releases Heat)

**Boiling Point:** Decomposes

**Freezing Point:** 4°F (-15.5°C)

**Molecular Weight:** 144.1

## EXPOSURE LIMITS

**ACGIH:** 0.5 ppm, 8-hr TWA; 2 ppm Ceiling (for *Hydrogen Fluoride*)

**IDLH:** 30 ppm (for *Hydrogen Fluoride*)

The Protective Action Criteria values are:

PAC-1 = 12 ppm      PAC-3 = 60 ppm

PAC-2 = 16 ppm

## PROTECTIVE EQUIPMENT

**Gloves:** Butyl, Silver Shield®/4H®, Viton and Barrier® (>8-hr breakthrough for *Hydrogen Fluoride*)

**Coveralls:** Tychem® BR, LV, Responder®, and TK; and Trelchem® HPS and VPS (>8-hr breakthrough)

**Respirator:** >0.5 ppm - Full facepiece APR with acid gas cartridges specific for *Hydrogen Fluoride*  
 >5 ppm - SCBA

## HEALTH EFFECTS

**Eyes:** Severe irritation and burns

**Skin:** Severe irritation and burns

**Inhalation:** Nose, throat and lung irritation with coughing and severe shortness of breath (pulmonary edema)

Headache, nausea and vomiting, weakness, convulsions and collapse

## FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention immediately.

**Immediately** flush with large amounts of water. Continue flushing while removing clothing. Apply 2.5% *Calcium Gluconate* gel to the affected skin. Seek medical assistance immediately.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

**Medical** observation is recommended as symptoms may be delayed.

Common Name: **SILICON TETRACHLORIDE**

Synonyms: Silicon Chloride; Tetrachlorosilicon

CAS No: 10026-04-7

Molecular Formula: SiCl<sub>4</sub>

RTK Substance No: 1666

Description: Clear, colorless, fuming liquid with an irritating odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>3 - Health</b></p> <p><b>0 - Fire</b></p> <p><b>2W - Reactivity</b></p> <p><b>DOT#:</b> UN 1818</p> <p><b>ERG Guide #:</b> 157</p> <p><b>Hazard Class:</b> 8 (Corrosive)</p>	<p><b>CORROSIVE AND WATER REACTIVE</b></p> <p>Extinguish fire using an agent suitable for type of surrounding fire. <b>Silicon Tetrachloride</b> itself does not burn.</p> <p><b>Silicon Tetrachloride</b> may react with WATER and FOAM to release toxic and corrosive gases.</p> <p>When using Alcohol Resistant Aqueous Film Forming Foam (AR-AFFF) use at medium expansion and carefully float onto spill to form a continuous layer.</p> <p><b>POISONOUS GASES ARE PRODUCED IN FIRE, including Hydrogen Chloride and Silicon Oxide.</b></p> <p><b>CONTAINERS MAY EXPLODE IN FIRE.</b></p> <p>Use water spray to keep fire-exposed containers cool but <b>DO NOT</b> get water into containers.</p>	<p><b>Silicon Tetrachloride</b> reacts violently with WATER and MOIST AIR to form heat, and toxic and corrosive Hydrogen Chloride gas. Contact between Hydrogen Chloride gas and METALS may release flammable and explosive <i>Hydrogen gas</i>.</p> <p><b>Silicon Tetrachloride</b> reacts violently with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); ALCOHOLS; STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); KETONES; and ALDEHYDES.</p> <p>Prevent contact with LIGHT, HEAT and AIR.</p>

### SPILL/LEAKS

**Isolation Distance:**

Spill (small): 30 meters (100 feet)  
(large): 100 meters (300 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in dry sand, earth, or a similar material and place into sealed containers for disposal.

AR-AFF Foam can be used to suppress vapors and blanket release.

**Silicon Tetrachloride** spilled in water produces large amounts of *Hydrogen Chloride*.

Neutralize spills using *Sodium Hydroxide* with a 1 to 1 ratio of *Sodium Hydroxide* to *Chlorosilane* or use a 2 to 1 ratio of *Sodium Bicarbonate* to *Chlorosilane*.

Keep **Silicon Tetrachloride** out of confined spaces, such as sewers, because of the possibility of an explosion.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	1 to 5 ppm
<b>Flash Point:</b>	Nonflammable
<b>Vapor Density:</b>	5.8 (air = 1)
<b>Vapor Pressure:</b>	194 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.48 (water = 1)
<b>Water Solubility:</b>	Reactive (Decomposes)
<b>Boiling Point:</b>	136°F (58°C)
<b>Freezing Point:</b>	-57°F (-70°C)
<b>Ionization Potential:</b>	12.74 eV (as <i>Hydrogen Chloride</i> )
<b>Molecular Weight:</b>	169.9

### EXPOSURE LIMITS

**OSHA/NIOSH:** 5 ppm, Ceiling (as *Hydrogen Chloride*)

**ACGIH:** 2 ppm, Ceiling (as *Hydrogen Chloride*)

**IDLH:** 50 ppm (as *Hydrogen Chloride*)

The Protective Action Criteria values are:

PAC-1 = 0.45 ppm    PAC-2 = 5.5 ppm

PAC-3 = 25 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Viton (>8-hr breakthrough)
<b>Coveralls:</b>	Tychem® BR, CSM and TK (>8-hr breakthrough)
<b>Respirator:</b>	SCBA

### HEALTH EFFECTS

**Eyes:** Severe irritation, burns and possible eye damage

**Skin:** Irritation and burns

**Inhalation:** Nose, throat and lung irritation, with coughing, and severe shortness of breath (pulmonary edema)

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention immediately.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

**Medical** observation is recommended as symptoms may be delayed.

Common Name: **SILVER NITRATE**

Synonyms: Argerol; Lunar Caustic

CAS No: 7761-88-8

 Molecular Formula: AgNO<sub>3</sub>

RTK Substance No: 1672

Description: Odorless, colorless or white, crystalline solid

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 1493 ERG Guide #: 140 Hazard Class: 5.1 (Oxidizer)	<b>Silver Nitrate</b> is not combustible, but it is a STRONG OXIDIZER that enhances the combustion of other substances. Use large quantities of water as an extinguishing agent or extinguish fire using an agent suitable for type of surrounding fire. <b>Silver Nitrate</b> itself does not burn. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Silver Oxides</i> and <i>Nitrogen Oxides</i> . CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool. <b>Silver Nitrate</b> may ignite combustibles (wood, paper and oil).	<b>Silver Nitrate</b> reacts with ACETYLENE, in the presence of AMMONIA, to form <i>Silver Acetylide</i> , a sensitive and powerful detonator. <b>Silver Nitrate</b> reacts violently with COMBUSTIBLES; CHLOROSULFONIC ACID and other ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); METALS; METAL CARBIDES; REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES); and OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE). <b>Silver Nitrate</b> is not compatible with ETHYLENE OXIDE; CHARCOAL; AMMONIUM HYDROXIDE; ETHANOL; AZIRIDINE; ARSENIC; SULFUR; and many other compounds.

## SPILL/LEAKS

**Isolation Distance:**

Spills: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

DO NOT wash into sewer.

**Silver Nitrate** is very toxic to aquatic organisms.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Noncombustible
<b>Specific Gravity:</b>	4.35 to 5.35 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	831°F (444°C) (Decomposes)
<b>Melting Point:</b>	413.6°F (212°C)
<b>Molecular Weight:</b>	169.9

## EXPOSURE LIMITS

**OSHA:** 0.01 mg/m<sup>3</sup>, 8-hr TWA (as *Silver*)

**IDLH:** 10 mg/m<sup>3</sup> (as *Silver*)

The Protective Action Criteria values are:

 PAC-1 = 0.4 mg/m<sup>3</sup>

 PAC-2 = 3 mg/m<sup>3</sup>

 PAC-3 = 15.7 mg/m<sup>3</sup>

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Nitrile and Natural Rubber
<b>Coveralls:</b>	Tyvek®
<b>Respirator:</b>	>0.01 mg/m <sup>3</sup> - full facepiece APR with High efficiency filters >0.4 mg/m <sup>3</sup> - SCBA

## HEALTH EFFECTS

<b>Eyes:</b>	Irritation, burns and possible eye damage
<b>Skin:</b>	Irritation, burns, rash and blisters
<b>Inhalation:</b>	Nose, throat and lung irritation, with coughing, wheezing and shortness of breath Headache, fatigue and blue color to the skin and lips (methemoglobinemia)

## FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention immediately  
**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water. Seek medical attention immediately.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** promptly to a medical facility.

Common Name: **SODIUM**

Synonyms: Natrium

CAS No: 7440-23-5

Molecular Formula: Na

RTK Substance No: 1674

Description: Odorless, soft, silvery-white metal

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>3 - Health</b></p> <p><b>3 - Fire</b></p> <p><b>2 - Reactivity</b></p> <p><b>DOT#:</b> UN 1428</p> <p><b>ERG Guide #:</b> 138</p> <p><b>Hazard Class:</b> 4.3 (Dangerous when wet)</p>	<p><b>Sodium</b> is a <b>FLAMMABLE SOLID</b> which will ignite spontaneously in <b>AIR</b> or <b>MOIST AIR</b> and reacts violently with <b>WATER</b> or <b>STEAM</b> to produce flammable and explosive <i>Hydrogen gas</i>.</p> <p>Use dry chemicals appropriate for extinguishing metal fires such as graphite, soda ash or powdered sodium chloride. <b>DO NOT USE WATER, CO<sub>2</sub> or halogenated extinguishing agents.</b></p> <p><b>POISONOUS GASES ARE PRODUCED IN FIRE</b>, including (<i>Sodium Oxides</i>).</p>	<p><b>Sodium</b> reacts violently with <b>WATER, STEAM, AIR</b> and <b>MOIST AIR</b> to produce corrosive <i>Sodium Hydroxide</i> and flammable and explosive <i>Hydrogen gas</i>.</p> <p><b>Sodium</b> can react explosively or violently with a broad range of chemicals including <b>METALS</b> (such as <b>ALUMINUM, ARSENIC</b> and <b>ZINC</b>); <b>METAL COMPOUNDS</b>; <b>STRONG ACIDS</b> (such as <b>HYDROCHLORIC, SULFURIC</b> and <b>NITRIC</b>); <b>OXIDIZING AGENTS</b> (such as <b>PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE</b> and <b>FLUORINE</b>); <b>CHLORINATED HYDROCARBONS</b> (such as <b>METHYLENE CHLORIDE</b> and <b>TRICHLOROETHYLENE</b>); <b>CARBON DIOXIDE, AZIDES</b>; and <b>MALEIC ANHYDRIDE</b>.</p>

### SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

DO NOT sweep up dry material, keep dry, cover with dry sand, limestone or clay, and place quickly into a container of *Kerosene, Naphtha, Light Oil* or similar material.

Use only non-sparking tools and equipment, especially when opening and closing containers of **Sodium**.

DO NOT wash into sewer.

Keep **Sodium** out of confined spaces, such as sewers, because of the possibility of an explosion.

**Sodium** is dangerous to aquatic life at high concentrations.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Flammable solid
<b>Auto Ignition Temp:</b>	>239°F (115°C)
<b>Vapor Density:</b>	0.003 (air = 1)
<b>Vapor Pressure:</b>	1.2 mm Hg at 752°F (400°C)
<b>Specific Gravity:</b>	0.97 (water = 1)
<b>Water Solubility:</b>	Decomposes (violently)
<b>Boiling Point:</b>	1,619°F (882°C)
<b>Melting Point:</b>	208°F (98°C)
<b>Molecular Weight:</b>	22.49

### EXPOSURE LIMITS

No occupational exposure limits have been established for **Sodium**.

The Protective Action Criteria values are:

PAC-1 = 0.5 mg/m<sup>3</sup>    PAC-2 = 5 mg/m<sup>3</sup>

PAC-3 = 50 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Nitrile (>8-hr breakthrough for <i>Kerosene</i> and <i>Naphtha</i> )
<b>Coveralls:</b>	Turn out gear or flash protection
<b>Respirator:</b>	>0.5 mg/m <sup>3</sup> -full facepiece APR with High efficiency filters >5 mg/m <sup>3</sup> - SCBA

### HEALTH EFFECTS

**Eyes:** Irritation and burns

**Skin:** Irritation and burns

**Inhalation:** Nose, throat and lung irritation, with coughing, and severe shortness of breath (pulmonary edema)

Headache, dizziness, nausea and vomiting

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Quickly** brush off excess chemical from the face. Flush with large amounts of water for at least 30 minutes. Remove contact lenses, if worn. Seek medical attention immediately.

**Quickly** remove contaminated clothing. Immediately blot or brush off excess chemical and wash with large amounts of water for at least 30 minutes. Seek medical attention immediately.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

**Medical** observation is recommended as symptoms may be delayed.



Common Name: **SODIUM AZIDE**

Synonyms: Azide; Azium; Smite®

CAS No: 26628-22-8

Molecular Formula:  $\text{NaN}_3$

RTK Substance No: 1684

Description: Colorless to white, odorless solid which is highly soluble in water which may result in the formation of *Hydrazoic Acid*

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>3 - Health</b></p> <p><b>1 - Fire</b></p> <p><b>3 - Reactivity</b></p> <p><b>DOT#:</b> UN 1687</p> <p><b>ERG Guide #:</b> 153</p> <p><b>Hazard Class:</b> 6.1 (Poison)</p>	<p>REACTIVE and SEVERE EXPLOSION HAZARD.</p> <p>Use dry sand or special powder as extinguishing agents.</p> <p>DO NOT USE WATER.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> and <i>Sodium Oxide</i>.</p> <p>CONTAINERS MAY EXPLODE IN FIRE.</p> <p>Use water spray to keep fire-exposed containers cool. DO NOT get water inside containers as <b>Sodium Azide</b> reacts with WATER to form <i>Hydrazoic Acid</i>.</p>	<p>Reacts with CARBON DISULFIDE and METALS (such as LEAD, BRASS, COPPER, SILVER and MERCURY) to form shock-sensitive compounds.</p> <p>Reacts with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) to form toxic and explosive <i>Hydrazoic Acid</i>.</p> <p><b>Sodium Azide</b> reacts violently with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); BARIUM CARBONATE; DIMETHYL SULFATE; HALOGENATED SOLVENTS; and DIBROMOMALONONITRILE.</p> <p><b>Sodium Azide</b> is not compatible with CAUSTICS; METAL OXIDES; METAL SULFIDES; METAL AZIDES; and PHOSGENE.</p> <p>Protect from HEAT, SHOCK and FRICTION.</p>

### SPILL/LEAKS

**Isolation Distance:**

Liquids: 50 meters (150 feet)

Solid: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Collect powdered material in the most convenient and safe manner and deposit in sealed containers.

DO NOT FLUSH into *Copper* or *Lead* pipes, as violent explosions may occur.

Harmful to aquatic life.

### EXPOSURE LIMITS

**NIOSH:** 0.3 mg/m<sup>3</sup>, Ceiling (as **Sodium Azide**)

0.1 ppm, Ceiling (as *Hydrazoic Acid*),

**ACGIH:** 0.29 mg/m<sup>3</sup>, Ceiling (as **Sodium Azide**)

0.11 ppm, Ceiling (as *Hydrazoic Acid*)

### HEALTH EFFECTS

**Eyes:** Irritation, burns, possible loss of vision

**Skin:** Irritation, burns, redness, blisters

**Inhalation:** Nose and throat irritation, coughing and/or shortness of breath (pulmonary edema)

Headache, nausea, vomiting and dizziness

Muscle weakness, dizziness, anxiety, tremor, collapse and even death

### PHYSICAL PROPERTIES

**Odor Threshold:** Odorless

**Flash Point:** Not flammable but decomposes explosively when heated

**Vapor Density:** 2.2 (air = 1)

**Specific Gravity:** 1.8 (water = 1)

**Water Solubility:** Soluble/Decomposes

**Melting Point:** 527°F (275°C) (decomposes and may explode)

**Ionization Potential:** 11.7 eV

**Molecular Weight:** 65

### PROTECTIVE EQUIPMENT

**Gloves:** Rubber

**Coveralls:** DuPont Tyvek® for **Sodium Azide**  
DuPont Responder® and St. Gobain ONESuit® TEC for *Hydrazoic Acid*

**Respirator:** Supplied air

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention immediately.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** to a medical facility.

**Medical** observation is recommended as symptoms may be delayed.



Common Name: **SODIUM BISULFITE**

Synonym: Sodium Hydrogen Sulfite

CAS No: 7631-90-5

 Molecular Formula: NaHSO<sub>3</sub>

RTK Substance No: 1685

Description: White, crystalline solid which is corrosive when in a liquid solution

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 2693 (Solution) ERG Guide #: 154 Hazard Class: 8 (Corrosive)	Extinguish fire using an agent suitable for type of surrounding fire. <b>Sodium Bisulfite</b> itself does not burn. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Sodium Oxides</i> and <i>Sulfur Oxides</i> . Use water spray to keep fire-exposed containers cool.	<b>Sodium Bisulfite</b> reacts with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); and STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) to release <i>Sulfur Dioxide</i> gas. <b>Sodium Bisulfite</b> decomposes in HEAT and is corrosive to ALUMINUM.

## SPILL/LEAKS

**Isolation Distance:**

Spills: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Collect powdered material in the most convenient and safe manner and deposit in sealed containers.

DO NOT wash into sewer.

Dangerous to aquatic life in high concentrations.

## PHYSICAL PROPERTIES

**Odor Threshold:** Odor of rotten eggs

**Flash Point:** Not combustible

**Specific Gravity:** 1.48 (water =1)

**Water Solubility:** Soluble

**Boiling Point:** Decomposes

**Melting Point:** Decomposes

**Molecular Weight:** 104.1

## EXPOSURE LIMITS

**OSHA:** None

**NIOSH:** 5 mg/m<sup>3</sup>, 10-hr TWA

**ACGIH:** 5 mg/m<sup>3</sup>, 8-hr TWA

**IDLH:** None

## PROTECTIVE EQUIPMENT

**Gloves:** Rubber or Nitrile

**Coveralls:** DuPont Tyvek® or equivalent

**Respirator:** >5 mg/m<sup>3</sup> - Full facepiece APR with High efficiency filters  
 >50 mg/m<sup>3</sup> - Supplied air

## HEALTH EFFECTS

**Eyes:** Severe irritation and burns

**Skin:** Severe irritation, burns, itching and skin rash

**Inhalation:** Nose, throat and lung irritation with coughing, wheezing and shortness of breath

## FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Quickly** brush off excess chemical from the face. Immediately flush with large amounts of water for at least 60 minutes, lifting upper and lower lids. Remove contact lenses, if worn, while flushing. **DO NOT INTERRUPT FLUSHING.** Seek medical attention immediately.

**Quickly** remove contaminated clothing. Immediately blot or brush off excess chemical and wash gently with large amounts of water for at least 60 minutes. **DO NOT INTERRUPT WASHING.** Seek medical attention immediately.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** to a medical facility.

Common Name: **SODIUM BROMATE**

Synonyms: None

CAS No: 7789-38-0

Molecular Formula: NaBrO<sub>3</sub>

RTK Substance No: 1686

Description: Colorless to white, crystalline or granular, odorless powder

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>2 - Health</b></p> <p><b>0 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p><b>DOT#:</b> UN 1494</p> <p><b>ERG Guide #:</b> 141</p> <p><b>Hazard Class:</b> 5.1 (Oxidizer)</p>	<p><b>Sodium Bromate</b> is not combustible but it is a <b>STRONG OXIDIZER</b> which enhances the combustion of other substances.</p> <p>Use water only. <b>DO NOT USE DRY CHEMICAL</b> or CO<sub>2</sub> extinguishing agents.</p> <p><b>POISONOUS GASES ARE PRODUCED IN FIRE</b>, including <i>Hydrogen Bromide</i>.</p> <p><b>CONTAINERS MAY EXPLODE IN FIRE.</b></p> <p>Use water spray to keep fire-exposed containers cool.</p> <p><b>Sodium Bromate</b> may ignite combustibles (wood, paper and oil).</p> <p>Contamination may cause containers to explode.</p>	<p><b>Sodium Bromate</b> reacts violently with <b>REDUCING AGENTS</b> (such as LITHIUM, SODIUM, POTASSIUM and their HYDRIDES); <b>COMBUSTIBLE MATERIALS</b>; <b>ORGANICS</b> (such as OIL, FAT, GREASE and FUELS); <b>METAL POWDERS</b> (such as ALUMINUM, ARSENIC and COPPER); <b>POTASSIUM</b>; <b>METAL SULFIDES</b>; <b>CARBON</b>; <b>SUGAR</b>; and <b>AMMONIUM SALTS</b>.</p> <p><b>Sodium Bromate</b> will become shock sensitive if contaminated with <b>ORGANIC MATERIALS</b>, <b>METALS</b> or <b>CARBON</b>.</p>

### SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal. **DO NOT** use combustible absorbents. **DO NOT** wash into sewer.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Noncombustible
<b>Specific Gravity:</b>	3.34 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	718°F (381°C) (Decomposes)
<b>Molecular Weight:</b>	150.9

### EXPOSURE LIMITS

The Protective Action Criteria values are:

PAC-1 = 1.5 mg/m<sup>3</sup>

PAC-2 = 12.5 mg/m<sup>3</sup>

PAC-3 = 60 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Nitrile and Natural Rubber
<b>Coveralls:</b>	Tyvek®
<b>Respirator:</b>	>1.5 mg/m <sup>3</sup> - SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, wheezing and severe shortness of breath (pulmonary edema) Headache, fatigue and blue color to the skin and lips ( <i>methemoglobinemia</i> )

### FIRST AID AND DECONTAMINATION

- Remove** the person from exposure.
- Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
- Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water.
- Begin** artificial respiration if breathing has stopped and CPR if necessary.
- Transfer** promptly to a medical facility.
- Medical** observation is recommended as symptoms may be delayed.

Common Name: **SODIUM CACODYLATE**

Synonyms: Cacodylic Acid, Sodium Salt

CAS No: 124-65-2

 Molecular Formula: C<sub>2</sub>H<sub>6</sub>AsO<sub>2</sub>Na

RTK Substance No: 1687

Description: Colorless to light yellow, crystalline solid or powder with a slight garlic odor

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>4 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 1688 ERG Guide #: 152 Hazard Class: 6.1 (Poison)	<b>Sodium Cacodylate</b> may burn, but does not readily ignite. Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Arsenic Oxide</i> and <i>Arsenic fumes</i> . Use water spray to keep fire-exposed containers cool.	<b>Sodium Cacodylate</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); and SODIUM BOROHYDRIDE. <b>Sodium Cacodylate</b> reacts with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) to form toxic <i>Dimethylarsine gas</i> .

## SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and deposit in sealed containers.

DO NOT wash into sewer.

Harmful to aquatic life.

## PHYSICAL PROPERTIES

**Odor Threshold:** Slight garlic odor

**Flash Point:** Nonflammable

**Specific Gravity:** >1 (water = 1)

**Water Solubility:** Soluble

**Boiling Point:** Decomposes

**Melting Point:** 140°F (60°C)

**Molecular Weight:** 160

**pH:** 8 to 9

## EXPOSURE LIMITS

**OSHA:** 0.5 mg/m<sup>3</sup>, 8-hr TWA

**NIOSH:** None

**ACGIH:** None

**IDLH:** None

## PROTECTIVE EQUIPMENT

**Gloves:** Nitrile and Natural Rubber

**Coveralls:** DuPont Tyvek®

**Respirator:** <0.5 mg/m<sup>3</sup> - full facepiece APR with High efficiency filter  
 >0.5 mg/m<sup>3</sup> - Supplied air

## HEALTH EFFECTS

**Eyes:** Irritation, burns, red and watery eyes

**Skin:** Irritation, burns, itching, rash and loss of pigment

**Inhalation:** Nose and throat irritation with coughing and wheezing, weakness, nausea, vomiting, headache and muscle cramps

**Chronic:** *Arsenic and Arsenic compounds* cause skin and lung cancer in humans

## FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** to a medical facility.

Common Name: **SODIUM CHLORATE**

Synonyms: Atlacide; Chlorate of Soda; Oxycil

CAS No: 7775-09-9

 Molecular Formula: NaClO<sub>3</sub>

RTK Substance No: 1688

Description: Odorless, pale yellow to white, crystalline solid

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 1495 UN 2428 (solution) ERG Guide #: 140 Hazard Class: 5.1 (Oxidizer)	<b>Sodium Chlorate</b> is not combustible, but it is a STRONG OXIDIZER that enhances the combustion of other substances. Flood with water. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Chlorides</i> and <i>Sodium Oxides</i> . Use water spray to keep fire-exposed containers cool. <b>Sodium Chlorate</b> may ignite combustibles (wood, paper and oil).	<b>Sodium Chlorate</b> reacts with ARSENIC TRIOXIDE; STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES); ORGANIC MATERIALS (such as PEAT, SUGAR and WOOD); COMBUSTIBLES; and FINELY POWDERED METALS (such as ALUMINUM) to cause fires and explosions. <b>Sodium Chlorate</b> is not compatible with AMMONIUM COMPOUNDS; CYANIDES; and HYDROGEN PEROXIDE.

## SPILL/LEAKS

## Isolation Distance:

Spill (solid): 25 meters (75 feet)

(solution): 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in dry sand, earth, or a noncombustible material and place into sealed containers for disposal.

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

DO NOT wash into sewer.

**Sodium Chlorate** is dangerous to aquatic life at high concentrations.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Nonflammable
<b>Specific Gravity:</b>	2.5 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	Decomposes
<b>Melting Point:</b>	478°F (248°C)
<b>Molecular Weight:</b>	106.44

## EXPOSURE LIMITS

 No occupational exposure limits have been established for **Sodium Chlorate**.

The Protective Action Criteria values are:

 PAC-1 = 0.4 mg/m<sup>3</sup>

 PAC-2 = 3 mg/m<sup>3</sup>

 PAC-3 = 75 mg/m<sup>3</sup>

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl, Nitrile, Neoprene and Viton (>8-hr breakthrough)
<b>Coveralls:</b>	Tyvek® ( <i>solid</i> ); Tychem® F, C3, BR, CSM and TK (>8-hr breakthrough for <b>Sodium Chlorate in solution</b> )
<b>Respirator:</b>	Spill ( <i>solid</i> ): full facepiece APR with <i>High efficiency filters</i> >0.4 mg/m <sup>3</sup> or fire - SCBA

## HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns
<b>Inhalation:</b>	Headache, fatigue and blue color to the skin and lips (methemoglobinemia)

## FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **SODIUM CHROMATE**

Synonyms: Disodium Chromate; Chromate of Soda

CAS No: 7775-11-3

 Molecular Formula: Na<sub>2</sub>CrO<sub>4</sub>

RTK Substance No: 1692

Description: Odorless, yellow, crystalline solid

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>4 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 3288 ERG Guide #: 151 Hazard Class: 6.1 (Poison)	<b>Sodium Chromate</b> is not combustible but is a STRONG OXIDIZER which enhances the combustion of other substances. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Chromium Oxide</i> and <i>Sodium Monoxide</i> . Use water spray to keep fire-exposed containers cool. <b>Sodium Chromate</b> may ignite combustibles (wood, paper and oil).	<b>Sodium Chromate</b> is a powerful OXIDIZER. Contact with REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES); COMBUSTIBLE and ORGANIC MATERIALS (such as PAPER, WOOD and PLASTICS); and STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) may result in violent reactions and fires.

## SPILL/LEAKS

## Isolation Distance:

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and deposit into sealed containers.

DO NOT wash into sewer.

**Sodium Chromate** is very toxic to aquatic organisms.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Noncombustible
<b>Vapor Density:</b>	2.7 (air = 1)
<b>Specific Gravity:</b>	1.48 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Melting Point:</b>	1,458°F (792°C)
<b>Molecular Weight:</b>	162

## EXPOSURE LIMITS

**OSHA:** 0.005 mg/m<sup>3</sup>, 8-hr TWA (as *Chromium VI*)

**NIOSH:** 0.001 mg/m<sup>3</sup>, 10-hr TWA (as *Chromium*)

**ACGIH:** 0.05 mg/m<sup>3</sup>, 8-hr TWA (as *Chromium*)

**IDLH:** 15 mg/m<sup>3</sup> (as *Chromium VI*)

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Nitrile, Neoprene and Natural Rubber
<b>Coveralls:</b>	Tyvek®
<b>Respirator:</b>	>0.005 mg/m <sup>3</sup> - Full facepiece APR with High efficiency filters >0.05 mg/m <sup>3</sup> - Supplied air

## HEALTH EFFECTS

<b>Eyes:</b>	Irritation, burns and possible eye damage
<b>Skin:</b>	Irritation, burns, itching, rash and skin ulcers.
<b>Inhalation:</b>	Nose and throat irritation with coughing and wheezing
<b>Chronic:</b>	<i>Hexavalent Chromium</i> or <i>Chromium VI</i> compounds cause cancer (lung) in humans.

## FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention.

**Quickly** remove contaminated clothing. Immediately wash contaminated skin with large amounts of water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility

Common Name: **SODIUM DICHROMATE**

Synonyms: Sodium Bichromate; Chromic Acid, Disodium Salt

CAS No: 10588-01-9

Molecular Formula:  $\text{Na}_2\text{Cr}_2\text{O}_7$

RTK Substance No: 1695

Description: Odorless, red or red-orange, crystalline solid

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> <b>DOT#:</b> UN 1479 <b>ERG Guide #:</b> 140 <b>Hazard Class:</b> 6 (Poison)	<p><b>Sodium Dichromate</b> is not combustible, but it is a <b>STRONG OXIDIZER</b> that enhances the combustion of other substances.</p> <p>Use water only. <b>DO NOT USE CHEMICAL</b> or <math>\text{CO}_2</math> as extinguishing agents.</p> <p><b>POISONOUS GASES ARE PRODUCED IN FIRE</b>, including <i>Sodium Oxides</i>.</p> <p>Use water spray to keep fire-exposed containers cool.</p> <p><b>Sodium Dichromate</b> may ignite combustibles (wood, paper and oil).</p>	<p><b>Sodium Dichromate</b> reacts violently with HYDRAZINE; ACETIC ANHYDRIDE; ETHANOL; and SULFURIC ACID.</p> <p><b>Sodium Dichromate</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and COMBUSTIBLES.</p>

### SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

Liquid spills can be neutralized with *Sodium Carbonate*. **DO NOT** wash into sewer.

**Sodium Dichromate** is very toxic to aquatic organisms and may cause long-term effects in the aquatic environment.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Nonflammable
<b>Specific Gravity:</b>	2.35 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	752°F (400°C)
<b>Melting Point:</b>	675°F (357°C)
<b>Molecular Weight:</b>	262
<b>pH:</b>	4 (1% solution)

### EXPOSURE LIMITS

**OSHA:** 0.005  $\text{mg}/\text{m}^3$ , 8-hr TWA

**NIOSH:** 0.001  $\text{mg}/\text{m}^3$ , 10-hr TWA

**ACGIH:** 0.05  $\text{mg}/\text{m}^3$ , 8-hr TWA

**IDLH:** 15  $\text{mg}/\text{m}^3$

(All the above are for *Chromium VI*)

The Protective Action Criteria values are:

PAC-1 = 20  $\text{mg}/\text{m}^3$  PAC-2 = 37.8  $\text{mg}/\text{m}^3$  PAC-3 = 37.8  $\text{mg}/\text{m}^3$

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Nitrile and Natural Rubber
<b>Coveralls:</b>	Tyvek®
<b>Respirator:</b>	>0.001 $\text{mg}/\text{m}^3$ - full facepiece APR with <i>High efficiency filters</i> >1 $\text{mg}/\text{m}^3$ - Supplied air >15 $\text{mg}/\text{m}^3$ - SCBA

### HEALTH EFFECTS

**Eyes:** Irritation, burns and possible eye damage

**Skin:** Irritation, burns, itching, rash and ulcers

**Inhalation:** Nose, throat and lung irritation with coughing, wheezing and shortness of breath

**Chronic:** *Hexavalent Chromium* or *Chromium VI compounds* cause lung cancer in humans.

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention.

**Quickly** remove contaminated clothing. Immediately wash contaminated skin with large amounts of water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility



Common Name: **SODIUM DITHIONITE**

Synonyms: Sodium Hydrosulfite

CAS No: 7775-14-6

Molecular Formula: Na<sub>2</sub>S<sub>2</sub>O<sub>4</sub>

RTK Substance No: 1697

Description: White to grayish, crystalline powder with a slight rotten egg odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>2 - Health</b></p> <p><b>1 - Fire</b></p> <p><b>2 - Reactivity</b></p> <p><b>DOT#:</b> UN 1384</p> <p><b>ERG Guide #:</b> 135</p> <p><b>Hazard Class:</b> 4.2 (Spontaneously Combustible)</p>	<p><b>Sodium Dithionite</b> is REACTIVE and contact with MOIST AIR, MOISTURE, WATER or HEAT can cause <b>Sodium Dithionite</b> to decompose, producing enough heat to ignite combustible materials.</p> <p>Use CO<sub>2</sub> or dry sand for small fires. Use water in flooding quantities for large fires. If flooding quantities are not available, let burn.</p> <p>Monitor container temperature for at least 48-hours to make sure decomposition is not occurring.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Sulfur Dioxide</i>.</p> <p>CONTAINERS MAY EXPLODE IN FIRE.</p> <p>Use water spray to keep fire-exposed containers cool.</p> <p><b>Sodium Dithionite</b> may form an ignitable dust/air mixture in closed tanks or containers.</p> <p><b>Sodium Dithionite</b> may be ignited by static discharge.</p>	<p>Exposure to MOISTURE, MOIST AIR, WATER or elevated TEMPERATURES (over 140°F (60°C)) causes <b>Sodium Dithionite</b> to decompose. Decomposition produces enough heat to ignite combustibles.</p> <p><b>Sodium Dithionite</b> may react violently or explosively with SODIUM CHLORITE and other OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).</p> <p><b>Sodium Dithionite</b> reacts with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) to form toxic gases.</p> <p><b>Sodium Dithionite</b>, in combination with a mixture of ALUMINUM POWDER, POTASSIUM CARBONATE, and BENZALDEHYDE, resulted in an explosion.</p>

### SPILL/LEAKS

**Isolation Distance:**

Dry Spill: 25 meters (75 feet)  
 Water Spill: 30 meters (100 feet)  
 Fire: 800 meters (1/2 mile)

Cover and mix in with dry sand, earth or other noncombustible material and place into sealed, dry containers for disposal.  
 Use only non-sparking tools and equipment, especially when opening and closing containers of **Sodium Dithionite**.  
 Ventilate and wash area after clean-up is complete.  
 DO NOT wash into sewer.  
**Sodium Dithionite** is harmful to the aquatic environment.

### PHYSICAL PROPERTIES

**Odor Threshold:** Rotten egg odor  
**Flash Point:** 212°F (100°C)  
**Vapor Density:** 3.6 (air = 1)  
**Specific Gravity:** 1.4 (water = 1)  
**Water Solubility:** Soluble (Decomposes)  
**Melting Point:** 158° to 266°F (70° to 130°C)  
**Molecular Weight:** 174.1

### EXPOSURE LIMITS

No occupational exposure limits have been established for **Sodium Dithionite**.

The Protective Action Criteria values are:  
 PAC-1 = 30 mg/m<sup>3</sup>    PAC-2 = 50 mg/m<sup>3</sup>  
 PAC-3 = 250 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

**Gloves:** Neoprene, Natural Rubber and Polyvinyl Chloride  
**Coveralls:** Tyvek®  
**Respirator:** SCBA

### HEALTH EFFECTS

**Eyes:** Irritation and burns  
**Skin:** Irritation and burns  
**Inhalation:** Nose, throat and lung irritation, with coughing, wheezing and shortness of breath  
 Headache, dizziness, lightheadedness, and convulsions.

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.  
**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** promptly to a medical facility.

Common Name: **SODIUM FLUORIDE**

Synonyms: Sodium Fluoride; Sodium Monofluoride

CAS No: 7681-49-4

Molecular Formula: NaF

RTK Substance No: 1699

Description: Colorless or white, odorless crystal or powder that also may be dyed blue or green when used as a pesticide

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b>  <b>DOT#:</b> UN 1690 <b>ERG Guide #:</b> 154 <b>Hazard Class:</b> 6.1 (Poison)	Extinguish fire using an agent suitable for type of surrounding fire. <b>Sodium Fluoride</b> itself does not burn.  POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Hydrogen Fluoride gas</i> .  Use water spray to keep fire-exposed containers cool.	<b>Sodium Fluoride</b> reacts with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) to form toxic <i>Hydrogen Fluoride gas</i> .  <b>Sodium Fluoride</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); and METALS.

### SPILL/LEAKS

**Isolation Distance:**

Spill (solid): 25 meters (75 feet)

Spill (liquid): 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Collect powdered material in the most convenient and safe manner and place into sealed containers for disposal.

For **Sodium Fluoride** in solution, cover with dry lime, sand or soda ash and place into sealed containers for disposal.

For water spills, neutralize with agricultural lime, crushed limestone or sodium bicarbonate.

DO NOT wash into sewer.

**Sodium Fluoride** is dangerous to aquatic life in high concentrations.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Nonflammable
<b>Vapor Pressure:</b>	0 mm Hg at 68°F (20°C) (approx)
<b>Specific Gravity:</b>	2.56 (water = 1)
<b>Water Solubility:</b>	Very slightly soluble
<b>Boiling Point:</b>	3,083°F (1,695°C)
<b>Melting Point:</b>	1,819°F (993°C)
<b>Molecular Weight:</b>	42

### EXPOSURE LIMITS

**OSHA:** 2.5 mg/m<sup>3</sup>, 8-hr TWA

**NIOSH:** 2.5 mg/m<sup>3</sup>, 10-hr TWA

**ACGIH:** 2.5 mg/m<sup>3</sup>, 8-hr TWA

**IDLH:** 250 mg/m<sup>3</sup>

(All of the above are for *inorganic Fluoride*)

The Protective Action Criteria values are:

PAC-1 = 5.5 mg/m<sup>3</sup> PAC-2 = 5.5 mg/m<sup>3</sup> PAC-3 = 500 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Nitrile and Neoprene (>8-hr breakthrough for <i>inorganic salt solutions</i> )
<b>Coveralls:</b>	Tychem® Responder® (>8-hr breakthrough for <b>Sodium Fluoride</b> in <i>water solution</i> )
<b>Respirator:</b>	>2.5 mg/m <sup>3</sup> - full facepiece APR with <i>High efficiency filters</i> >25 mg/m <sup>3</sup> - SCBA

### HEALTH EFFECTS

**Eyes:** Severe irritation and burns

**Skin:** Severe irritation and burns

**Inhalation:** Nose, throat and lung irritation with coughing, wheezing and shortness of breath

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** to a medical facility.

Common Name: **SODIUM HYDROGEN FLUORIDE**

Synonyms: Sodium Bifluoride; Sodium Difluoride

CAS No: 1333-83-1

 Molecular Formula: Na(HF<sub>2</sub>)

RTK Substance No: 1703

Description: Colorless to white, crystalline powder

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>0 - Fire</b> <b>1 - Reactivity</b> DOT#: UN 2439 ERG Guide #: 154 Hazard Class: 8 (Corrosive)	Extinguish fire using an agent suitable for type of surrounding fire. <b>Sodium Hydrogen Fluoride</b> itself does not burn. <b>Sodium Hydrogen Fluoride</b> may react with WATER to form flammable and corrosive gases. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Hydrogen Fluoride</i> and <i>Sodium Fluoride</i> . CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool.	<b>Sodium Hydrogen Fluoride</b> will react with WATER and MOIST AIR to form flammable and corrosive gases. <b>Sodium Hydrogen Fluoride</b> is not compatible with METALS; STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); and COMBUSTIBLE MATERIALS. <i>Water-based solutions</i> of <b>Sodium Hydrogen Fluoride</b> can corrode GLASS, CONCRETE and certain METALS, and will attack RUBBER, LEATHER and many ORGANIC MATERIALS.

**SPILL/LEAKS**
**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Collect powdered material in the most convenient and safe manner and place into sealed containers for disposal.

DO NOT wash into sewer.

**Sodium Hydrogen Fluoride** is harmful to fish and other aquatic organisms.

**PHYSICAL PROPERTIES**

<b>Flash Point:</b>	Nonflammable
<b>Vapor Pressure:</b>	<0.01 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	2.08 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	Decomposes
<b>Molecular Weight:</b>	61.99

**EXPOSURE LIMITS**
**OSHA:** 2.5 mg/m<sup>3</sup>, 8-hr TWA (as *Fluorides*)

**ACGIH:** 2.5 mg/m<sup>3</sup>, 8-hr TWA (as *Fluorides*);  
 0.5 ppm, 8-hr TWA (as *Hydrogen Fluoride*)

**IDLH:** 250 mg/m<sup>3</sup> (as *Fluorine*)

The Protective Action Criteria values are:

 PAC-1 = 2.5 mg/m<sup>3</sup>

 PAC-2 = 2.5 mg/m<sup>3</sup>

 PAC-3 = 250 mg/m<sup>3</sup>
**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Nitrile or Natural Rubber
<b>Coveralls:</b>	Tyvek®
<b>Respirator:</b>	<2.5 mg/m <sup>3</sup> - full facepiece APR with High efficiency filters >2.5 mg/m <sup>3</sup> (as <i>Fluorides</i> ) - SCBA >0.5 ppm (as <i>Hydrogen Fluoride</i> ) - SCBA

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation, severe burns and possible eye damage
<b>Skin:</b>	Irritation, severe burns
<b>Inhalation:</b>	Nose, throat and lung irritation, with coughing, and severe shortness of breath (pulmonary edema) Headache, dizziness, and nausea

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention immediately.

**Immediately** flush with large amounts of water. Apply 2.5% *Calcium Gluconate* gel to the affected skin. Seek medical assistance immediately.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

**Medical** observation is recommended as symptoms may be delayed.

Common Name: **SODIUM HYDROSULFIDE**

Synonyms: Sodium Bisulfide; Sodium Hydrogen Sulfide; Sodium Mercaptan; Sodium Sulfide

CAS No: 16721-80-5

Molecular Formula: NaHS

RTK Substance No: 1705

Description: Colorless to lemon-colored, crystalline solid with a rotten egg odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>3 - Health</b> <b>*2 - Fire</b> <b>1 - Reactivity</b></p> <p><b>DOT#:</b> UN 2318 (less than 25% water of crystallization)</p> <p><b>ERG Guide #:</b> 135</p> <p><b>Hazard Class:</b> 4.2 (Spontaneously Combustible)</p>	<p><b>Sodium Hydrosulfide</b>, when not solution, may be SPONTANEOUSLY COMBUSTIBLE.</p> <p>FLAMMABLE <i>Hydrogen Sulfide</i> gas may form with heating. Use dry chemical, CO<sub>2</sub>, water spray or foam as extinguishing agents. DO NOT apply directly on <b>Sodium Hydrosulfide</b> itself as splattering may occur.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Sulfur Oxides</i> and <i>Hydrogen Sulfide</i>.</p> <p>Use water spray to keep fire-exposed containers cool.</p> <p><b>Sodium Hydrosulfide</b> may form an ignitable vapor/air mixture in closed tanks or containers.</p>	<p><b>Sodium Hydrosulfide</b> reacts with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); MOIST AIR and MOISTURE to release flammable and toxic <i>Hydrogen Sulfide</i> gas.</p> <p><b>Sodium Hydrosulfide</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and METALS (such as ZINC, ALUMINUM and COPPER, and their ALLOYS).</p>

### SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Collect powdered material in the most convenient and safe manner and place into sealed containers for disposal.

For **Sodium Hydrosulfide** in *solution*, cover with dry sand or earth and place into sealed containers for disposal.

Keep **Sodium Hydrosulfide** out of confined spaces, such as sewers, because of the possibility of an explosion due to *Hydrogen Sulfide* gas formation.

DO NOT wash into sewer.

For water spills, add Sodium Carbonate (Na<sub>2</sub>CO<sub>3</sub>).

**Sodium Hydrosulfide** is very toxic to aquatic life.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Rotten egg odor
<b>Flash Point:</b>	194°F (90°C) (Hydrate form)
<b>LEL:</b>	4.3% (as <i>Hydrogen Sulfide</i> )
<b>UEL:</b>	46% (as <i>Hydrogen Sulfide</i> )
<b>Vapor Density:</b>	1.17 (air = 1)
<b>Specific Gravity:</b>	1.79 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	212°F (100°C)
<b>Melting Point:</b>	662°F (350°C)
<b>Molecular Weight:</b>	56.06

### EXPOSURE LIMITS

**ACGIH:** 1 ppm, 8-hr TWA; 5 ppm STEL (as *Hydrogen Sulfide*)

**IDLH:** 100 ppm (as *Hydrogen Sulfide*)

The Protective Action Criteria values are:

PAC-1 = 0.51 ppm   PAC-2 = 27 ppm   PAC-3 = 50 ppm (as *Hydrogen Sulfide*)

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Neoprene (>8-hr breakthrough)
<b>Coveralls:</b>	Tychem® Responder (>8-hr breakthrough)
<b>Respirator:</b>	SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Severe irritation, burns and possible eye damage
<b>Skin:</b>	Severe irritation and burns
<b>Inhalation:</b>	Nose, throat and lung irritation, with coughing and severe shortness of breath (pulmonary edema)
	Headache, dizziness, disorientation, and passing out
	Higher levels can cause seizures and death

### FIRST AID AND DECONTAMINATION

- Remove** the person from exposure.
- Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention immediately.
- Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention immediately.
- Begin** artificial respiration if breathing has stopped and CPR if necessary.
- Transfer** promptly to a medical facility.
- Medical** observation is recommended as symptoms may be delayed.

**Common Name: SODIUM HYDROXIDE**

**Synonyms:** Caustic Soda; Lye; Sodium Hydrate

**CAS No:** 1310-73-2

**Molecular Formula:** NaOH

**RTK Substance No:** 1706

**Description:** Odorless, white solid that absorbs moisture from the air

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>0 - Fire</b> <b>1 - Reactivity</b>  <b>DOT#:</b> UN 1823 (solid) UN 1824 (solution)  <b>ERG Guide #:</b> 154 <b>Hazard Class:</b> 8 (Corrosive)	Extinguish fire using an agent suitable for type of surrounding fire. <b>Sodium Hydroxide</b> itself does not burn.  POISONOUS GASES ARE PRODUCED IN FIRE. Use water spray to keep fire-exposed containers cool. DO NOT get water inside containers.  <b>Sodium Hydroxide</b> in contact with water or moisture may generate enough heat to ignite combustibles.	<b>Sodium Hydroxide</b> reacts with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); WATER; and MOISTURE to rapidly release heat.  <b>Sodium Hydroxide</b> reacts with METALS (such as ALUMINUM, LEAD, TIN and ZINC) to form flammable and explosive <i>Hydrogen gas</i> .  <b>Sodium Hydroxide</b> can form shock sensitive salts on contact with NITROGEN CONTAINING COMPOUNDS (such as NITROMETHANE).  <b>Sodium Hydroxide</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); CHLORINATED SOLVENTS; AMMONIA; and ORGANIC MATERIALS.  <b>Sodium Hydroxide</b> can attack IRON, COPPER, PLASTICS, RUBBER and COATINGS.

### SPILL/LEAKS

**Isolation Distance:**

Spill (solid): 25 meters (75 feet) Spill (liquid): 50 meters (150 feet)  
 Fire: 800 meters (1/2 mile)

For **Sodium Hydroxide** in *solution* absorb liquids in dry sand, earth, or a similar material and place into sealed containers for disposal.

Collect *solid* material in the most convenient and safe manner and place into sealed containers for disposal.

DO NOT USE WATER OR WET METHOD.

DO NOT wash into sewer.

Neutralize water spills with a dilute acid.

**Sodium Hydroxide** is hazardous to the environment, especially water organisms.

### PHYSICAL PROPERTIES

- Odor Threshold:** Odorless
- Flash Point:** Noncombustible
- Vapor Density:** 2.1 (air = 1)
- Vapor Pressure:** 0 mm Hg at 68°F (20°C)
- Specific Gravity:** 2.1 (water = 1)
- Water Solubility:** Soluble
- Boiling Point:** 2,534°F (1,390°C)
- Melting Point:** 604°F (318°C)
- Molecular Weight:** 40

### EXPOSURE LIMITS

**OSHA:** 2 mg/m<sup>3</sup>, 8-hr TWA

**NIOSH:** 2 mg/m<sup>3</sup>, Ceiling

**ACGIH:** 2 mg/m<sup>3</sup>, Ceiling

**IDLH:** 10 mg/m<sup>3</sup>

The Protective Action Criteria values are:

PAC-1 = 0.5 mg/m<sup>3</sup> PAC-2 = 5 mg/m<sup>3</sup>

PAC-3 = 50 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

- Gloves:** Butyl, Nitrile, Neoprene, PVC, SilverShield®/4H®, Viton and Barrier® (>8-hr breakthrough for **Sodium Hydroxide in solution**)
- Coveralls:** Tychem® SL and Responder®, and Trelchem® HPS and VPS (>8-hr breakthrough for **Sodium Hydroxide solid or solution**)
- Respirator:** <10 mg/m<sup>3</sup> - Full facepiece APR with *High efficiency filters*  
>10 mg/m<sup>3</sup> - SCBA

### HEALTH EFFECTS

- Eyes:** Severe irritation, burns and possible eye damage
- Skin:** Irritation and severe burns
- Inhalation:** Nose, throat and lung irritation with coughing and severe shortness of breath (pulmonary edema)

### FIRST AID AND DECONTAMINATION

- Remove** the person from exposure.
- Quickly** brush off excess chemical from the face. Flush with large amounts of water for at least 30 minutes. Remove contact lenses, if worn. Seek medical attention immediately.
- Quickly** remove contaminated clothing. Immediately blot or brush off excess chemical and wash with large amounts of water for at least 30 minutes. Seek medical attention immediately.
- Begin** artificial respiration if breathing has stopped and CPR if necessary.
- Transfer** promptly to a medical facility.
- Medical** observation is recommended as symptoms may be delayed.



Common Name: **SODIUM HYPOCHLORITE**

Synonyms: Clorox; Liquid Bleach; Sodium Oxychloride

CAS No: 7681-52-9

Molecular Formula: NaOCl

RTK Substance No: 1707

Description: Clear, slightly yellow or green liquid with a strong *Chlorine* odor

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<p><b>3 - Health</b></p> <p><b>0 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p><b>DOT#:</b> UN 1791</p> <p><b>ERG Guide #:</b> 154</p> <p><b>Hazard Class:</b> 8 (Corrosive)</p>	<p><b>Sodium Hypochlorite</b> is not combustible but is a <b>STRONG OXIDIZER</b> which enhances the combustion of other substances.</p> <p>Use dry chemical, CO<sub>2</sub>, water spray or foam as extinguishing agents.</p> <p><b>POISONOUS GASES ARE PRODUCED IN FIRE</b>, including <i>Sodium Oxide</i> and <i>Chlorine</i>.</p> <p>Use water spray to keep fire-exposed containers cool.</p> <p><b>Sodium Hypochlorite</b> may ignite combustibles (wood, paper and oil).</p>	<p><b>Sodium Hypochlorite</b> may react violently or explosively with <b>STRONG ACIDS</b> (such as HYDROCHLORIC, SULFURIC and NITRIC); <b>ACID COMPOUNDS</b> (such as ALUMINUM CHLORIDE, FERRIC CHLORIDE and ALUM); <b>ACID-BASED CLEANING COMPOUNDS</b> (such as BRICK and CONCRETE CLEANERS); and <b>AMMONIA COMPOUNDS</b> (such as AMMONIUM HYDROXIDE, AMMONIUM CHLORIDE and QUATERNARY AMMONIUM SALTS) to release <i>Chlorine</i> and other toxic gases.</p> <p><b>Sodium Hypochlorite</b> may react violently with <b>ORGANIC MATERIALS</b> (such as SOLVENTS, FUELS, ALCOHOLS, GLYCOLS and INSECTICIDES); <b>AMINES</b>; and <b>ORGANIC POLYMERS</b> to form <i>Chlorinated Organic compounds</i>, explosive compounds and <i>Chlorine gas</i>.</p> <p><b>Sodium Hypochlorite</b> is not compatible with <b>HYDROGEN PEROXIDE</b> and <b>METALS</b> (such as COPPER, NICKEL, COBALT and IRON), and should not be handled in equipment or piping containing <b>STAINLESS STEEL</b>, <b>ALUMINUM</b>, <b>CARBON STEEL</b> or <b>OTHER COMMON METALS</b>. The reaction may release <i>Oxygen gas</i> and can cause container rupture.</p> <p>The reaction of <b>Sodium Hypochlorite</b> and <b>REDUCING AGENTS</b> (such as <b>SODIUM BISULFITE</b> and <b>SODIUM THIOSULFATE</b>) gives off heat.</p>

**SPILL/LEAKS**

**Isolation Distance:**  
 Small Spill: 30 meters (100 feet)  
 Large Spill: 100 meters (300 feet)  
 Fire: 800 meters (1/2 mile)

Neutralize with *Sodium Bisulfite*, cover with *Soda Ash* and place into covered containers for disposal or wash with plenty of water.  
 DO NOT wash into sewer.

**Sodium Hypochlorite** is toxic to aquatic organisms.

**PHYSICAL PROPERTIES**

**Odor Threshold:** *Chlorine*-like  
**Flash Point:** Noncombustible  
**Specific Gravity:** 1.1, 5% solution (water = 1)  
**Water Solubility:** Soluble  
**Boiling Point:** Decomposes  
**Molecular Weight:** 74.4  
**pH:** 10.8 to 11.4 (5.25% solution in water)

**EXPOSURE LIMITS**

**NIOSH:** 0.5 ppm, 15-min Ceiling (as *Chlorine*)  
**AIHA:** 2 mg/m<sup>3</sup>, 15-min WEEL  
**IDLH:** 30 ppm (as *Chlorine*)

**PROTECTIVE EQUIPMENT**

**Gloves:** Butyl, Nitrile, Neoprene, Natural Rubber and Viton (>8-hr breakthrough for 30 to 70% solutions)  
**Coveralls:** Tychem® SL, CPF 3, Responder®, Zytron® 300; and ONESuit® TEC (>8-hr breakthrough for 30 to 70% solutions)  
**Respirator:** >2 mg/m<sup>3</sup> - full facepiece APR with Acid gas cartridge and N100 prefilters  
 >20 mg/m<sup>3</sup> or >5 ppm *Chlorine* - Supplied air

**HEALTH EFFECTS**

**Eyes:** Irritation, burns and possible eye damage  
**Skin:** Severe irritation, burns, rash and blisters  
**Inhalation:** Nose, throat and lung irritation, with coughing and severe shortness of breath (Pulmonary edema)  
 Headache, dizziness, nausea and vomiting

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention immediately.  
**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water. Seek medical attention.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** promptly to a medical facility.  
**Medical** observation is recommended as symptoms may be delayed.



Common Name: **SODIUM NITRITE**

Synonyms: Anti-Rust; Diazoting Salts; Erininitrit

CAS No: 7632-00-0

 Molecular Formula:  $\text{NaNO}_2$ 

RTK Substance No: 2258

Description: Odorless, yellowish white, crystalline granule, rod or powder

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>0 - Fire</b> <b>1 - Reactivity</b> DOT#: UN 1500 ERG Guide #: 140 Hazard Class: 5.1 (Oxidizer)	<b>Sodium Nitrite</b> is not combustible, but it is a STRONG OXIDIZER that enhances the combustion of other substances. Use water only. DO NOT USE dry chemical, Halon® or CO <sub>2</sub> as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> and <i>Sulfur Oxides</i> . CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool. <b>Sodium Nitrite</b> may ignite combustibles (wood, paper and oil).	<b>Sodium Nitrite</b> may explode on heating above 986°F (530°C) or on contact with CYANIDES; PHOSPHORUS; TIN (II) CHLORIDE; COMBUSTIBLES; and REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES). <b>Sodium Nitrite</b> reacts with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) to form <i>Nitrogen Dioxide</i> and reacts with <i>liquid AMMONIA</i> and other AMMONIUM COMPOUNDS to form reactive and explosive substances. <b>Sodium Nitrite</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); CELLULOSE; AMINES; CHEMICALLY ACTIVE METALS (such as POTASSIUM, MAGNESIUM and ZINC); METALS, METAL SALTS; and many other chemicals.

## SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Collect powdered material in the most convenient and safe manner and place into sealed containers for disposal.

DO NOT wash into sewer.

 For water spills add *Soda Ash* and *Calcium Hypochlorite* to adjust pH to 7.

**Sodium Nitrite** is toxic to aquatic life.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Nonflammable
<b>Auto Ignition Temp:</b>	1,000°F (538°C)
<b>Vapor Density:</b>	<1 (air = 1)
<b>Specific Gravity:</b>	2.2 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	608°F (320°C) (Decomposes)
<b>Melting Point:</b>	520°F (271°C)
<b>Molecular Weight:</b>	69
<b>pH:</b>	9 (in solution)

## EXPOSURE LIMITS

The Protective Action Criteria values are:

 PAC-1 = 6.4 mg/m<sup>3</sup>

 PAC-2 = 71 mg/m<sup>3</sup>

 PAC-3 = 240 mg/m<sup>3</sup>

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Nitrile and Natural Rubber
<b>Coveralls:</b>	Tyvek®
<b>Respirator:</b>	>0.15 mg/m <sup>3</sup> - full facepiece APR with High efficiency filters >1 mg/m <sup>3</sup> - SCBA

## HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose and throat irritation with coughing and wheezing Methemoglobinemia with headache, fatigue and blue color to the skin and lips

## FIRST AID AND DECONTAMINATION

<b>Remove</b> the person from exposure.
<b>Flush</b> eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
<b>Remove</b> contaminated clothing and wash contaminated skin with water.
<b>Begin</b> artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b> promptly to a medical facility.

Common Name: **SODIUM SULFIDE**

Synonyms: Sodium Monosulfide

CAS No: 1313-82-2

Molecular Formula: Na<sub>2</sub>S

RTK Substance No: 1728

Description: White, yellow to red or pink, crystalline solid or flake which discolors on exposure to air

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<p><b>3 - Health</b></p> <p><b>1 - Fire</b></p> <p><b>1 - Reactivity</b></p> <p><b>DOT#:</b> UN 1385</p> <p><b>ERG Guide #:</b> 135</p> <p><b>Hazard Class:</b> 4.2 (Spontaneously Combustible)</p>	<p>Finely divided <b>Sodium Sulfide</b> can explode spontaneously in air.</p> <p>Use flooding quantities of water, foam or dry powder as extinguishing agents.</p> <p>DO NOT use CO<sub>2</sub> fire extinguishers.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Hydrogen Sulfide</i> and <i>Sulfur Oxides</i>.</p> <p>CONTAINERS MAY EXPLODE IN FIRE.</p> <p>Use water spray to keep fire-exposed containers cool.</p>	<p>ELEVATED TEMPERATURES (1,688°F, 920°C) or FRICTION can cause explosive decomposition.</p> <p><b>Sodium Sulfide</b> reacts violently with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); ALUMINUM POWDER; CARBON; and DIAZONIUM SALTS.</p> <p><b>Sodium Sulfide</b> reacts with WATER to form <i>Hydrogen Sulfide</i> gas.</p> <p>DO NOT ALLOW <b>Sodium Sulfide</b> to become completely dry as it may ignite spontaneously.</p>

**SPILL/LEAKS**

**Isolation Distance:**

Spills: 25 meter (75 feet)

Fire: 800 meters (1/2 mile)

Keep finely divided **Sodium Sulfide** out of confined spaces, such as sewers, because of the possibility of an explosion.

May be hazardous to the environment and harmful to aquatic life.

**PHYSICAL PROPERTIES**

**Odor Threshold:** Rotten eggs

**Flash Point:** Spontaneously combustible when heated

**Auto Ignition Temp:** >896°F (>480°C)

**Specific Gravity:** 1.86 (water = 1)

**Water Solubility:** Slightly soluble

**Melting Point:** 1,688° to 1,742°F (920° to 950°C)

**Molecular Weight:** 78.05

**EXPOSURE LIMITS**

No occupational exposure limits have been established.

**PROTECTIVE EQUIPMENT**

**Gloves:** Silver Shield®/4H®

**Coveralls:** DuPont Tychem® CPF 1, QC, CPF 2 and SL for **Sodium Sulfide** and DuPont Tychem®, CSM, Responder® and TK for **Sodium Sulfide** solution

**Respirator:** Supplied air

**HEALTH EFFECTS**

**Eyes:** Irritation and burns

**Skin:** Irritation and burns, skin allergy with itching and rash

**Inhalation:** Nose, throat and lung irritation with coughing, and shortness of breath

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention immediately.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** to a medical facility.

Common Name: **STANNOUS CHLORIDE**

Synonyms: Tin Chloride; Tin Dichloride

CAS No: 7772-99-8

 Molecular Formula: SnCl<sub>2</sub>

RTK Substance No: 1733

Description: White to off-white flake or crystalline solid

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 1759 ERG Guide #: 154 Hazard Class: 8 (Corrosive)	Extinguish fire using an agent suitable for type of surrounding fire. <b>Stannous Chloride</b> itself does not burn. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Hydrogen Chloride</i> and <i>Tin Oxide fumes</i> . Use water spray to keep fire-exposed containers cool.	<b>Stannous Chloride</b> reacts violently with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); ETHYLENE OXIDE; HYDRAZINE HYDRATE; and CALCIUM CARBIDE. <b>Stannous Chloride</b> is not compatible with METALS (such as POTASSIUM, SODIUM, MAGNESIUM and ZINC); METAL CARBIDES; and COMBUSTIBLE MATERIALS. <b>Stannous Chloride</b> is MOISTURE and AIR sensitive.

**SPILL/LEAKS**
**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Collect powdered material in the most convenient and safe manner and place into sealed containers for disposal.

DO NOT wash into sewer.

**PHYSICAL PROPERTIES**

<b>Flash Point:</b>	Noncombustible
<b>Vapor Pressure:</b>	0 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	3.95 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	1,206°F (652°C)
<b>Melting Point:</b>	475°F (246°C)
<b>Molecular Weight:</b>	189.6

**EXPOSURE LIMITS**
**OSHA:** 2 mg/m<sup>3</sup>, 8-hr TWA

**NIOSH:** 2 mg/m<sup>3</sup>, 10-hr TWA

**ACGIH:** 2 mg/m<sup>3</sup>, 8-hr TWA

**IDLH:** 100 mg/m<sup>3</sup>

 (All of the above are for *Tin*)

The Protective Action Criteria values are:

 PAC-1 = 9.6 mg/m<sup>3</sup>

 PAC-2 = 50 mg/m<sup>3</sup>

 PAC-3 = 160 mg/m<sup>3</sup>
**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Nitrile and Natural Rubber
<b>Coveralls:</b>	Tyvek®
<b>Respirator:</b>	>2 mg/m <sup>3</sup> - full facepiece APR with High efficiency filters >10 mg/m <sup>3</sup> - SCBA

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns
<b>Inhalation:</b>	Nose and throat irritation with coughing and wheezing Headache, nausea and vomiting.

**FIRST AID AND DECONTAMINATION**

<b>Remove</b>	the person from exposure.
<b>Flush</b>	eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention.
<b>Quickly</b>	remove contaminated clothing and wash contaminated skin with large amounts of water. Seek medical attention.
<b>Begin</b>	artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b>	promptly to a medical facility.

Common Name: **STODDARD SOLVENT**

Synonyms: White Spirits, Varsol, Mineral Spirits

CAS No: 8052-41-3

Molecular Formula: Mixture

RTK Substance No: 1736

Description: Clear colorless liquid with a Kerosene-like odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>1 - Health</b></p> <p><b>2 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p><b>DOT#:</b> UN 1268</p> <p><b>ERG Guide #:</b> 128</p> <p><b>Hazard Class:</b> 3 (Flammable)</p>	<p>COMBUSTIBLE LIQUID</p> <p>Use dry chemical, CO<sub>2</sub>, or foam as extinguishing agents.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE.</p> <p>Use water spray to keep fire-exposed containers cool.</p> <p>Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.</p>	<p><b>Stoddard Solvent</b> reacts with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) to cause fires and explosions.</p>

### SPILL/LEAKS

**Isolation Distance:**

Small Spills: 50 meters (150 feet)

Large Spills: 300 meters (1,000 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.

If released into water, shoreline fouling may occur.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	1 to 30 ppm
<b>Flash Point:</b>	100° to 140°F (38° to 60°C)
<b>LEL:</b>	0.9%
<b>UEL:</b>	6%
<b>Auto Ignition Temp:</b>	450°F (232°C)
<b>Vapor Density:</b>	4.8 (air = 1)
<b>Vapor Pressure:</b>	2 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	0.8 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	309° to 399°F (154° to 204°C)
<b>Molecular Weight:</b>	approximately 140

### EXPOSURE LIMITS

**OSHA:** 2,900 mg/m<sup>3</sup> (500 ppm), 8-hr TWA

**NIOSH:** 350 mg/m<sup>3</sup> (61 ppm), 10-hr TWA;  
1,800 mg/m<sup>3</sup> (314 ppm), 15-min Ceiling

**ACGIH:** 525 mg/m<sup>3</sup> (100 ppm), 8-hr TWA

**IDLH:** 20,000 mg/m<sup>3</sup> (3,493 ppm)

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Neoprene, Silver Shield®/4H®, Viton and Nitrile (>8-hr breakthrough)
<b>Coveralls:</b>	DuPont Tychem® CPF 4, BR, LV, Responder®, CSM, and TK; Kappler Zytron® 300; and Saint-Gobain ONESuit®/TEC or equivalent (>8-hr breakthrough)
<b>Respirator:</b>	>350 mg/m <sup>3</sup> - APR with an Organic vapor cartridge >3,500 mg/m <sup>3</sup> - Supplied air

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation, rash, redness and skin ulcers
<b>Inhalation:</b>	Nose and throat irritation, headache, dizziness and passing out

### FIRST AID AND DECONTAMINATION

<b>Remove</b> the person from exposure.
<b>Flush</b> eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
<b>Quickly</b> remove contaminated clothing. Wash contaminated skin with large amounts of soap and water.
<b>Begin</b> artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b> to a medical facility.

Common Name: **STRONTIUM NITRATE**

Synonyms: Strontium Dinitrate

CAS No: 10042-76-9

Molecular Formula:  $\text{Sr}(\text{NO}_3)_2$

RTK Substance No: 1743

Description: Odorless, colorless or white, crystalline powder

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>2 - Health</b></p> <p><b>0 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p>DOT#: UN 1507</p> <p>ERG Guide #: 140</p> <p>Hazard Class: 5.1 (Oxidizer)</p>	<p><b>Strontium Nitrate</b> is not combustible, but it is a <b>STRONG OXIDIZER</b> that enhances the combustion of other substances.</p> <p>Use water only. <b>DO NOT USE CHEMICAL, FOAM or CO<sub>2</sub></b> as extinguishing agents.</p> <p><b>POISONOUS GASES ARE PRODUCED IN FIRE, including Nitrogen Oxides.</b></p> <p><b>CONTAINERS MAY EXPLODE IN FIRE.</b></p> <p>Use water spray to keep fire-exposed containers cool.</p> <p><b>Strontium Nitrate</b> may ignite combustibles (wood, paper and oil).</p> <p>Prolonged exposure to heat, shock or friction may cause <b>Strontium Nitrate</b> to explode.</p>	<p><b>Strontium Nitrate</b> and <b>ALKYL ESTERS</b> may form explosive <i>Alkyl Nitrates</i>.</p> <p><b>Strontium Nitrate</b> may react violently with <b>REDUCING AGENTS</b> (such as <b>LITHIUM, SODIUM, ALUMINUM</b> and their <b>HYDRIDES</b>).</p> <p><b>Strontium Nitrate</b> is not compatible with <b>COMBUSTIBLE MATERIALS; ORGANIC MATERIALS; HALOGENS; METALS; METAL SALTS; and STRONG ACIDS</b> (such as <b>HYDROCHLORIC, SULFURIC and NITRIC</b>).</p>

### SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Collect powdered material in the most convenient and safe manner and place into sealed containers for disposal.

DO NOT wash into sewer.

**Strontium Nitrate** can persist indefinitely in water.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Nonflammable
<b>Specific Gravity:</b>	2.98 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	1,193°F (645°C)
<b>Melting Point:</b>	1,058°F (570°C)
<b>Molecular Weight:</b>	211.6

### EXPOSURE LIMITS

No occupational exposure limits have been established for **Strontium Nitrate**.

The Protective Action Criteria values are:

PAC-1 = 30 mg/m<sup>3</sup>

PAC-2 = 250 mg/m<sup>3</sup>

PAC-3 = 500 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Nitrile and Natural Rubber
<b>Coveralls:</b>	Tyvek®
<b>Respirator:</b>	Full facepiece APR with High efficiency filters >30 mg/m <sup>3</sup> - SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, wheezing and shortness of breath

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **STYRENE MONOMER**

Synonyms: Cinnamene; Ethenylbenzene; Phenylethylene; Vinyl Benzene

CAS No: 100-42-5

Molecular Formula: C<sub>8</sub>H<sub>8</sub>

RTK Substance No: 1748

Description: Clear, colorless to yellow, oily liquid, with a sweet odor at low concentrations

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>2 - Health</b></p> <p><b>3 - Fire</b></p> <p><b>2- Reactivity</b></p> <p><b>DOT#:</b> UN 2055</p> <p><b>ERG Guide #:</b> 128P</p> <p><b>Hazard Class:</b> 3 (Flammable)</p>	<p><b>Styrene Monomer</b> is a FLAMMABLE LIQUID. Use dry chemical, CO<sub>2</sub>, water spray or foam as extinguishing agents.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE.</p> <p>Use water spray to keep fire-exposed containers cool.</p> <p>Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source and flash back.</p> <p><b>Styrene Monomer</b> can POLYMERIZE resulting in uncontrolled reactions. These reactions may be explosive.</p> <p><b>Styrene Monomer</b> may accumulate static electricity.</p>	<p><i>Unstabilized Styrene Monomer</i> can POLYMERIZE VIOLENTLY on exposure to HEAT; LIGHT; OXIDIZING AGENTS (such as PERCHLORATES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); OXYGEN; PEROXIDES (such as <i>Dibenzoyl Peroxide</i>) or when CONTAMINATED.</p> <p><b>Styrene Monomer</b> can form unstable <i>Peroxides</i> in AIR that may explode spontaneously.</p> <p><b>Styrene Monomer</b> reacts violently with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC, NITRIC and OLEUM) and METAL SALTS (such as IRON CHLORIDE and ALUMINUM CHLORIDE).</p> <p><b>Styrene Monomer</b> attacks RUBBER, COPPER and COPPER ALLOYS.</p>

### SPILL/LEAKS

**Isolation Distance:**

**Spill:** 50 meters (150 feet)

**Fire:** 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers for disposal.

Use only non-sparking tools and equipment, especially when opening and closing containers of **Styrene Monomer**.

Ground and bond containers when transferring **Styrene Monomer**.

Keep **Styrene Monomer** out of confined spaces, such as sewers, because of the possibility of an explosion.

DO NOT wash into sewer.

**Styrene Monomer** is toxic to aquatic organisms.

### PHYSICAL PROPERTIES

**Odor Threshold:** 0.04 to 0.32 ppm

**Flash Point:** 88°F (31°C)

**LEL:** 1%

**UEL:** 7%

**Auto Ignition Temp:** 914°F (490°C)

**Vapor Density:** 3.6 (air = 1)

**Vapor Pressure:** 5 mm Hg at 68°F (20°C)

**Specific Gravity:** 0.91 (water = 1)

**Water Solubility:** Very slightly soluble

**Boiling Point:** 293°F (145°C)

**Freezing Point:** -23°F (-31°C)

**Ionization Potential:** 8.4 eV

**Molecular Weight:** 104.2

### EXPOSURE LIMITS

**OSHA:** 100 ppm, 8-hr TWA; 200 ppm Ceiling; 600 ppm, 5-min peak

**NIOSH:** 50 ppm, 10-hr; 100 ppm Ceiling

**ACGIH:** 20 ppm, 8-hr TWA; 40 ppm Ceiling

**IDLH:** 700 ppm

The Protective Action Criteria values are:

PAC-1 = 20 ppm    PAC-2 = 130 ppm

PAC-3 = 1,100 ppm

### PROTECTIVE EQUIPMENT

**Gloves:** Silver Shield®/4H®, Viton and Barrier® (>8-hr breakthrough)

**Coveralls:** Tychem® F, CPF3, BR, CSM and TK; Trelchem® HPS and VPS (>8-hr breakthrough)

**Respirator:** >20 ppm - full facepiece APR with *Organic vapor* cartridges  
>200 ppm - SCBA

### HEALTH EFFECTS

**Eyes:** Irritation, rash, dryness, redness and burning feeling on contact

**Skin:** Irritation

**Inhalation:** Nose and throat irritation  
Headache, dizziness, lightheadedness, and passing out

**Chronic:** Cancer (lung) in animals

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.



Common Name: **STYRENE OXIDE**

Synonyms: (Epoxyethyl)Benzene; Epoxy Styrene; Phenyl Oxirane

CAS No: 96-09-3

Molecular Formula: C<sub>8</sub>H<sub>8</sub>O

RTK Substance No: 1749

Description: Colorless to pale, straw-colored liquid with a pleasant, sweet odor

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<p><b>3 - Health</b></p> <p><b>2 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p><b>DOT#:</b> UN 3082</p> <p><b>ERG Guide #:</b> 171</p> <p><b>Hazard Class:</b> 9 (Miscellaneous Hazardous Material)</p>	<p>COMBUSTIBLE LIQUID</p> <p>Use dry chemical, CO<sub>2</sub>, water spray, alcohol-resistant foam or other foam as extinguishing agents.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE.</p> <p>CONTAINERS MAY EXPLODE IN FIRE.</p> <p>Use water spray to keep fire-exposed containers cool.</p>	<p><b>Styrene Oxide</b> reacts violently with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); and STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE).</p> <p><b>Styrene Oxide</b> may polymerize violently and release heat with compounds which easily release <i>Hydrogen</i> (such as WATER) when ACIDS, BASES, and some SALTS are also present.</p>

**SPILL/LEAKS**

**Isolation Distance:**

Small Spills: 60 meters (200 feet)  
 Large Spills: 270 meters (900 feet)  
 Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers. DO NOT wash into sewer.

Degrades in water. Bioconcentration should not be significant.

**PHYSICAL PROPERTIES**

**Odor Threshold:** 0.06 to 0.4 ppm  
**Flash Point:** 165°F (74°C)  
**LEL:** 1.1%  
**UEL:** 22%  
**Auto Ignition:** 929°F (498°C)  
**Vapor Density:** 4.3 (air = 1)  
**Vapor Pressure:** 0.3 mm Hg at 68°F (20°C)  
**Specific Gravity:** 1.1 (water = 1)  
**Water Solubility:** Slightly soluble  
**Boiling Point:** 382°F (194°C)  
**Melting Point:** -34°F (-37°C)  
**Molecular Weight:** 120.2

**EXPOSURE LIMITS**

**OSHA:** 100 ppm, 8-hr TWA; 200 ppm, Ceiling; and 600 ppm, for 5-mins in any 3-hour period

**NIOSH:** 50 ppm, 10-hr TWA, 100 ppm STEL

**ACGIH:** 20 ppm, 8-hr TWA, 40 ppm STEL

**IDLH:** 700 ppm  
(All of the above are for *Styrene*)

**PROTECTIVE EQUIPMENT**

**Gloves:** Silver Shield®/4H® and Viton (>8-hr breakthrough for *Styrene*)

**Coveralls:** DuPont Tyvek® CPF 3, CPF 4, F, BR, LV, Responder® and TK; Kappler® Zytron® 300; and Saint-Gobain ONESuit® TEC (>8-hr breakthrough for *Aromatic Hydrocarbons*)

**Respirator:** >20 ppm - Full facepiece APR with Organic vapor cartridge  
 >200 ppm - Supplied air

**HEALTH EFFECTS**

**Eyes:** Irritation

**Skin:** Irritation, itching and rash

**Inhalation:** Nose, throat and lung irritation with coughing, wheezing and shortness of breath

Headache, dizziness and passing out

**Chronic:** Cancer (liver) in animals

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** to a medical facility.

Common Name: **SULFUR**

Synonyms: Brimstone; Colloidal Sulfur; Molten Sulfur

CAS No: 7704-34-9

Molecular Formula: S, S<sub>8</sub> (Molten)

RTK Substance No: 1757

Description: Pale yellow, crystalline solid (odorless when pure or faint "rotten egg" odor) or an amber-colored liquid when *molten*

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>2 - Health</b></p> <p><b>1 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p><b>DOT#:</b> UN 1350 UN 2448 (Molten)</p> <p><b>ERG Guide #:</b> 133</p> <p><b>Hazard Class:</b> 4.1 (Flammable Solid)</p>	<p><i>Molten Sulfur</i> is a <b>FLAMMABLE SOLID</b> and a fire and explosion risk above 450 °F (232 °C).</p> <p><b>Sulfur</b> is a <b>COMBUSTIBLE SOLID</b>.</p> <p>Use water spray to fight fires and to keep fire-exposed containers cool.</p> <p><b>POISONOUS GASES ARE PRODUCED IN FIRE</b>, including <i>Hydrogen Sulfide</i>, <i>Sulfur Dioxide</i> and <i>Sulfur Trioxide</i>.</p> <p><b>CONTAINERS MAY EXPLODE IN FIRE.</b></p> <p>Flow or agitation may generate electrostatic charges.</p> <p><b>Sulfur</b> may form an ignitable vapor/air mixture in closed tanks or containers.</p>	<p><b>Sulfur</b> reacts explosively with <b>OXIDIZING AGENTS</b> (such as <b>PERCHLORATES</b>, <b>PEROXIDES</b>, <b>PERMANGANATES</b>, <b>CHLORATES</b>, <b>NITRATES</b>, <b>CHLORINE</b>, <b>BROMINE</b> and <b>FLUORINE</b>).</p> <p><b>Sulfur</b> is not compatible with <b>METALS</b> and <b>METAL POWDERS</b> (such as <b>ZINC</b> and <b>TIN</b>); <b>ALKALI METALS</b> (such as <b>LITHIUM</b>, <b>SODIUM</b> and <b>POTASSIUM</b>); <b>PHOSPHORUS</b>; <b>AMMONIA</b>; <b>CHARCOAL</b>; and <b>HYDROGEN</b>.</p> <p><i>Molten Sulfur</i> reacts with <b>HYDROCARBONS</b> to form toxic and flammable gases such as <i>Carbon Disulfide</i> and <i>Hydrogen Sulfide</i>.</p> <p><i>Molten Sulfur</i> can reach temperatures of 320 °F (160 °C), resulting in the formation of flammable and toxic <i>Hydrogen Sulfide</i>, <i>Sulfur Dioxide</i> and <i>Sulfur Trioxide</i> gases. These gases can accumulate in the vapor space of tankers and enclosed spaces.</p>

### SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet) (*Solid*)  
50 meters (150 feet) (*Molten*)

Fire: 800 meters (1/2 mile)

Cover *molten Sulfur* with dry sand, earth, or a noncombustible material and place into sealed containers for disposal.

Collect powdered material in the most convenient and safe manner and place into sealed containers for disposal.

Use only non-sparking tools and equipment.

Keep *molten Sulfur* out of confined spaces, such as sewers, because of the possibility of an explosion.

DO NOT wash into sewer.

**Sulfur** is dangerous to aquatic life in high concentrations.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless to rotten egg odor
<b>Flash Point:</b>	405°F (207°C)
<b>LEL:</b>	3.3% (as <i>Hydrogen Sulfide</i> )
<b>UEL:</b>	46% (as <i>Hydrogen Sulfide</i> )
<b>Auto Ignition Temp:</b>	450°F (232°C)
<b>Vapor Pressure:</b>	1 mm Hg at 363°F (184°C)
<b>Specific Gravity:</b>	1.8 to 2.1 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	832°F (445°C)
<b>Melting Point:</b>	239°F (115°C)
<b>Molecular Weight:</b>	32.07(S), 256.81 (S <sub>8</sub> ) ( <i>molten</i> )

### EXPOSURE LIMITS

**NIOSH:** 10 ppm, 10-min Ceiling for *Hydrogen Sulfide*

**ACGIH:** 1 ppm, 8-hr TWA; 5 ppm, STEL for *Hydrogen Sulfide*

The Protective Action Criteria values for **Sulfur** are:

PAC-1 = 4 mg/m<sup>3</sup>    PAC-2 = 30 mg/m<sup>3</sup>  
PAC-3 = 150 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Nitrile, Neoprene and Natural Rubber (for <i>solid Sulfur</i> ) and Insulated materials (for <i>molten Sulfur</i> )
<b>Coveralls:</b>	Tyvek® for <i>solid Sulfur</i> ; use Turn out gear or heat/flame protection for <i>molten Sulfur</i>
<b>Respirator:</b>	Spill: full facepiece APR with N, R or P100 filters for <i>solid Sulfur</i> and SA or SCBA for <i>molten Sulfur</i>
	Fire: SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns
<b>Inhalation:</b>	Nose, throat and lung irritation, with coughing, wheezing and shortness of breath Headache, nausea and vomiting

### FIRST AID AND DECONTAMINATION

<b>Remove</b> the person from exposure.
<b>Flush</b> eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.
<b>Quickly</b> remove contaminated clothing and wash contaminated skin with large amounts of soap and water.
<b>Begin</b> artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b> promptly to a medical facility.

Common Name: **SULFUR DIOXIDE**

Synonyms: Sulfurous Oxide; Sulfur Oxide

CAS No: 7446-09-5

Molecular Formula: SO<sub>2</sub>

RTK Substance No: 1759

Description: Colorless gas with a strong, irritating odor, that is often shipped as a liquid under pressure

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> <b>DOT#:</b> UN 1079 <b>ERG Guide #:</b> 125 <b>Hazard Class:</b> 2.3 (Toxic gas)	Extinguish fire using an agent suitable for type of surrounding fire. <b>Sulfur Dioxide</b> itself does not burn. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Sulfur Oxides</i> . CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool and to dilute and disperse vapors.	<b>Sulfur Dioxide</b> reacts violently with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); SODIUM HYDRIDE; and OTHER REDUCING AGENTS (such as LITHIUM, ZINC, ALUMINUM and their HYDRIDES). <b>Sulfur Dioxide</b> is not compatible with AMMONIA; BRASS; and COPPER. <b>Sulfur Dioxide</b> reacts with WATER or MOISTURE to form <i>Sulfuric Acid</i> .

### SPILL/LEAKS

**Isolation Distance:**

Spill (small): 60 meters (200 feet)

Spill (large): 400 meters (1,250 feet)

Fire: 1,600 meters (1 mile)

Stop flow of gas. If source of leak is a cylinder and the leak cannot be stopped in place, remove the leaking cylinder to a safe place in the open air, and repair leak or allow cylinder to empty.

Turn leaking cylinder with leak up to prevent escape of gas in liquid state.

Cover *liquid* spills with dry lime, sand or soda ash and place into sealed containers for disposal.

DO NOT wash into sewer.

**Sulfur Dioxide** is harmful to aquatic organisms.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	0.3 to 5 ppm
<b>Flash Point:</b>	Nonflammable
<b>Vapor Density:</b>	2.2 (air = 1)
<b>Vapor Pressure:</b>	2,432 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.46 (water = 1)
<b>Water Solubility:</b>	Slightly soluble
<b>Boiling Point:</b>	14°F (-10°C)
<b>Melting Point:</b>	-104°F (-76°C)
<b>Critical Temp:</b>	315°F (157°C)
<b>Ionization Potential:</b>	12.3 eV
<b>Molecular Weight:</b>	64.07

### EXPOSURE LIMITS

**OSHA:** 5 ppm, 8-hr TWA

**NIOSH:** 2 ppm, 10-hr TWA, 5 ppm, STEL

**ACGIH:** 0.25 ppm, 8-hr TWA

**IDLH:** 100 ppm

The Protective Action Criteria values are:

PAC-1 = 0.2 ppm PAC-2 = 0.75 ppm PAC-3 = 30 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Insulated Butyl and Neoprene (>4-hr breakthrough)
<b>Coveralls:</b>	Tychem® SL, BR, Responder® and TK (>8-hr breakthrough)
<b>Respirator:</b>	>0.25 ppm - full facepiece APR with cartridges specific for <b>Sulfur Dioxide</b> >20 ppm - SCBA

### HEALTH EFFECTS

**Eyes:** Irritation and burns, contact with liquid may cause frostbite

**Skin:** Irritation and burns, contact with liquid may cause frostbite

**Inhalation:** Nose, throat and lung irritation, with coughing, and severe shortness of breath (pulmonary edema)

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.

**Immerse** affected part in warm water. Seek medical attention.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

**Medical** observation is recommended as symptoms may be delayed.

Common Name: **SULFURIC ACID**

Synonyms: Battery Acid; Hydrogen Sulfate; Oil of Vitriol

CAS No: 7664-93-9

 Molecular Formula: H<sub>2</sub>SO<sub>4</sub>

RTK Substance No: 1761

Description: Clear, colorless to brown, odorless liquid

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>0 - Fire</b> <b>2-W - Reactivity</b> DOT#: UN 1830 ERG Guide #: 137 Hazard Class: 8 (Corrosive)	<b>Sulfuric Acid</b> is not combustible, but it is a STRONG OXIDIZER that enhances the combustion of other substances. Extinguish fire using an agent suitable for type of surrounding fire. <b>Sulfuric Acid</b> itself does not burn. DO NOT USE WATER directly on <b>Sulfuric Acid</b> . POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Sulfur Oxides</i> . CONTAINERS MAY EXPLODE IN FIRE. <b>Sulfuric Acid</b> may ignite combustibles (wood, paper and oil).	<b>Sulfuric Acid</b> reacts violently with ALCOHOL and WATER to release HEAT and will also react violently or explosively with ORGANIC MATERIALS; COMBUSTIBLES; STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES); and OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE). <b>Sulfuric Acid</b> reacts with MOST METALS to produce flammable and explosive <i>Hydrogen gas</i> . <b>Sulfuric Acid</b> is not compatible with STRONG ACIDS (such as HYDROCHLORIC and NITRIC); MOISTURE; AMINES; and many OTHER SUBSTANCES.

## SPILL/LEAKS

**Isolation Distance:**

 Small Spill: 60 meters (200 feet)  
 Large Spill: 300 meters (1,000 feet)  
 Fire: 800 meters (1/2 mile)

Neutralize spill with crushed limestone, soda ash or lime and place into sealed containers for disposal.

DO NOT USE WATER OR WET METHOD.

DO NOT wash into sewer.

**Sulfuric Acid** is harmful to aquatic organisms.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Nonflammable
<b>Vapor Density:</b>	3.4 (air = 1)
<b>Vapor Pressure:</b>	0.001 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.8 (water = 1)
<b>Water Solubility:</b>	Soluble (mixes)
<b>Boiling Point:</b>	554° to 640°F (290° to 338°C)
<b>Melting Point:</b>	51°F (10°C)
<b>Molecular Weight:</b>	98.1
<b>pH:</b>	0.3

## EXPOSURE LIMITS

**OSHA:** 1 mg/m<sup>3</sup>, 8-hr TWA  
**NIOSH:** 1 mg/m<sup>3</sup>, 10-hr TWA  
**ACGIH:** 0.2 mg/m<sup>3</sup>, 8-hr TWA  
**IDLH:** 15 mg/m<sup>3</sup>  
 ERPG-1 = 2 mg/m<sup>3</sup>,  
 ERPG-2 = 10 mg/m<sup>3</sup>  
 ERPG-3 = 120 mg/m<sup>3</sup>

## PROTECTIVE EQUIPMENT

**Gloves:** Butyl, Silver Shield®/4H®, Viton and Barrier® (>8-hr breakthrough)  
**Coveralls:** Tychem® fabrics; Zytron® 300; ONESuit®/TEC; and Trelchem® HPS and VPS (>8-hr breakthrough)  
**Respirator:** <2 mg/m<sup>3</sup> - full facepiece APR with Acid gas cartridge and R or P100 prefilter  
 >2 mg/m<sup>3</sup> - Supplied air or SCBA

## HEALTH EFFECTS

**Eyes:** Severe irritation and burns  
**Skin:** Severe irritation and burns  
**Inhalation:** Nose, throat and lung irritation with coughing and severe shortness of breath (pulmonary edema)  
 Headache, nausea and vomiting  
**Chronic:** Strong *inorganic acid mists* containing **Sulfuric Acid** cause cancer of the larynx in humans

## FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention immediately.  
**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention immediately.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** promptly to a medical facility.  
**Medical** observation is recommended as symptoms may be delayed.

Common Name: **SULFUR TRIOXIDE**

Synonyms: Sulfuric Anhydride; Sulfuric Oxide

CAS No: 7446-11-9

 Molecular Formula: SO<sub>3</sub>

RTK Substance No: 1767

Description: Colorless to white, crystalline solid or a colorless gas or liquid

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>0 - Fire</b> <b>2W - Reactivity</b> DOT#: UN 1829 ERG Guide #: 137 Hazard Class: 8  (Corrosive)	<b>Sulfur Trioxide</b> is not combustible but is a STRONG OXIDIZER which enhances the combustion of other substances. Use dry chemical or CO <sub>2</sub> as extinguishing agents. DO NOT USE WATER directly on <b>Sulfur Trioxide</b> as an explosion may result. POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool. DO NOT get water inside containers. <b>Sulfur Trioxide</b> may ignite combustibles (wood, paper and oil).	<b>Sulfur Trioxide</b> reacts explosively with WATER to form toxic <i>Sulfuric Acid</i> . <b>Sulfur Trioxide</b> reacts violently with ORGANIC MATERIALS; STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); TETRAFLUOROETHYLENE; OXYGEN DIFLUORIDE; ANHYDROUS PERCHLORIC ACID; and REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES) to release heat and cause fires, and form toxic gases <b>Sulfur Trioxide</b> is AIR SENSITIVE.

## SPILL/LEAKS

**Isolation Distance:**

Small Spill: 60 meters (200 feet)

Large Spill: 300 meters (1,000 feet)

Fire: 800 meters (1/2 mile)

Cover spilled material with crushed limestone, soda ash, or lime.

Cover with a plastic sheet to protect from rain and water.

Collect material in the most convenient and safe manner and deposit into sealed containers.

DO NOT wash into sewer.

 Keep **Sulfur Trioxide** out of confined spaces, such as sewers, because of the possibility of an explosion.

May be toxic to aquatic life.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	1 ppm
<b>Flash Point:</b>	Noncombustible
<b>Vapor Density:</b>	2.8 (air = 1)
<b>Vapor Pressure:</b>	73 mm Hg at 77°F (25°C)
<b>Specific Gravity:</b>	1.9 (water = 1)
<b>Water Solubility:</b>	Reacts
<b>Boiling Point:</b>	113°F (45°C)
<b>Ionization Potential:</b>	12.8 +/- 0.04 (liquid)
<b>Molecular Weight:</b>	80

## EXPOSURE LIMITS

**ERPG-1:** 2 mg/m<sup>3</sup>
**ERPG-2:** 10 mg/m<sup>3</sup>
**ERPG-3:** 30 mg/m<sup>3</sup>

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Silver Shield®/4H® and Fluoroelastomer (>8-hr breakthrough for <i>Oleum</i> )
<b>Coveralls:</b>	DuPont Tychem® CPF 4 and TK; Kappler® Zytron® 300; and Saint-Gobain ONESuit® TEC (>8-hr breakthrough for <i>Oleum</i> )
<b>Respirator:</b>	< 2 mg/m <sup>3</sup> - Supplied air > 2 mg/m <sup>3</sup> - SCBA

## HEALTH EFFECTS

<b>Eyes:</b>	Severe irritation and burns
<b>Skin:</b>	Severe irritation and burns
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing and severe shortness of breath (pulmonary edema)  Headache, dizziness, nausea and vomiting
<b>Chronic:</b>	Strong inorganic acid mists containing <i>Sulfuric Acid</i> cause cancer of the lung and larynx in humans

## FIRST AID AND DECONTAMINATION

<b>Remove</b>	the person from exposure.
<b>Flush</b>	eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention immediately.
<b>Quickly</b>	remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention immediately.
<b>Begin</b>	artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b>	promptly to a medical facility.
<b>Medical</b>	observation is recommended as symptoms may be delayed.



Common Name: **SULFURYL CHLORIDE**

Synonyms: Chlorosulfuric Acid; Sulfuric Dichloride; Sulfur Oxychloride

CAS No: 7791-25-5

Molecular Formula: SO<sub>2</sub>Cl<sub>2</sub>

RTK Substance No: 1768

Description: Colorless liquid with a strong, irritating odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>0 - Fire</b> <b>2W - Reactivity</b> <b>DOT#: UN 1834</b> <b>ERG Guide #: 137</b> <b>Hazard Class: 8</b> (Corrosive)	CORROSIVE AND WATER REACTIVE Extinguish fire using an agent suitable for type of surrounding fire. <b>Sulfuryl Chloride</b> itself does not burn. DO NOT USE WATER. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Chlorine, Hydrogen Chloride, and Sulfur Oxides.</i> <b>Sulfuryl Chloride</b> may ignite combustibles (wood, paper and oil).	<b>Sulfuryl Chloride</b> reacts with WATER or MOIST AIR to form toxic and corrosive gases such as <i>Hydrogen Chloride</i> and <i>Sulfuric Acid</i> . <b>Sulfuryl Chloride</b> can react explosively with LEAD DIOXIDE and ETHERS (when in the presence of METAL SALTS). <b>Sulfuryl Chloride</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); ALCOHOLS; and AMINES. <b>Sulfuryl Chloride</b> attacks many METALS in the presence of WATER.

### SPILL/LEAKS

**Isolation Distance:**

Small Spill: 30 meters (100 feet)

Large Spill: 100 meters (300 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers for disposal.

DO NOT USE WATER OR WET METHOD.

DO NOT wash into sewer.

**Sulfuryl Chloride** may be hazardous to the environment, especially water systems.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Strong, irritating odor
<b>Flash Point:</b>	Nonflammable
<b>Vapor Density:</b>	4.6 (air = 1)
<b>Vapor Pressure:</b>	105 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.67 (water = 1)
<b>Water Solubility:</b>	Decomposes/Reacts
<b>Boiling Point:</b>	156°F (69°C)
<b>Freezing Point:</b>	-65°F (-54°C)
<b>Molecular Weight:</b>	134.96

### EXPOSURE LIMITS

No occupational exposure limits have been established for **Sulfuryl Chloride**.

The Protective Action Criteria values are:

PAC-1 = 0.3 ppm    PAC-2 = 3.7 ppm    PAC-3 = 11ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Barrier® (>8-hr breakthrough for <i>Inorganic Halides</i> )
<b>Coveralls:</b>	Tychem® BR, Responder®, and TK (>8-hr breakthrough)
<b>Respirator:</b>	SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Severe irritation, burns and possible eye damage
<b>Skin:</b>	Severe irritation and burns
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, and severe shortness of breath (pulmonary edema)

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention immediately.  
**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention immediately.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** promptly to a medical facility.  
**Medical** observation is recommended as symptoms may be delayed.



Common Name: **SULPHAMIC ACID**

Synonyms: Amidosulfonic Acid; Sulfamidic Acid

CAS No: 5329-14-6

Molecular Formula:  $\text{NH}_2\text{SO}_3\text{H}$

RTK Substance No: 1770

Description: Odorless, white, crystalline solid

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> <b>DOT#:</b> UN 2967 <b>ERG Guide #:</b> 154 <b>Hazard Class:</b> 8 (Corrosive)	<b>Sulphamic Acid</b> may burn, but does not readily ignite. Use dry chemical, $\text{CO}_2$ , water spray or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Sulfur Oxides</i> and <i>Ammonia</i> . Use water spray to keep fire-exposed containers cool.	<b>Sulphamic Acid</b> reacts violently with CHLORINE, NITRIC ACID, and STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE). <b>Sulphamic Acid</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, BROMINE and FLUORINE); AMMONIA; AMINES; and ISOCYANATES. <b>Sulphamic Acid</b> reacts with WATER to release heat and form <i>Ammonium Bisulfate</i> .

### SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Collect powdered material in the most convenient and safe manner and place into sealed containers for disposal.

Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers for disposal.

DO NOT wash into sewer.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Specific Gravity:</b>	2.15 (water = 1)
<b>Water Solubility:</b>	Moderately soluble
<b>Melting Point:</b>	392°F (200°C) (Decomposes)
<b>Molecular Weight:</b>	97.1
<b>pH:</b>	1.18 (1% solution)

### EXPOSURE LIMITS

No occupational exposure limits have been established for **Sulphamic Acid**.

The Protective Action Criteria values are:

PAC-1 = 40 mg/m<sup>3</sup>

PAC-2 = 250 mg/m<sup>3</sup>

PAC-3 = 500 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl, Neoprene and Natural Rubber
<b>Coveralls:</b>	Tyvek® (for <i>solids</i> ); Tychem® BR, Responder® and TK; Trellchem® HPS and VPS (for <i>solutions</i> )
<b>Respirator:</b>	Full facepiece APR with High <i>efficiency filters</i> >40 mg/m <sup>3</sup> - SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Severe irritation and burns
<b>Skin:</b>	Severe irritation and burns
<b>Inhalation:</b>	Nose, throat and lung irritation, with coughing, and severe shortness of breath (pulmonary edema)

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention immediately.  
**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water. Seek medical attention.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** promptly to a medical facility.  
**Medical** observation is recommended as symptoms may be delayed.

Common Name: **TALC (NOT CONTAINING ASBESTOS FIBERS)**

Synonyms: Hydrous Magnesium Silicate; Steatite Talc

CAS No: 14807-96-6

Molecular Formula:  $Mg_3H_2(SiO_3)_4$

RTK Substance No: 1773

Description: Odorless white to grayish-white, crystalline powder

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>1 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> DOT#: None ERG Guide #: None Hazard Class: None	Extinguish fire using an agent suitable for type of surrounding fire. <b>Talc</b> itself does not burn.	No incompatibilities or reactivities reported.

### SPILL/LEAKS

**Isolation Distance:**

Spills: 25 meters (75 feet)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Nonflammable
<b>Vapor Pressure:</b>	0 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	2.7 to 2.8 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Melting Point:</b>	1,652°F (900°C) to 1,832°F (1,000°C)
<b>Molecular Weight:</b>	379.3

### EXPOSURE LIMITS

**OSHA:** 20 mppcf, 8-hr TWA  
**NIOSH:** 2 mg/m<sup>3</sup>, 10-hr TWA (*respirable dust*)  
**ACGIH:** 2 mg/m<sup>3</sup>, 8-hr TWA (*respirable fraction*)  
**IDLH:** 1,000 mg/m<sup>3</sup>

The Protective Action Criteria values are:

PAC-1 = 2 mg/m<sup>3</sup>  
 PAC-2 = 10 mg/m<sup>3</sup>  
 PAC-3 = 500 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

**Gloves:** Nitrile and Natural Rubber  
**Coveralls:** Tyvek®  
**Respirator:** >2 mg/m<sup>3</sup> - full facepiece APR with *High efficiency filters*  
 >10 mg/m<sup>3</sup> - SCBA

### HEALTH EFFECTS

**Eyes:** Irritation  
**Skin:** Irritation and rash  
**Inhalation:** Nose, throat and lung irritation, with coughing, wheezing and shortness of breath

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.  
**Remove** contaminated clothing and wash contaminated skin with soap and water.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** promptly to a medical facility.

Common Name: **TELLURIUM**

Synonyms: Aurum Paradoxum; Telloy

CAS No: 13494-80-9

Molecular Formula: Te

RTK Substance No: 1777

Description: Odorless, silvery-white crystalline solid or a dark gray to brown powder

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>3 - Health</b></p> <p><b>3 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p><b>DOT#:</b> UN 7325</p> <p><b>ERG Guide #:</b> 133</p> <p><b>Hazard Class:</b> 5.1 (Flammable solid)</p>	<p><i>Finely divided Tellurium</i> is a <b>FLAMMABLE SOLID</b> and can form explosive mixtures in air.</p> <p>Use dry chemical powder, sand, graphite or other extinguishing agents appropriate for metal fires.</p> <p><b>POISONOUS GASES ARE PRODUCED IN FIRE</b>, including <i>Tellurium Oxide</i> and <i>Hydrogen Telluride</i>.</p> <p>Use water spray to keep fire-exposed containers cool.</p>	<p><b>Tellurium</b> may react violently with <b>OXIDIZING AGENTS</b> and <b>HALOGENS</b> (such as <b>PERCHLORATES</b>, <b>PEROXIDES</b>, <b>PERMANGANATES</b>, <b>CHLORATES</b>, <b>NITRATES</b>, <b>CHLORINE</b>, <b>BROMINE</b> and <b>FLUORINE</b>) and <b>SILICIDES</b>.</p> <p><b>Tellurium</b> is not compatible with <b>STRONG ACIDS</b> (such as <b>HYDROCHLORIC</b>, <b>SULFURIC</b> and <b>NITRIC</b>); <b>STRONG BASES</b> (such as <b>SODIUM HYDROXIDE</b> and <b>POTASSIUM HYDROXIDE</b>); <b>CHEMICALLY ACTIVE METALS</b> (such as <b>POTASSIUM</b>, <b>SODIUM</b>, <b>MAGNESIUM</b> and <b>ZINC</b>); and <b>METAL SALTS</b>.</p>

### SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Collect powdered material in the most convenient and safe manner and place into sealed containers for disposal.

Keep *finely divided Tellurium* out of confined spaces, such as sewers, because of the possibility of an explosion.

DO NOT wash into sewer.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Auto Ignition Temp:</b>	944°F (340°C)
<b>Vapor Pressure:</b>	0 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	6.1 to 6.3 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	1,814°F (990°C)
<b>Melting Point:</b>	842°F (450°C)
<b>Molecular Weight:</b>	127.6

### EXPOSURE LIMITS

**OSHA:** 0.1 mg/m<sup>3</sup>, 8-hr TWA

**NIOSH:** 0.1 mg/m<sup>3</sup>, 10-hr TWA

**IDLH:** 25 mg/m<sup>3</sup>

The Protective Action Criteria values are:

PAC-1 = 0.3 mg/m<sup>3</sup>    PAC-3 = 25 mg/m<sup>3</sup>

PAC-2 = 20 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Nitrile and Natural Rubber
<b>Coveralls:</b>	Tyvek®
<b>Respirator:</b>	>0.3 mg/m <sup>3</sup> - SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose, throat and lung irritation, with coughing, and severe shortness of breath (pulmonary edema)
	Headache, fatigue, dizziness, drowsiness and weakness

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

**Medical** observation is recommended as symptoms may be delayed.

# RIGHT TO KNOW

## HAZARDOUS SUBSTANCE FACT SHEET

**Common Name:** TEMEPHOS

Synonyms: Abate; Difenthos; Nimitex; Biothion  
 CAS Number: 3383-96-8  
 Molecular Formula: C<sub>16</sub>H<sub>12</sub>O<sub>6</sub>P<sub>2</sub>S<sub>3</sub>  
 RTK Number: 1780  
 Description: White, crystalline, sand-like solid or thick brown liquid

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>Health:</b> 3 <b>Fire:</b> 1 <b>Reactivity:</b> 1 <b>DOT #:</b> UN 2783 UN 3018 <b>ERG #:</b> 152 <b>DOT Hazard:</b> 6.1 (poison)	<b>Temephos</b> may burn but does not readily ignite. <b>Temephos</b> is COMBUSTIBLE POISONOUS FUMES ARE PRODUCED IN FIRE, including <i>Sulfur Oxides</i> and <i>Phosphorus Oxide fumes</i> . CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool.	<b>Temephos</b> is susceptible to formation of highly toxic and flammable <i>Phosphine gas</i> in the presence of strong reducing agents such as HYDRIDES.

### SPILLS/LEAKS

**Isolation Distances:**  
**Liquid Spill:** 50 meters (150 feet)  
**Solid Spill:** 25 meters (75 feet)  
**Fire:** 800 meters (1/2 miles)

Evacuate personnel.  
 Secure and control entrance to the area.  
 If it is safe to do so, remove potential ignition sources.  
 Collect *powdered* material in the most convenient and safe manner and deposit in sealed containers. DO NOT DRY SWEEP.  
 Absorb *liquids* in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.  
 Do not allow this substance to enter waterways, including sewers, as it is very toxic to aquatic life with long-lasting effects.

### PHYSICAL PROPERTIES

**Molecular Weight:** 466.5  
**Melting Point:** 31 °C (87 °F)  
**Water Solubility:** Insoluble  
**Vapor Pressure:** 7 x 10<sup>-8</sup> mm Hg at 25 °C (77 °F)  
**Specific Gravity:** 1.32

### EXPOSURE LIMITS

The following exposure limits are for **Temephos**:

**OSHA:** 15 mg/m<sup>3</sup> (*total dust*), 8-hour average  
 5 mg/m<sup>3</sup> (*respirable dust*), 8-hour average

**NIOSH:** 10 mg/m<sup>3</sup> (*total dust*), 10-hour average  
 5 mg/m<sup>3</sup> (*respirable dust*), 10-hour average

**ACGIH:** 10 mg/m<sup>3</sup> (*total dust*) – 8-hour average  
 1 mg/m<sup>3</sup> (*respirable dust*) – 8-hour average

### PROTECTIVE EQUIPMENT

**Gloves:** Nitrile and Neoprene  
**Coverall:** Tychem® BR, CSM and TK, or the equivalent  
**Respirator:** >1 mg/m<sup>3</sup> - full facepiece respirator, pesticide cartridge, particulate prefilters  
 >10 mg/m<sup>3</sup> - supplied-air respirator, full facepiece pressure-demand or other positive-pressure mode

### ACUTE HEALTH EFFECTS

**Eyes:** Irritation  
**Skin:** Irritation  
**Inhalation:** Headache, dizziness, blurred vision, chest tightness, twitching, loss of coordination, convulsions, coma, death

### FIRST AID AND DECONTAMINATION

Immediately flush eyes with large amounts of water for at least 15 minutes.  
 Quickly remove contaminated clothing. Immediately wash area with large amounts of soap and water. Seek medical attention immediately.  
 Shampoo hair promptly if contaminated.  
 Remove the person from exposure.  
 Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped  
 Medical observation is recommended for several days following exposure as symptoms may be delayed.  
 Transfer promptly to a medical facility.

Common Name: **TERPHENYLS (mixed isomers)**

Synonyms: Diphenylbenzenes

CAS No: 26140-60-3

 Molecular Formula:  $C_{12}H_{10}$ 

RTK Substance No: 3650

Description: Colorless or light-yellow solids

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>1 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b>  DOT#: N/A ERG Guide #: N/A Hazard Class: N/A	- May burn, but do not readily ignite. - Use dry chemical, CO <sub>2</sub> , water spray, an alcohol-resistant foam or other foaming agent. - POISONOUS GASES ARE PRODUCED IN FIRE. - CONTAINERS MAY EXPLODE IN FIRE. - Use water spray to keep fire-exposed containers cool.	- Incompatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).

**SPILL/LEAKS**
**Isolation Distance:** 25 meters (75 feet)

- Vacuum or sweep spilled material into containers.
- This chemical can bioaccumulate in fish.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	No Information
<b>Flash Point:</b>	325°F – 405°F (163°C – 207°C)
<b>LEL:</b>	N/A
<b>UEL:</b>	N/A
<b>Vapor Density:</b>	7.9 (air = 1)
<b>Vapor Pressure:</b>	0.01 mm Hg at 68°F (20°C)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	630°F (332°C)
<b>Melting Point:</b>	133°F – 415°F (56°C – 213°C)

**EXPOSURE LIMITS**

<b>OSHA PEL:</b>	9 mg/m <sup>3</sup> Ceiling
<b>NIOSH REL:</b>	5 mg/m <sup>3</sup> Ceiling
<b>ACGIH TLV:</b>	5 mg/m <sup>3</sup> Ceiling
<b>IDLH LEVEL:</b>	500 mg/m <sup>3</sup>

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Rubber
<b>Coverall:</b>	No Information
<b>Boot:</b>	No Information
<b>Respirator:</b>	>5 mg/m <sup>3</sup> N95 (If heat is involved use an Organic Vapor Cartridge along with an N95) >50 mg/m <sup>3</sup> SA

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation, burning
<b>Skin:</b>	Irritation, burning
<b>Acute:</b>	Nose, throat, and lung irritation with coughing, and shortness of breath
<b>Chronic:</b>	Cancer – Not Tested Can affect the liver and kidneys

**FIRST AID AND DECONTAMINATION**

- Flush eyes with cool water for at least 15 minutes.
- Remove contaminated clothing and wash contaminated skin with soap and water.
- Remove person from exposure.
- Transfer to a medical facility.

Common Name: **1,1,1,2-TETRACHLORO-2,2-DIFLUOROETHANE**

Synonyms: CFC112a; Halocarbon 112a; Refrigerant 112a

CAS No: 76-11-9

 Molecular Formula: C<sub>2</sub>Cl<sub>4</sub>F<sub>2</sub>

RTK Substance No: 1807

 Description: Colorless, crystalline solid with an *Ether*-like odor at room temperature, or a liquid above 105°F (41°C)

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> DOT#: None ERG Guide #: None Hazard Class: None	Extinguish fire using an agent suitable for type of surrounding fire. <b>1,1,1,2-Tetrachloro-2,2-Difluoroethane</b> itself does not burn. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Hydrogen Chloride</i> , <i>Hydrogen Fluoride</i> and <i>Phosgene</i> . Use water spray to keep fire-exposed containers cool.	<b>1,1,1,2-Tetrachloro-2,2-Difluoroethane</b> reacts with CHEMICALLY ACTIVE METALS (such as POTASSIUM, SODIUM, MAGNESIUM and ZINC). <b>1,1,1,2-Tetrachloro-2,2-Difluoroethane</b> may react with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) and ACID FUMES to release toxic <i>Fluoride fumes</i> .

## SPILL/LEAKS

**Isolation Distance:**

Solid Spill: 25 meters (75 feet)

Liquid Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Collect solid material in the most convenient and safe manner and place into sealed containers for disposal.

Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers for disposal.

**1,1,1,2-Tetrachloro-2,2-Difluoroethane** does not degrade in the atmosphere.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	<i>Ether</i> -like odor
<b>Flash Point:</b>	Noncombustible
<b>Vapor Pressure:</b>	40 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.65 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	197°F (91.7°C)
<b>Melting Point:</b>	105°F (41°C)
<b>Ionization Potential:</b>	11.30 eV
<b>Molecular Weight:</b>	203.83

## EXPOSURE LIMITS

<b>OSHA:</b>	500 ppm, 8-hr TWA
<b>NIOSH:</b>	500 ppm, 10-hr TWA
<b>ACGIH:</b>	100 ppm, 8-hr TWA
<b>IDLH:</b>	2,000 ppm

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Viton and Barrier® (>4-hr breakthrough for <i>liquid Hydrocarbons, aliphatic</i> )
<b>Coveralls:</b>	Tychem® BR, Responder® and TK; and Trelchem® HPS and VPS (>8-hr breakthrough for <i>liquid Hydrocarbons, aliphatic</i> )
<b>Respirator:</b>	>100 ppm - SCBA

## HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation and rash
<b>Inhalation:</b>	Nose, throat and lung irritation, with coughing, and severe shortness of breath (pulmonary edema) Exposure can cause headache, dizziness, confusion, tremors, lightheadedness, and passing out

## FIRST AID AND DECONTAMINATION

<b>Remove</b>	the person from exposure.
<b>Flush</b>	eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
<b>Quickly</b>	remove contaminated clothing and wash contaminated skin with large amounts of soap and water.
<b>Begin</b>	artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b>	promptly to a medical facility.
<b>Medical</b>	observation is recommended as symptoms may be delayed.



Common Name: **1,1,1,2-TETRACHLOROETHANE**

Synonyms: None

CAS No: 630-20-6

Molecular Formula: C<sub>2</sub>H<sub>2</sub>Cl<sub>4</sub>

RTK Substance No: 2992

Description: Colorless to yellowish-red liquid

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 1702 ERG Guide #: 151 Hazard Class: 6.1 (Poison)	DOES NOT BURN. Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Hydrogen Chloride gas</i> . Use water spray to keep fire-exposed containers cool.	<b>1,1,1,2-Tetrachloroethane</b> reacts with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); CHEMICALLY ACTIVE METALS (such as POTASSIUM, SODIUM, MAGNESIUM and ZINC); DINITROGEN TETRAOXIDE; 2,4-DINITROPHENYL DISULFIDE; SODIUM TETRAOXIDE; and SODIUM POTASSIUM ALLOY. Prevent contact with HOT SURFACES.

**SPILL/LEAKS**

**Isolation Distance:**

Small Spill: 60 meters (200 feet)

Large Spill: 270 meters (900 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.

DO NOT wash into sewer.

**1,1,1,2-Tetrachloroethane** is harmful to aquatic organisms.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	Unknown
<b>Flash Point:</b>	Nonflammable
<b>Vapor Density:</b>	1.5 (air = 1)
<b>Vapor Pressure:</b>	14 mm Hg at 77°F (25°C)
<b>Specific Gravity:</b>	1.54 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	267°F (130°C)
<b>Freezing Point:</b>	-94°F (-70°C)
<b>Ionization Potential:</b>	11 +/- 0.2 eV
<b>Molecular Weight:</b>	167.8

**EXPOSURE LIMITS**

**OSHA:** None

**NIOSH:** Lowest feasible concentration

**ACGIH:** 1 ppm, 8-hr TWA (as *1,1,2,2-Tetrachloroethane*)

**IDLH:** None

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Viton (>8-hr breakthrough)
<b>Coveralls:</b>	DuPont Tychem® BR, LV, Responder® and TK; Kappler® Zytron® 300; and Saint-Gobain ONESuit® TEC (>8-hr breakthrough for <i>1,1,2,2-Tetrachloroethane</i> )
<b>Respirator:</b>	>1 ppm - full facepiece APR with Organic vapor cartridge >10 ppm - Supplied air

**HEALTH EFFECTS**

**Eyes:** Irritation

**Skin:** Irritation and drying and cracking with redness

**Inhalation:** Nose, throat and lung irritation with coughing, wheezing and shortness of breath

Headache, nausea, dizziness, seizures and passing out.

**Chronic:** Cancer (liver) in animals

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **1,1,2,2-TETRACHLOROETHANE**

Synonyms: Acetylene Tetrachloride; Tetrachloroethane

CAS No: 79-34-5

Molecular Formula: C<sub>2</sub>H<sub>2</sub>Cl<sub>4</sub>

RTK Substance No: 1809

Description: Clear, colorless to pale yellow liquid with a sweet odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>3 - Health</b></p> <p><b>0 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p><b>DOT#:</b> UN 1702</p> <p><b>ERG Guide #:</b> 151</p> <p><b>Hazard Class:</b> 6.1 (Poison)</p>	<p>Extinguish fire using an agent suitable for type of surrounding fire. <b>1,1,2,2-Tetrachloroethane</b> itself does not burn.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Phosgene</i> and <i>Hydrogen Chloride</i>.</p> <p>Use water spray to keep fire-exposed containers cool.</p>	<p><b>1,1,2,2-Tetrachloroethane</b> is decomposed by HEAT, AIR, ULTRAVIOLET LIGHT and MOISTURE to form toxic <i>Hydrogen Chloride</i> and <i>Phosgene</i> gases.</p> <p><b>1,1,2,2-Tetrachloroethane</b> reacts violently with ALKALI METALS (such as LITHIUM, SODIUM and POTASSIUM) and their ALLOYS to produce <i>Chloroacetylene</i> and <i>Dichloroacetylene</i> gases that can ignite or explode in AIR.</p> <p><b>1,1,2,2-Tetrachloroethane</b> reacts violently with STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE) and POWDERED METALS.</p> <p><b>1,1,2,2-Tetrachloroethane</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); FUMING SULFURIC ACID; and AMINES.</p>

### SPILL/LEAKS

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers for disposal.

DO NOT wash into sewer.

**1,1,2,2-Tetrachloroethane** is a marine pollutant.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	0.5 to 1.5 ppm
<b>Flash Point:</b>	Noncombustible
<b>Vapor Density:</b>	5.79 (air = 1)
<b>Vapor Pressure:</b>	5 mm Hg at 65°F (20°C)
<b>Specific Gravity:</b>	1.6 (water = 1)
<b>Water Solubility:</b>	Very slightly soluble
<b>Boiling Point:</b>	295°F (146°C)
<b>Freezing Point:</b>	-33°F (-44°C)
<b>Ionization Potential:</b>	11.1 eV
<b>Molecular Weight:</b>	167.86

### EXPOSURE LIMITS

**OSHA:** 5 ppm, 8-hr TWA

**NIOSH:** 1 ppm, 10-hr TWA

**ACGIH:** 1 ppm, 8-hr TWA

**IDLH:** 100 ppm

The Protective Action Criteria values are:

PAC-1 = 3 ppm    PAC-2 = 30 ppm    PAC-3 = 100 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Polyvinyl Alcohol and Viton (>8-hr breakthrough)
<b>Coveralls:</b>	Tychem® BR, Responder® and TK (>8-hr breakthrough)
<b>Respirator:</b>	>1 ppm - SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns
<b>Inhalation:</b>	Nose, throat and lung irritation, with coughing, and severe shortness of breath (pulmonary edema)
	Headache, nausea, vomiting and fatigue
<b>Chronic:</b>	Cancer (liver) in animals

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

**Medical** observation is recommended as symptoms may be delayed.

Common Name: **TETRACHLOROETHYLENE**

Synonyms: Ethene, Tetrachloro-; Ethylene Tetrachloride; Perchloroethylene

CAS No: 127-18-4

Molecular Formula:  $Cl_2C=CCl_2$

RTK Substance No: 1810

Description: Clear, colorless liquid with a sweet *Ether*-like odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 1897 ERG Guide #: 160 Hazard Class: 6.1 (Toxic)	Extinguish fire using an agent suitable for type of surrounding fire. <b>Tetrachloroethylene</b> itself does not burn. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Hydrogen Chloride</i> and <i>Phosgene</i> . Use water spray to keep fire-exposed containers cool.	<b>Tetrachloroethylene</b> reacts violently with <i>finely dispersed</i> or <i>finely divided</i> METALS (such as ALUMINUM, BARIUM, LITHIUM, BERYLLIUM and ZINC). <b>Tetrachloroethylene</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); SULFURIC ACID; NITRIC ACID; SODIUM HYDROXIDE; and POTASSIUM HYDROXIDE. <b>Tetrachloroethylene</b> slowly decomposes in WATER to form acids such as <i>Hydrogen Chloride</i> . <b>Tetrachloroethylene</b> decomposes slowly with heating, and with exposure to ultraviolet light or on contact with hot surfaces, to form toxic <i>Hydrogen Chloride</i> and <i>Phosgene</i> gases.

### SPILL/LEAKS

**Isolation Distance:**

**Spill:** 50 meters (150 feet)

**Fire:** 800 meters (1/2 mile)

Absorb liquids in dry sand, earth, or a similar material and place into sealed containers for disposal.  
 DO NOT wash into sewer.

**Tetrachloroethylene** is toxic to aquatic organisms and may cause long term effects on the aquatic environment.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	5 to 50 ppm
<b>Flash Point:</b>	Noncombustible
<b>Vapor Density:</b>	5.8 (air = 1)
<b>Vapor Pressure:</b>	14 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.62 (water = 1)
<b>Water Solubility:</b>	Very slightly soluble
<b>Boiling Point:</b>	250°F (121°C)
<b>Freezing Point:</b>	-2°F (-19°C)
<b>Ionization Potential:</b>	9.32 eV
<b>Molecular Weight:</b>	165.8

### EXPOSURE LIMITS

**OSHA:** 100 ppm, 8-hr TWA; 200 ppm, Ceiling; 300 ppm, Peak

**NIOSH:** Lowest feasible concentration

**ACGIH:** 25 ppm, 8-hr TWA; 100 ppm, STEL

**IDLH:** 150 ppm

The Protective Action Criteria values are:

PAC-1 = 35 ppm    PAC-2 = 230 ppm

PAC-3 = 1,200 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Polyvinyl Alcohol, Silver Shield®/4H®, Viton, Viton/Butyl and Barrier® (>8-hr breakthrough)
<b>Coveralls:</b>	Tychem® F, CPF3, BR and CSM; Trelchem® HPS and VPS (>8-hr breakthrough)
<b>Respirator:</b>	<25 ppm - full facepiece APR with <i>Organic vapor filters</i> Spills or Fire - SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns (skin absorbable)
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing and severe shortness of breath (pulmonary edema) Headache, dizziness, lightheadedness, and passing out
<b>Chronic:</b>	Cancer (liver, esophagus and bladder)

### FIRST AID AND DECONTAMINATION

<b>Remove</b>	the person from exposure.
<b>Flush</b>	eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
<b>Quickly</b>	remove contaminated clothing and wash contaminated skin with large amounts of soap and water.
<b>Begin</b>	artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b>	promptly to a medical facility.
<b>Medical</b>	observation is recommended as symptoms may be delayed.

Common Name: **TETRAETHYLENEPENTAMINE**

Synonyms: TEP; Tetraethylpentylamine

CAS No: 112-57-2

Molecular Formula: C<sub>8</sub>H<sub>23</sub>N<sub>5</sub>

RTK Substance No: 1816

Description: Thick, yellow liquid with an *Ammonia*-like odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 2320 ERG Guide #: 153 Hazard Class: 8 (Corrosive)	<b>Tetraethylenepentamine</b> may burn, but does not readily ignite. Use dry chemical, CO <sub>2</sub> , water spray or alcohol-resistant foam as extinguishing agents. Water or foam may cause frothing and solid streams of water may be ineffective in fighting fire. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Ammonia</i> , <i>Amines</i> , and <i>Nitrogen Oxides</i> . Use water spray to keep fire-exposed containers cool.	<b>Tetraethylenepentamine</b> reacts with WATER to release heat and may result in the violent formation of steam. <b>Tetraethylenepentamine</b> reacts with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); NITROGEN COMPOUNDS; CHLORINATED HYDROCARBONS (such as METHYLENE CHLORIDE); ACRYLATES; ALDEHYDES; ALCOHOLS, and KETONES.

### SPILL/LEAKS

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (½ mile)

Absorb liquids in dry sand, earth, or a similar material and place into sealed containers for disposal.

DO NOT wash into sewer.

**Tetraethylenepentamine** is toxic to aquatic organisms and may cause long-term damage to the aquatic environment.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	0.1 ppm
<b>Flash Point:</b>	325°F (163°C)
<b>LEL:</b>	0.8%
<b>UEL:</b>	4.6%
<b>Auto Ignition Temp:</b>	610°F (321°C)
<b>Vapor Density:</b>	6.53 (air = 1)
<b>Vapor Pressure:</b>	<0.01 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	0.99 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	631° to 644°F (333° to 340°C)
<b>Freezing Point:</b>	-40°F (-40°C)
<b>Molecular Weight:</b>	189.3

### EXPOSURE LIMITS

No occupational exposure limits have been established for **Tetraethylenepentamine**.

The Protective Action Criteria values are:

PAC-1 = 6.5 ppm (50 mg/m<sup>3</sup>)

PAC-2 = 45 ppm (350 mg/m<sup>3</sup>)

PAC-3 = 65 ppm (500 mg/m<sup>3</sup>)

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl, Neoprene and Viton (>8-hr breakthrough)
<b>Coveralls:</b>	Tychem® BR, CSM and TK (>8-hr breakthrough for <i>Ethylene Diamine</i> )
<b>Respirator:</b>	SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns (skin absorbable)
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, wheezing and shortness of breath Headache, nausea and vomiting

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention.  
**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water. Seek medical attention.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** promptly to a medical facility.

Common Name: **TETRAETHYL LEAD**

Synonyms: Tetraethylplumbane; TEL

CAS No: 78-00-2

 Molecular Formula: C<sub>8</sub>H<sub>20</sub>Pb

RTK Substance No: 1817

Description: Colorless, oily liquid with a sweet, musty odor

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>2 - Fire</b> <b>2-<del>W</del> - Reactivity</b>  DOT#: UN 1649 ERG Guide #: 131 Hazard Class: 6.1 (Poison)	<b>Tetraethyl Lead</b> is a COMBUSTIBLE LIQUID. Use dry chemical, CO <sub>2</sub> , alcohol-resistant foam or other foaming agent as extinguishing agents, as water may not be effective in fighting fires.  POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Lead Oxides</i> .  CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool.  Vapors may travel to a source of ignition and flash back.  Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.	<b>Tetraethyl Lead</b> will react with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) to cause fires and explosions.  <b>Tetraethyl Lead</b> is not compatible with RUST; SULFURYL CHLORIDE; POTASSIUM PERMANGANATE; METALS; METAL OXIDES; and COMBUSTIBLES.  <b>Tetraethyl Lead</b> will attack RUBBER, some PLASTICS, and COATINGS.  Forms explosive mixtures in air above 200°F (93°C).

## SPILL/LEAKS

**Isolation Distance:**

Small spills: 60 meters (200 feet)

Large spills: 270 meters (900 feet)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.

Toxic to aquatic organisms.

Hazardous to the environment and persists in the environment.

## PHYSICAL PROPERTIES

<b>Odor:</b>	Sweet
<b>Flash Point:</b>	200°F (93°C)
<b>LEL:</b>	1.8%
<b>Vapor Density:</b>	8.6 (air = 1)
<b>Vapor Pressure:</b>	0.2 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.66 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	228°F (109°C)
<b>Ionization Potential:</b>	11.1 eV
<b>Molecular Weight:</b>	323.5

## EXPOSURE LIMITS

<b>OSHA:</b>	0.075 mg/m <sup>3</sup> , 8-hr TWA (as <i>Lead</i> )
<b>NIOSH:</b>	0.075 mg/m <sup>3</sup> , 10-hr TWA (as <i>Lead</i> )
<b>ACGIH:</b>	0.1 mg/m <sup>3</sup> , 8-hr TWA (as <i>Lead</i> )
<b>IDLH LEVEL:</b>	40 mg/m <sup>3</sup> (as <i>Lead</i> )

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	No information
<b>Coveralls:</b>	DuPont Tychem® CPF-3, BR and LV, and TK (>8-hr breakthrough)
<b>Boots:</b>	No information
<b>Respirator:</b>	>0.075 mg/m <sup>3</sup> - Supplied air

## HEALTH EFFECTS

<b>Eyes:</b>	Irritation, possible loss of vision
<b>Skin:</b>	Irritation
<b>Acute:</b>	Headache, irritability, upset stomach, and weakness
<b>Chronic:</b>	<i>Lead compounds</i> may cause lung cancer in humans Limited evidence of damage to male reproductive system Metallic taste, colic, muscle cramps Damage to the nervous system

## FIRST AID AND DECONTAMINATION

<b>Remove</b>	the person from exposure.
<b>Flush</b>	eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
<b>Remove</b>	contaminated clothing and wash contaminated skin with soap and water.
<b>Begin</b>	rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.
<b>Transfer</b>	to a medical facility.



Common Name: **TETRAMETHRIN**

Synonyms: Duracide®; TTM

CAS No: 7696-12-0

Molecular Formula: C<sub>19</sub>H<sub>25</sub>NO<sub>4</sub>

RTK Substance No: 3745

Description: Colorless to white, crystalline powder, *Pyrethroid* insecticide with a faint odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>2 - Health</b></p> <p><b>1 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p><b>DOT#:</b> UN 2588</p> <p><b>ERG Guide #:</b> 151</p> <p><b>Hazard Class:</b> 9 (Environmentally Hazardous Material)</p>	<p><b>Tetramethrin</b> does not burn, however, it is often dissolved in a liquid carrier that may be flammable or combustible.</p> <p>Use dry chemical, CO<sub>2</sub>, water spray or foam as extinguishing agents.</p> <p><b>POISONOUS GASES ARE PRODUCED IN FIRE,</b> including <i>Nitrogen Oxides</i>.</p> <p>Use water spray to keep fire-exposed containers cool.</p>	<p><b>Tetramethrin</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); and STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE).</p>

### SPILL/LEAKS

**Isolation Distance:**

Spill (solid): 25 meters (75 feet)  
(liquid): 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in dry sand, earth, or a similar material and place into sealed containers for disposal.

Moisten *solid* spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

DO NOT wash into sewer.

**Tetramethrin** is very toxic to aquatic life and bees.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Faint odor
<b>Flash Point:</b>	Flammable/Combustible in <i>solution</i>
<b>Vapor Pressure:</b>	7 x 10 <sup>-6</sup> mm Hg at 86°F (30°C)
<b>Specific Gravity:</b>	1.1 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	356° to 374°F (180° to 190°C)
<b>Melting Point:</b>	140° to 176°F (60° to 90°C)
<b>Molecular Weight:</b>	331.4

### EXPOSURE LIMITS

No occupational exposure limits have been established for **Tetramethrin**.

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Nitrile (for <i>solid Tetramethrin</i> ) Silver Shield®/4H® and Barrier® (>8-hr breakthrough for <b>Tetramethrin</b> in <i>solution</i> )
<b>Coveralls:</b>	Tyvek® (for <i>solid Tetramethrin</i> ) Tychem® BR, CSM and TK (>8-hr breakthrough for <b>Tetramethrin</b> in <i>solution</i> )
<b>Respirator:</b>	Spill: full facepiece APR with <i>Organic vapor</i> and <i>P100</i> cartridges Fire: SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation, burns, itching, rash and redness (skin absorbable)
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, wheezing and shortness of breath  Headache, dizziness, fatigue, muscle weakness, nausea and vomiting

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.



Common Name: **TETRAMETHYL LEAD**

Synonyms: Lead Tetramethyl; TML

CAS No: 75-74-1

 Molecular Formula:  $\text{Pb}(\text{CH}_3)_4$ 

RTK Substance No: 1831

Description: Colorless liquid with a slightly fruity or musty odor.

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>3 - Fire</b> <b>3 W - Reactivity</b> DOT#: UN 1649 ERG Guide #: 131 Hazard Class: 6.1 (Poison)	Use dry chemical, $\text{CO}_2$ , water spray or foam as extinguishing agent. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Lead Oxides</i> . CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool. Vapors may travel to a source of ignition and flash back. Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.	<b>Tetramethyl Lead</b> decomposes in WATER to produce heat and may explode. <b>Tetramethyl Lead</b> reacts with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); TETRACHLOROTRIFLUOROMETHYL PHOSPHORANE; SULFURYL CHLORIDE and STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) to cause fires and explosions. <b>Tetramethyl Lead</b> is not compatible with COMBUSTIBLES; RUBBER; METALS; and METAL OXIDES.

## SPILL/LEAKS

**Isolation Distance:** 25 to 50 meters  
 (80 to 160 feet)

Absorb liquid in sand or inert absorbent.

Toxic to aquatic organisms.

Hazardous to the environment and persists in the environment.

## PHYSICAL PROPERTIES

<b>Boiling Point:</b>	230°F (110°C)
<b>Flash Point:</b>	100°F (37.8°C)
<b>LEL:</b>	1.8%
<b>UEL:</b>	No information
<b>Specific Gravity:</b>	1.9 (water = 1)
<b>Relative Vapor Density:</b>	6.5 (air = 1)
<b>Vapor Pressure:</b>	23 mm Hg at 68°F (20°C)
<b>Solubility:</b>	Insoluble
<b>Melting Point:</b>	-17.5°F (-27.5°C)

## EXPOSURE LIMITS

<b>OSHA:</b>	0.075 $\text{mg}/\text{m}^3$ , 8-hr TWA
<b>NIOSH:</b>	0.075 $\text{mg}/\text{m}^3$ , 10-hr TWA
<b>ACGIH:</b>	0.15 $\text{mg}/\text{m}^3$ , 8-hr TWA
<b>IDLH LEVEL:</b>	40 $\text{mg}/\text{m}^3$ (as <i>Lead</i> )

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	No information
<b>Coveralls:</b>	DuPont Tychem® Responder®, CSM, and TK for heavy <i>liquid toxics</i> and <i>corrosives</i>
<b>Boots:</b>	No information
<b>Respirator:</b>	>0.075 $\text{mg}/\text{m}^3$ - Supplied air

## HEALTH EFFECTS

<b>Eyes:</b>	Irritation, possible loss of vision
<b>Skin:</b>	Irritation
<b>Acute:</b>	Headache, irritability, upset stomach, and weakness
<b>Chronic:</b>	<i>Lead compounds</i> may cause lung cancer in humans Metallic taste, colic and muscle cramps Damage to the nervous system

## FIRST AID AND DECONTAMINATION

<b>Remove</b>	the person from exposure.
<b>Flush</b>	eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
<b>Remove</b>	contaminated clothing and wash contaminated skin with soap and water.
<b>Begin</b>	artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b>	to a medical facility.

Common Name: **TETRASODIUM PYROPHOSPHATE**

Synonyms: Sodium Pyrophosphate; Tetron

CAS No: 7722-88-5

Molecular Formula: Na<sub>4</sub>O<sub>7</sub>P<sub>2</sub>

RTK Substance No: 1837

Description: Odorless, white powder or granular solid

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<p><b>2 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> <b>DOT#:</b> None <b>ERG Guide #:</b> 154 <b>Hazard Class:</b> None</p>	<p>Extinguish fire using an agent suitable for type of surrounding fire. <b>Tetrasodium Pyrophosphate</b> itself does not burn. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Phosphorus Oxides</i> and <i>Sodium Oxides</i>.</p>	<p><b>Tetrasodium Pyrophosphate</b> is not compatible with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); ETHYL ALCOHOL; ALUMINUM; and MAGNESIUM.</p>

**SPILL/LEAKS**

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

Thoroughly wash area after clean-up with water and detergent.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Noncombustible
<b>Vapor Pressure:</b>	0 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	2.5 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	Decomposes
<b>Melting Point:</b>	1,810°F (993°C)
<b>Molecular Weight:</b>	265.9
<b>pH:</b>	10.2 (1% solution)

**EXPOSURE LIMITS**

**NIOSH:** 5 mg/m<sup>3</sup>, 10-hr TWA

The Protective Action Criteria values are:

PAC-1 = 15 mg/m<sup>3</sup>

PAC-2 = 25 mg/m<sup>3</sup>

PAC-3 = 500 mg/m<sup>3</sup>

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Nitrile, Neoprene and Natural Rubber
<b>Coveralls:</b>	Tyvek®
<b>Respirator:</b>	>5 mg/m <sup>3</sup> - Full facepiece APR with <i>High efficiency filters</i> >25 mg/m <sup>3</sup> - SCBA

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns
<b>Inhalation:</b>	Nose and throat irritation with coughing and wheezing.

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.  
**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** promptly to a medical facility.

Common Name: **THIRAM**

Synonyms: Bis(Dimethylthiocarbamoyl)Disulfide; TMTD; Tetramethylthiuram Disulfide

CAS No: 137-26-8

Molecular Formula: C<sub>6</sub>H<sub>12</sub>N<sub>2</sub>S<sub>4</sub>

RTK Substance No: 1854

Description: White to light yellow, odorless powder or the commercial product may be dyed blue

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>2 - Fire</b> <b>0 - Reactivity</b> <b>DOT#:</b> UN 2771 <b>ERG Guide #:</b> 151 <b>Hazard Class:</b> 6.1 (Toxic)	<b>COMBUSTIBLE SOLID</b> Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. <b>POISONOUS GASES ARE PRODUCED IN FIRE,</b> including <i>Nitrogen Oxides</i> and <i>Sulfur Oxides</i> . Use water spray to keep fire-exposed containers cool.	<b>Thiram</b> will react with <b>STRONG ACIDS</b> (such as <b>HYDROCHLORIC, SULFURIC</b> and <b>NITRIC</b> ) to form toxic <i>Carbon Disulfide</i> and <i>Hydrogen Sulfide</i> gases. <b>Thiram</b> is not compatible with <b>OXIDIZING AGENTS</b> (such as <b>PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE</b> and <b>FLUORINE</b> ); <b>REDUCING AGENTS</b> (such as <b>LITHIUM, SODIUM, ALUMINUM</b> and their <b>HYDRIDES</b> ); <b>COPPER</b> ; and <b>NITRATING AGENTS</b> .

### SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Absorb **Thiram** in *solution* in dry sand, earth, or a similar material and place into sealed containers for disposal.

Moisten spilled *solid* material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

DO NOT wash into sewer.

**Thiram** is toxic to aquatic life at very low concentrations.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	280°F (138°C)
<b>Vapor Pressure:</b>	0 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.29 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	264°F (129°C) Decomposes
<b>Melting Point:</b>	311°F (155°C) (Pure)
<b>Molecular Weight:</b>	240.4

### EXPOSURE LIMITS

**OSHA:** 5 mg/m<sup>3</sup>, 8-hr TWA

**NIOSH:** 5 mg/m<sup>3</sup>, 10-hr TWA

**ACGIH:** 0.05 mg/m<sup>3</sup>, 8-hr TWA

**IDLH:** 100 mg/m<sup>3</sup>

The Protective Action Criteria values are:

PAC-1 = 10 mg/m<sup>3</sup>    PAC-2 = 75 mg/m<sup>3</sup>

PAC-3 = 100 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl, Nitrile and Viton (>4-hr breakthrough for <i>Carbamates</i> )
<b>Coveralls:</b>	Tyvek® ( <i>solid Thiram</i> ); Tychem® BR, Responder® and TK (>8-hr breakthrough for <b>Thiram</b> in <i>solution</i> )
<b>Respirator:</b>	>0.05 mg/m <sup>3</sup> - full facepiece APR with <i>Organic vapor cartridge</i> and <i>P100 prefilter</i> >10 mg/m <sup>3</sup> - SCBA

### HEALTH EFFECTS

**Eyes:** Irritation and burns

**Skin:** Irritation and burns

**Inhalation:** Nose and throat irritation with coughing and wheezing  
Headache, dizziness, confusion, nausea and vomiting

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **TIN TETRACHLORIDE**

Synonyms: Stannic Chloride; Tin Perchloride

CAS No: 7646-78-8

Molecular Formula: SnCl<sub>4</sub>

RTK Substance No: 1859

Description: Colorless or slightly yellow liquid which fumes in moist air

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<p><b>3 - Health</b></p> <p><b>0 - Fire</b></p> <p><b>1 - Reactivity</b></p> <p><b>DOT#:</b> UN 1827</p> <p><b>ERG Guide #:</b> 137</p> <p><b>Hazard Class:</b> 8 (Corrosive)</p>	<p>Extinguish fire using an agent suitable for type of surrounding fire. <b>Tin Tetrachloride</b> itself does not burn.</p> <p>DO NOT USE WATER.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Hydrogen Chloride</i> and <i>Tin Oxides</i>.</p> <p>Use water spray only to keep fire-exposed containers cool.</p> <p><b>Tin Tetrachloride</b> may ignite organic materials (wood, paper and oil).</p>	<p><b>Tin Tetrachloride</b> reacts vigorously with WATER or MOIST AIR to produce corrosive <i>Hydrogen Chloride</i> gas, and contact with ETHYLENE OXIDE may cause violent polymerization (self-reaction).</p> <p><b>Tin Tetrachloride</b> reacts violently with STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); ORGANIC MATTER; TURPENTINE; ALKYL NITRATES; ALCOHOLS; and AMINES to cause fires and explosions.</p> <p><b>Tin Tetrachloride</b> attacks METALS, PLASTIC COATINGS, and RUBBER.</p>

**SPILL/LEAKS**

**Isolation Distance:**

Liquid Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in dry sand or earth, or cover with dry lime or soda ash and place in covered containers for disposal.

DO NOT USE WATER OR WET METHOD.

DO NOT wash into sewer.

Harmful to aquatic organisms.

**PHYSICAL PROPERTIES**

<b>Flash Point:</b>	Not combustible
<b>Vapor Density:</b>	9 (air = 1)
<b>Vapor Pressure:</b>	18 mm at 68°F (20°C)
<b>Specific Gravity:</b>	2.2 (water = 1)
<b>Water Solubility:</b>	Soluble - water reactive
<b>Boiling Point:</b>	237°F (114°C)
<b>Melting Point:</b>	-27.4°F (-33°C)
<b>Molecular Weight:</b>	260.5

**EXPOSURE LIMITS**

<b>OSHA:</b>	2 mg/m <sup>3</sup> , 8-hr TWA
<b>NIOSH:</b>	2 mg/m <sup>3</sup> , 10-hr TWA
<b>ACGIH:</b>	2 mg/m <sup>3</sup> , 8-hr TWA
<b>IDLH LEVEL:</b>	100 mg/m <sup>3</sup>
	All of the above are for <i>inorganic Tin compounds</i> . (measured as <i>Tin</i> )

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Viton and Silver Shield®/4H® (for <i>Carbon Tetrachloride</i> )
<b>Coveralls:</b>	DuPont Tychem® Responder®, CSM and TK; Kappler Zytron® 300, 400, and 500; Saint-Gobain ONESuit®/TEC or equivalent for <i>corrosive liquids</i> (>8-hr breakthrough)
<b>Respirator:</b>	>2 mg/m <sup>3</sup> - full facepiece APR with High efficiency filters >20 mg/m <sup>3</sup> - Supplied air

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation, burns
<b>Skin:</b>	Irritation, burns
<b>Inhalation:</b>	Nose and throat irritation Coughing and shortness of breath (pulmonary edema) Headache, nausea and vomiting

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention immediately.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water. Seek medical attention immediately.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** to a medical facility.

**Medical** observation is recommended as symptoms may be delayed.

Common Name: **TITANIUM**

Synonyms: Titanium Powder

CAS No: 7440-32-6

Molecular Formula: Ti

RTK Substance No: 1860

Description: Silvery solid or a dark gray powder

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>1 - Health</b> <b>3 - Fire</b> <b>1 - Reactivity</b> <b>DOT#:</b> UN 2546 (Powder, dry) <b>ERG Guide #:</b> 135 <b>Hazard Class:</b> 4.2 (Spontaneously Combustible)	<b>Titanium powder</b> is FLAMMABLE and SPONTANEOUSLY COMBUSTIBLE. Use dry chemical, sand or lime as extinguishing agents. DO NOT USE WATER on MOLTEN or BURNING TITANIUM as an explosion may occur. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Titanium Oxides</i> . CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool. But DO NOT get water inside containers. <b>Titanium powder</b> or <i>dust</i> can burn in atmospheres of <i>Carbon Dioxide, Nitrogen</i> or <i>Air</i> .	<b>Titanium powder</b> is WATER REACTIVE at 1,292°F (700°C), or when molten, and an explosion can result. <b>Titanium powder</b> reacts violently or explosively with CUPRIC OXIDE, LEAD OXIDE and inorganic POTASSIUM COMPOUNDS when heated. <b>Titanium powder</b> reacts with NITRIC ACID or LIQUID OXYGEN resulting in an explosion on exposure to FRICTION or HEAT. <b>Titanium powder</b> is not compatible with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); METALS (such as POTASSIUM, SODIUM, MAGNESIUM and ZINC); METAL SALTS; METAL OXIDES; STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); and HALOCARBONS (such as TRICHLOROETHYLENE).

### SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Collect powdered material in the most convenient and safe manner and place into sealed containers for disposal.

Use only non-sparking tools and equipment, especially when opening and closing containers of **Titanium**.

Keep **Titanium** out of confined spaces, such as sewers, because of the possibility of an explosion.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Flammable (Spontaneously Combustible Powder)
<b>Auto Ignition Temp:</b>	482°F (250°C) (Powder)
<b>Specific Gravity:</b>	4.5 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	5,908° to 5,945°F (3,260° to 3,285°C)
<b>Melting Point:</b>	3,033° to 3,047°F (1,667° to 1,675°C)
<b>Molecular Weight:</b>	47.9

### EXPOSURE LIMITS

No occupational exposure limits have been established for **Titanium**.

The Protective Action Criteria values are:

PAC-1 = 2 mg/m<sup>3</sup>    PAC-2 = 12.5 mg/m<sup>3</sup>

PAC-3 = 60 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Neoprene and Natural Rubber
<b>Coveralls:</b>	Tyvek®
<b>Respirator:</b>	>2 mg/m <sup>3</sup> - full facepiece APR with P95 filter >10 mg/m <sup>3</sup> - SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose, throat and lung irritation, with coughing, wheezing and shortness of breath

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.  
**Remove** contaminated clothing and wash contaminated skin with soap and water.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** promptly to a medical facility.

Common Name: **TITANIUM DIOXIDE**

Synonyms: Rutile; Titanium Oxide; Anatase; Brookite  
 CAS No: 13463-67-7; 1317-70-0 (powder form); 1317-80-2 (powder form)  
 Molecular Formula: TiO<sub>2</sub>  
 RTK Substance No: 1861  
 Description: Odorless, white powder

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b>  DOT#: None ERG Guide #: None Hazard Class: None	Extinguish fire using an agent suitable for type of surrounding fire. <b>Titanium Dioxide</b> itself does not burn. POISONOUS GASES ARE PRODUCED IN FIRE.	<b>Titanium Dioxide</b> <i>powders</i> or <i>dusts</i> may react violently with CHEMICALLY ACTIVE METALS (such as POTASSIUM, SODIUM, MAGNESIUM and ZINC). <b>Titanium Dioxide</b> <i>powders</i> or <i>dusts</i> are not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC).

### SPILL/LEAKS

**Isolation Distance:**  
 Spill: 25 meters (75 feet)  
 Fire: 800 meters (1/2 mile)  
 Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

### PHYSICAL PROPERTIES

**Odor Threshold:** Odorless  
**Flash Point:** Noncombustible  
**Vapor Pressure:** 0 mm Hg at 68°F (20°C)  
**Specific Gravity:** 3.9 to 4.2 (water = 1)  
**Water Solubility:** Insoluble  
**Boiling Point:** 4,532° to 5,432°F (2,500° to 3,000°C)  
**Melting Point:** 3,326° to 3,362°F (1,830° to 1,850°C)  
**Molecular Weight:** 79.9

### EXPOSURE LIMITS

**OSHA:** 15 mg/m<sup>3</sup>, 8-hr TWA  
**NIOSH:** 2.4 mg/m<sup>3</sup> (*fine*) and 0.3 mg/m<sup>3</sup> (*ultrafine*), 10-hr TWA  
**ACGIH:** 10 mg/m<sup>3</sup>, 8-hr TWA  
**IDLH:** 5,000 mg/m<sup>3</sup>  
 The Protective Action Criteria values are:  
 PAC-1 = 30 mg/m<sup>3</sup>    PAC-2 = 330 mg/m<sup>3</sup>  
 PAC-3 = 2,000 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

**Gloves:** Nitrile, Neoprene and Natural Rubber  
**Coveralls:** Tyvek®  
**Respirator:** Spill - Full facepiece APR with *P100 filters*  
 >0.3 mg/m<sup>3</sup> (ultrafine) or Fire – SCBA  
 >2.4 mg/m<sup>3</sup> (fine) or Fire - SCBA  
 >10 mg/m<sup>3</sup> or Fire - SCBA

### HEALTH EFFECTS

**Eyes:** Irritation  
**Skin:** No information available  
**Inhalation:** Nose and throat irritation  
**Chronic:** Cancer (lung) in animals

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.  
**Remove** contaminated clothing and wash contaminated skin with soap and water.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** promptly to a medical facility.



Common Name: **TOLUENE**

Synonyms: Toluol; Methyl Benzene; Phenyl Methane

CAS No: 108-88-3

 Molecular Formula: C<sub>7</sub>H<sub>8</sub>

RTK Substance No: 1866

Description: A colorless liquid with a sweet, strong odor

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>3 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 1294 ERG Guide #: 130 Hazard Class: 3 (Flammable)	<b>Toluene</b> is a FLAMMABLE LIQUID. Use dry chemical, CO <sub>2</sub> , alcohol-resistant foam or other foaming agent as extinguishing agents, as water may not be effective in fighting fires. POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool. Vapors may travel to a source of ignition and flash back. Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source. Use water spray to reduce vapors.	<b>Toluene</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); METAL SALTS; and STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC). <b>Toluene</b> may accumulate static electricity.

**SPILL/LEAKS**
**Isolation Distance:**

Small Spill: 60 meters (200 feet)

Large Spill: 270 meters (900 feet)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.

 DO NOT wash into sewer. **Toluene** is toxic to aquatic organisms.

Liquid floats on water and may travel to ignition source and spread fire.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	2.5 ppm
<b>Flash Point:</b>	40°F (4°C)
<b>LEL:</b>	1.1%
<b>UEL:</b>	7.1%
<b>Vapor Density:</b>	3.1 (air = 1)
<b>Vapor Pressure:</b>	21 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	0.87 (water = 1)
<b>Water Solubility:</b>	Very slightly soluble
<b>Boiling Point:</b>	232°F (111°C)
<b>Ionization Potential:</b>	8.82 eV
<b>Molecular Weight:</b>	92.1

**EXPOSURE LIMITS**
**OSHA:** 200 ppm, 8-hr TWA; 300 ppm, STEL; and 500 ppm, 10-min peak per 8-hr workshift

**NIOSH:** 100 ppm, 10-hr TWA; 150 ppm, STEL

**ACGIH:** 20 ppm, 8-hr TWA

**IDLH:** 500 ppm

**ERPGs:** ERPG-1 = 50 ppm; ERPG-2 = 300 ppm; ERPG-3 = 1,000 ppm

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Viton, 4-H®/Silver Shield® and Polyvinyl Alcohol (>4-hr breakthrough)
<b>Coveralls:</b>	DuPont Tychem® CPF-3, CPF-4, BR and LV, Responder®, TK and Kappler Zytron® 300 and 500 (>8-hr breakthrough)
<b>Boots:</b>	No information
<b>Respirator:</b>	>20 ppm - full facepiece APR with Organic Vapor cartridge >200 ppm - Supplied air

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation, drying, cracking and rash
<b>Acute:</b>	Nose and throat irritation with coughing and wheezing Headache, dizziness and passing out
<b>Chronic:</b>	Cancer (Not Classifiable) May be a teratogen in humans

**FIRST AID AND DECONTAMINATION**

<b>Remove</b>	the person from exposure.
<b>Flush</b>	eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
<b>Quickly</b>	remove contaminated clothing and wash contaminated skin with large amounts of soap and water.
<b>Begin</b>	artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b>	to a medical facility.

Common Name: **TOLUENE DIISOCYANATE (mixed isomers)**

Synonyms: Diisocyanatotoluene; Methylphenylene Isocyanate; TDI

CAS No: 26471-62-5

 Molecular Formula: C<sub>9</sub>H<sub>6</sub>N<sub>2</sub>O<sub>2</sub>

RTK Substance No: 3132

Description: Clear, colorless to pale yellow liquid with a strong odor

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>1 - Fire</b> <b>3-W - Reactivity</b> DOT#: UN 2078 ERG Guide #: 156 Hazard Class: 6.1 (Poison)	<p><b>Toluene Diisocyanate</b> is a COMBUSTIBLE LIQUID which may explode when exposed to HEAT and FLAMES.</p> <p>Use dry chemical, CO<sub>2</sub>, water spray (as fog, not in solid streams) or alcohol-resistant foam as extinguishing agents.</p> <p><b>Toluene Diisocyanate</b> is REACTIVE and a DANGEROUS EXPLOSION HAZARD.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> and <i>Cyanides</i>.</p> <p>CONTAINERS MAY EXPLODE IN FIRE.</p> <p>Use water spray to keep fire-exposed containers cool.</p> <p>Use water spray to reduce vapors.</p>	<p><b>Toluene Diisocyanate</b> reacts with WATER to form <i>Polyurea</i> and <i>Carbon Dioxide</i>. The reaction produces HEAT, resulting in container rupture.</p> <p><b>Toluene Diisocyanate</b> can polymerize (self react) uncontrollably when in contact with STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); ACYL CHLORIDES; and AMINES.</p> <p><b>Toluene Diisocyanate</b> is not compatible with ANILINE; ALCOHOLS; STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); and OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).</p>

## SPILL/LEAKS

**Isolation Distance:**

Spills: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers for disposal.

Use only non-sparking tools and equipment, especially when opening and closing containers.

 Containers of *unreacted Toluene Diisocyanate* and WATER should be left with the bung open or the lid slightly ajar to prevent pressure build-up.

DO NOT wash into sewer.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	2.1 ppm
<b>Flash Point:</b>	250°F (121°C)
<b>LEL:</b>	0.9%
<b>UEL:</b>	9.5%
<b>Auto Ignition Temp:</b>	>300°F (>149°C)
<b>Vapor Density:</b>	6 (air = 1)
<b>Vapor Pressure:</b>	0.025 mm Hg at 77°F (25°C)
<b>Specific Gravity:</b>	1.2 (water = 1)
<b>Water Solubility:</b>	Reacts
<b>Boiling Point:</b>	484°F (251°C)
<b>Melting Point:</b>	67° to 71°F (19° to 22°C)
<b>Molecular Weight:</b>	174.2

## EXPOSURE LIMITS

**OSHA:** 0.02 ppm, Ceiling

**ACGIH:** 0.001 ppm, 8-hr TWA; 0.003 ppm, 15-min STEL

**IDLH:** 2.5 ppm

The Protective Action Criteria values are:

PAC-1 = 0.75 ppm,

PAC-2 = 2 ppm

PAC-3 = 2 ppm

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl, Silver Shield®/4H®, Viton and Barrier® (>8-hr breakthrough)
<b>Coveralls:</b>	Tychem® BR, LV, Responder® and TK (>8-hr breakthrough)
<b>Respirator:</b>	Supplied air or SCBA

## HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing and severe shortness of breath (pulmonary edema) Headache, nausea and vomiting
<b>Chronic:</b>	Cancer (pancreas, liver, mammary glands) in animals

## FIRST AID AND DECONTAMINATION

<b>Remove</b>	the person from exposure.
<b>Flush</b>	eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention
<b>Quickly</b>	remove contaminated clothing and wash contaminated skin with large amounts of soap and water.
<b>Begin</b>	artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b>	promptly to a medical facility
<b>Medical</b>	observation is recommended as symptoms may be delayed.

Common Name: **o-TOLUIDINE**

Synonyms: 2-Aminotoluene; 2-Methylaniline; 2-Methylbenzenamine

CAS No: 95-53-4

Molecular Formula: C<sub>6</sub>H<sub>4</sub>CH<sub>3</sub>NH<sub>2</sub>

RTK Substance No: 1442

Description: Colorless to pale yellow liquid that turns dark on exposure to air or light

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>2 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 1708 ERG Guide #: 153 Hazard Class: 6.1 (Poison)	COMBUSTIBLE Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> . CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool. Flow or agitation may generate electrostatic charges.	<b>o-Toluidine</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); and STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE). Protect from AIR and LIGHT.

### SPILL/LEAKS

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in dry sand, earth, or a noncombustible material and place into sealed containers for disposal. DO NOT wash into sewer.

**o-Toluidine** is very toxic to aquatic organisms. DO NOT allow **o-Toluidine** to enter the environment.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	0.25 to 6.6 ppm
<b>Flash Point:</b>	185°F (85°C)
<b>LEL:</b>	1.5%
<b>Auto Ignition Temp:</b>	900°F (482°C)
<b>Vapor Density:</b>	3.7 (air = 1)
<b>Vapor Pressure:</b>	0.3 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.01 ( water = 1)
<b>Water Solubility:</b>	Slightly soluble
<b>Boiling Point:</b>	391°F (200°C)
<b>Melting Point:</b>	-3°F (-16°C)
<b>Critical Temperature:</b>	790°F (421°C)
<b>Ionization Potential:</b>	7.44 eV
<b>Molecular Weight:</b>	107.2

### EXPOSURE LIMITS

**OSHA:** 5 ppm, 8-hr TWA

**NIOSH:** Lowest feasible concentration

**ACGIH:** 2 ppm, 8-hr TWA

**IDLH:** 50 ppm

The Protective Action Criteria values are:

PAC-1 = 5 ppm PAC-2 = 5 ppm PAC-3 = 50 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl, Viton and Viton/Butyl (>8-hr breakthrough)
<b>Coveralls:</b>	Tychem® F, BR, CSM and TK (>8-hr breakthrough)
<b>Respirator:</b>	SCBA

### HEALTH EFFECTS

**Eyes:** Irritation and burns

**Skin:** Irritation and burns

**Inhalation:** Nose, throat and lung irritation, with tightness in the chest and shortness of breath

Headache, fatigue and blue color to the skin and lips (methemoglobinemia)

**Chronic:** Cancer (bladder and liver) in animals

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **TRICHLORFON**

Synonyms: Dylox®; Proxol®; Trichlorohydroxyethylidimethylphosphonate

CAS No: 52-68-6

Molecular Formula: C<sub>4</sub>H<sub>8</sub>Cl<sub>3</sub>O<sub>4</sub>P

RTK Substance No: 1882

Description: White, crystalline solid when pure

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> <b>DOT#:</b> UN 2783 <b>ERG Guide #:</b> 152 <b>Hazard Class:</b> 6.1 (Poison)	<b>Trichlorfon</b> may burn, but does not readily ignite. However, it is often dissolved in a liquid carrier that may be flammable or combustible. <b>POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE.</b> Use water spray to keep fire-exposed containers cool.	<b>Trichlorfon</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); and STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE).

### SPILL/LEAKS

**Isolation Distance:**

Spill (solid): 25 meters (75 feet)

Spill (liquid): 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in dry sand, earth, or a noncombustible material and place into sealed containers for disposal.

Moisten solid material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

DO NOT wash into sewer.

**Trichlorfon** is very toxic to aquatic organisms.

### PHYSICAL PROPERTIES

**Flash Point:** 242°F (117°C) (Solution)

**Vapor Pressure:** 7.8 x 10<sup>-6</sup> mm Hg at 68°F (20°C)

**Specific Gravity:** 1.73 (water = 1)

**Water Solubility:** Slightly soluble

**Boiling Point:** 212°F (100°C)

**Melting Point:** 181° to 183°F (83° to 84°C)

**Molecular Weight:** 257.4

### EXPOSURE LIMITS

**ACGIH:** 1 mg/m<sup>3</sup>; 8-hr TWA

### PROTECTIVE EQUIPMENT

**Gloves:** Nitrile and Neoprene (>8-hr breakthrough for *Organophosphorus compounds*)

**Coveralls:** Tychem® BR, CSM and TK (>8-hr breakthrough for *Organophosphorus compounds*)

**Respirator:** >1 mg/m<sup>3</sup> - full facepiece APR with *Organic vapor cartridges* and *High efficiency prefilters*

>10 mg/m<sup>3</sup> - SCBA

### HEALTH EFFECTS

**Eyes:** Irritation

**Skin:** Irritation (skin absorbable)

**Inhalation:** Headache, sweating, nausea and vomiting, loss of coordination, and death (*Organophosphate poisoning*)

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention immediately.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention.

**Shampoo** hair immediately if contaminated.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **1,1,2-TRICHLOROETHANE**

Synonyms: Ethane Trichloride; Vinyl Trichloride

CAS No: 79-00-5

Molecular Formula: C<sub>2</sub>H<sub>3</sub>Cl<sub>3</sub>

RTK Substance No: 1889

Description: Colorless liquid with a sweet, pleasant odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b>  <b>DOT#:</b> UN 3082 <b>ERG Guide #:</b> 171 <b>Hazard Class:</b> 9 (Environmentally Hazardous Substance)	<b>1,1,2-Trichloroethane</b> may burn, but does not readily ignite. Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Hydrogen Chloride</i> and <i>Phosgene</i> . CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool.	<b>1,1,2-Trichloroethane</b> may react violently with CHEMICALLY ACTIVE METALS (such as ALUMINUM, POTASSIUM, SODIUM, MAGNESIUM and ZINC). <b>1,1,2-Trichloroethane</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); and STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE). <b>1,1,2-Trichloroethane</b> will decompose on contact with HOT SURFACES or FLAMES to form toxic <i>Hydrogen Chloride</i> and <i>Phosgene</i> gases. <b>1,1,2-Trichloroethane</b> may attack RUBBER and STEEL.

### SPILL/LEAKS

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in dry sand, earth, or a similar material and place into sealed containers for disposal.

DO NOT wash into sewer.

**1,1,2-Trichloroethane** is harmful to aquatic life at very low concentrations.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Sweet, pleasant odor
<b>Flash Point:</b>	Nonflammable
<b>LEL:</b>	6%
<b>UEL:</b>	15.5%
<b>Vapor Density:</b>	4.63 (air = 1)
<b>Vapor Pressure:</b>	19 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.44 (water = 1)
<b>Water Solubility:</b>	Very slightly soluble
<b>Boiling Point:</b>	237°F (114°C)
<b>Melting Point:</b>	-34°F (-37°C)
<b>Ionization Potential:</b>	11 eV
<b>Molecular Weight:</b>	133.4

### EXPOSURE LIMITS

<b>OSHA:</b>	10 ppm, 8-hr TWA
<b>NIOSH:</b>	10 ppm, 10-hr TWA
<b>ACGIH:</b>	10 ppm, 8-hr TWA
<b>IDLH:</b>	100 ppm

The Protective Action Criteria values are:

PAC-1 = 10 ppm    PAC-2 = 15 ppm    PAC-3 = 100 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Viton (>8-hr breakthrough)
<b>Coveralls:</b>	Tychem® CSM, BR and TK (>8-hr breakthrough)
<b>Respirator:</b>	>10 ppm - SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns
<b>Inhalation:</b>	Nose and throat irritation with coughing and wheezing  Headache, dizziness, lightheadedness, and passing out
<b>Chronic:</b>	Cancer (liver, adrenal gland) in animals

### FIRST AID AND DECONTAMINATION

<b>Remove</b>	the person from exposure.
<b>Flush</b>	eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
<b>Quickly</b>	remove contaminated clothing and wash contaminated skin with large amounts of soap and water.
<b>Begin</b>	artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b>	promptly to a medical facility.



Common Name: **TRICHLOROETHYLENE**

Synonyms: Ethylene Trichloride; TCE; Trichloroethene

CAS No: 79-01-6

Molecular Formula: C<sub>2</sub>HCl<sub>3</sub>

RTK Substance No: 1890

Description: Clear, colorless liquid with a sweet, *Chloroform-like* odor

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<p><b>3 - Health</b></p> <p><b>1 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p><b>DOT#:</b> UN 1710</p> <p><b>ERG Guide #:</b> 160</p> <p><b>Hazard Class:</b> 6.1 (Poison)</p>	<p><b>Trichloroethylene</b> may burn, but does not readily ignite.</p> <p>Use dry chemical, CO<sub>2</sub>, water spray or alcohol-resistant foam as extinguishing agents.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Hydrogen Chloride</i> and <i>Phosgene</i>.</p> <p>CONTAINERS MAY EXPLODE IN FIRE.</p> <p>Use water spray to keep fire-exposed containers cool.</p> <p>Use water spray to reduce vapors.</p> <p><b>Trichloroethylene</b> accumulates static charge.</p>	<p><b>Trichloroethylene</b> will react explosively with <i>finely divided</i> or <i>powdered</i> BARIUM, BERYLLIUM, and MAGNESIUM.</p> <p><b>Trichloroethylene</b> reacts with ACTIVE METALS (such as LITHIUM, SODIUM and TITANIUM) to cause flashing and sparks.</p> <p><b>Trichloroethylene</b> will react with STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE) and EPOXIDES to form spontaneously flammable <i>Dichloroacetylene</i>.</p> <p><b>Trichloroethylene</b> is not compatible with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); ISOCYANATES; EPICHLOROHYDRIN; ALCOHOLS; and GLYCOLS.</p>

**SPILL/LEAKS**

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, fly ash or cement powder and place into sealed containers for disposal.

DO NOT wash into sewer.

Use only non-sparking tools and equipment, especially when opening and closing containers of **Trichloroethylene**.

Metal containers should be grounded and bonded as **Trichloroethylene** accumulates static charge.

**Trichloroethylene** is slightly toxic to aquatic life.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	1.4 ppm
<b>Flash Point:</b>	>200°F (93°C)
<b>LEL:</b>	8%
<b>UEL:</b>	10.5%
<b>Auto Ignition Temp:</b>	788°F (420°C)
<b>Vapor Density:</b>	4.5 (air = 1)
<b>Vapor Pressure:</b>	58 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.5 (water = 1)
<b>Water Solubility:</b>	Slightly soluble
<b>Boiling Point:</b>	189°F (87°C)
<b>Melting Point:</b>	-99°F (-73°C)
<b>Ionization Potential:</b>	9.5 eV
<b>Molecular Weight:</b>	131.4

**EXPOSURE LIMITS**

**ACGIH:** 10 ppm, 8-hr TWA; 25 ppm, 15-min STEL

**IDLH:** 1,000 ppm

The Protective Action Criteria values are:

PAC-1 = 130 ppm

PAC-2 = 450 ppm

PAC-3 = 3,800 ppm

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Silver Shield®/4H®, Viton and Barrier® (>8-hr breakthrough)
<b>Coveralls:</b>	Tychem® F, BR, LV, Responder®, and TK; Zytron® 500; ONESuit® TEC; and Trelchem® HPS and VPS (>8-hr breakthrough)
<b>Respirator:</b>	>10 ppm - Supplied air or SCBA

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns
<b>Inhalation:</b>	Headache, dizziness, lightheadedness, visual disturbances, nausea and vomiting, and passing out
<b>Chronic:</b>	Cancer (liver, kidney, and lung) in animals

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.



Common Name: **TRICHLOROISOCYANURIC ACID**

Synonyms: Symclosene; TCCA; Trichloro-s-Triazinetrione

CAS No: 87-90-1

 Molecular Formula: C<sub>3</sub>Cl<sub>3</sub>N<sub>3</sub>O<sub>3</sub>

RTK Substance No: 1892

 Description: White, crystalline powder with a *Chlorine*-like odor, often used in granular or powder form

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>0 - Fire</b> <b>2 - Reactivity</b> DOT#: UN 2468 ERG Guide #: 140 Hazard Class: 5.1 (Oxidizer)	REACTIVE SOLID <b>Trichloroisocyanuric Acid</b> is not combustible, but it is a STRONG OXIDIZER that enhances the combustion of other substances. Use water in flooding quantities only. DO NOT USE CHEMICAL or CO <sub>2</sub> extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Chlorine</i> and <i>Nitrogen Trichloride</i> . CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool. <b>Trichloroisocyanuric Acid</b> may ignite combustibles (wood, paper and oil).	<b>Trichloroisocyanuric Acid</b> may explode on HEATING and reacts violently with COMBUSTIBLES. <b>Trichloroisocyanuric Acid</b> reacts slowly with WATER to release toxic <i>Chlorine gas</i> , <i>Cyanuric Acid</i> , and highly reactive <i>Nitrogen Trichloride</i> . <b>Trichloroisocyanuric Acid</b> reacts violently with AMMONIA; AMMONIUM SALTS; AMINES; CALCIUM HYPOCHLORITE; HYDROGEN PEROXIDE; SODIUM CARBONATE; COMBUSTIBLE MATERIALS; and REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES) to cause fires and explosions. <b>Trichloroisocyanuric Acid</b> reacts with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) to form toxic <i>Chlorine gas</i> .

**SPILL/LEAKS**
**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Collect powdered material in the most convenient and safe manner and place into sealed dry containers for disposal.

 Keep **Trichloroisocyanuric Acid** out of confined spaces, such as sewers, because of the possibility of an explosion.

DO NOT wash into sewer.

**Trichloroisocyanuric Acid** is very toxic to aquatic organisms.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	<i>Chlorine</i> -like
<b>Flash Point:</b>	Noncombustible
<b>Vapor Density:</b>	2.07 (air = 1)
<b>Vapor Pressure:</b>	Negligible
<b>Specific Gravity:</b>	1.2 (water = 1)
<b>Water Solubility:</b>	Reacts slowly
<b>Melting Point:</b>	437°F (225°C) (Decomposes)
<b>Molecular Weight:</b>	232.4

**EXPOSURE LIMITS**

 No occupational exposure limits have been established for **Trichloroisocyanuric Acid**.

The Protective Action Criteria values are:

 PAC-1 = 75 mg/m<sup>3</sup>    PAC-2 = 500 mg/m<sup>3</sup>

 PAC-3 = 500 mg/m<sup>3</sup>
**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Butyl, Nitrile, Neoprene, Viton and Barrier® (>8-hr breakthrough for <i>Hydrogen Chloride</i> )
<b>Coveralls:</b>	Tychem® SL, CPF3, BR, Responder® and TK, and Trelchem® HPS and VPS (>8-hr breakthrough for <i>Hydrogen Chloride</i> )
<b>Respirator:</b>	Small Spill: full facepiece APR with <i>Acid gas</i> cartridges and P100 filters >75 mg/m <sup>3</sup> - SCBA

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, wheezing and shortness of breath

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **1,2,3-TRICHLOROPROPANE**

Synonyms: Allyl Trichloride; Trichlorohydrin

CAS No: 96-18-4

 Molecular Formula: C<sub>3</sub>H<sub>5</sub>Cl<sub>3</sub>

RTK Substance No: 1902

Description: Colorless to straw-colored liquid with a Chloroform-like odor

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>2 - Fire</b> <b>1 - Reactivity</b> DOT#: UN 2810 ERG Guide #: 153 Hazard Class: 6.1 (Poison)	<b>1,2,3-Trichloropropane</b> is a COMBUSTIBLE LIQUID. Use dry chemical, CO <sub>2</sub> , or alcohol-resistant foam as extinguishing agents. Fine water spray may be used to blanket the fire. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Hydrogen Chloride</i> and <i>Phosgene</i> . CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool.	<b>1,2,3-Trichloropropane</b> reacts violently with POWDERED METALS. <b>1,2,3-Trichloropropane</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); CHEMICALLY ACTIVE METALS (such as POTASSIUM, SODIUM, MAGNESIUM and ZINC); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); RESINS; and WAXES.

## SPILL/LEAKS

**Isolation Distance:**

Small Spill: 60 meters (200 feet)

Large Spill: 330 meters (1,200 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.

DO NOT wash into sewer.

**1,2,3-Trichloropropane** is a marine pollutant and may be hazardous to the environment.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	<i>Chloroform</i> odor
<b>Flash Point:</b>	160°F (71°C)
<b>LEL:</b>	3.2%
<b>UEL:</b>	12.6%
<b>Auto Ignition Temp:</b>	579°F (304°C)
<b>Vapor Density:</b>	5.1 (air = 1)
<b>Vapor Pressure:</b>	3 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.4 (water = 1)
<b>Water Solubility:</b>	Very slightly soluble
<b>Boiling Point:</b>	313°F (156°C)
<b>Molecular Weight:</b>	147.4

## EXPOSURE LIMITS

**OSHA:** 50 ppm, 8-hr TWA

**NIOSH:** 10 ppm, 10-hr TWA

**ACGIH:** 10 ppm, 8-hr TWA

**IDLH:** 100 ppm

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl, Polyvinyl Alcohol and Viton
<b>Coveralls:</b>	DuPont Tychem® BR, LV, Responder®, and TK; Kappler® Zytron® 300; and Saint-Gobain ONESuit® TEC, (>8-hr breakthrough for <i>Aliphatic Halogens</i> )
<b>Respirator:</b>	>10 ppm - Supplied air

## HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns with redness, drying and cracking.
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, wheezing and shortness of breath  Headache, dizziness and lightheadedness
<b>Chronic:</b>	Cancer (liver, mouth and stomach) in animals

## FIRST AID AND DECONTAMINATION

<b>Remove</b> the person from exposure.
<b>Flush</b> eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
<b>Quickly</b> remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water.
<b>Begin</b> artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b> promptly to a medical facility.

Common Name: **TRICHLOROSILANE**

Synonyms: Silicochloroform; Trichloromonosilane

CAS No: 10025-78-2

 Molecular Formula: SiHCl<sub>3</sub>

RTK Substance No: 1903

Description: Colorless liquid with a sharp, choking odor

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>4 - Fire</b> <b>2W - Reactivity</b> <b>DOT#:</b> UN 1295 <b>ERG Guide #:</b> 139 <b>Hazard Class:</b> 4.3 (Water Reactive/ Dangerous When Wet)	<b>FLAMMABLE and REACTIVE LIQUID</b> Use only Alcohol-Resistant Aqueous Film Forming Foam (AR-AFFF) at medium expansion. Apply foam carefully by <i>floating</i> it onto the spill to form a continuous layer. <b>USE WATER ONLY TO KNOCK DOWN VAPORS. POISONOUS GASES ARE PRODUCED IN FIRE, including Hydrogen Chloride, Phosgene and Chlorosilanes.</b> <b>CONTAINERS MAY EXPLODE IN FIRE.</b> Use water spray to keep fire-exposed containers cool but <b>DO NOT</b> get water inside containers. Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source or flash back. Flow or agitation may generate electrostatic charge.	<b>Trichlorosilane</b> reacts violently with WATER; SOLUTIONS CONTAINING WATER; STEAM; and MOISTURE IN AIR to release heat and flammable and corrosive gases such as <i>Hydrogen and Hydrogen Chloride</i> . <b>Trichlorosilane</b> reacts violently with ALCOHOLS; ACETONE; ORGANIC ACIDS (such as ACETIC ACID); OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); and AMINES. <b>Trichlorosilane</b> is incompatible with COMBUSTIBLES and METALS.

## SPILL/LEAKS

**Isolation Distance:**

Small Spill: 30 meters (100 feet)

Large Spill: 60 meters (200 feet)

Fire: 800 meters (1/2 mile)

For small spills, absorb liquids in vermiculite, dry sand or earth.

DO NOT stack or heap contaminated sorbents as the heat generated may cause auto ignition.

Apply AR-AFF Foam on small spills to suppress vapors and blanket release. Carefully float foam onto spill and reapply as necessary.

For large spills vapor ignition is possible.

Use only non-sparking tools and equipment, and ground and bond all containers when transferring liquid.

 Neutralize spills using *Sodium Hydroxide* with a 1 to 1 ratio of *Sodium Hydroxide* to *Chlorosilane* or use a 2 to 1 ratio of *Sodium Bicarbonate* to *Chlorosilane*.

 Keep **Trichlorosilane** out of confined spaces, such as sewers, because of the possibility of an explosion.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Sharp, choking odor
<b>Flash Point:</b>	-18° to 7°F (-28° to -14°C)
<b>LEL:</b>	1.2%
<b>UEL:</b>	90.5%
<b>Auto Ignition Temp:</b>	220°F (104°C)
<b>Vapor Density:</b>	4.7 (air = 1)
<b>Vapor Pressure:</b>	20.4 mm Hg at 70°F (21°C)
<b>Specific Gravity:</b>	1.34 (water = 1)
<b>Water Solubility:</b>	Reacts (Violent decomposition)
<b>Boiling Point:</b>	90°F (32°C)
<b>Freezing Point:</b>	-196°F (-127°C)
<b>Critical Temp:</b>	403°F (206°C)
<b>Molecular Weight:</b>	135.5

## EXPOSURE LIMITS

**OSHA/NIOSH:** 5 ppm, Ceiling (as *Hydrogen Chloride*)

**ACGIH:** 2 ppm, Ceiling (as *Hydrogen Chloride*)

**IDLH:** 50 ppm (as *Hydrogen Chloride*)

The Protective Action Criteria values are:

PAC-1 = 0.6 ppm PAC-2 = 7.3 ppm PAC-3 = 33 ppm

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Viton and Barrier® (>8-hr breakthrough for <i>Organo-Silicon compounds</i> )
<b>Coveralls:</b>	Tychem® BR and TK (>8-hr breakthrough) >10% of the LEL use flash protection or turn out gear
<b>Respirator:</b>	SCBA

## HEALTH EFFECTS

<b>Eyes:</b>	Severe irritation, burns and possible eye damage
<b>Skin:</b>	Severe irritation, burns and blisters
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing, wheezing and severe shortness of breath (pulmonary edema) Headache, nausea, vomiting, diarrhea and abdominal pain

## FIRST AID AND DECONTAMINATION

<b>Remove</b> the person from exposure.
<b>Flush</b> eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention immediately.
<b>Quickly</b> remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention.
<b>Begin</b> artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b> promptly to a medical facility.
<b>Medical</b> observation is recommended as symptoms may be delayed.

Common Name: **1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE**

Synonyms: Freon®113; Genetron®113

CAS No: 76-13-1

Molecular Formula: C<sub>2</sub>Cl<sub>3</sub>F<sub>3</sub>

RTK Substance No: 1904

Description: Colorless liquid with a faint, sweet or *Ether*-like odor at high concentrations

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> DOT#: None ERG Guide #: 171 Hazard Class: None	Extinguish fire using an agent suitable for type of surrounding fire. <b>1,1,2-Trichloro-1,2,2-Trifluoroethane</b> itself does not burn. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Hydrogen Chloride</i> , <i>Hydrogen Fluoride</i> , and <i>Phosgene</i> . Use water spray to keep fire-exposed containers cool.	<b>1,1,2-Trichloro-1,2,2-Trifluoroethane</b> may react violently with CHEMICALLY ACTIVE METALS (such as POTASSIUM, SODIUM, MAGNESIUM and ZINC) and their ALLOYS. Contact with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) releases toxic <i>Chlorine gas</i> . <b>1,1,2-Trichloro-1,2,2-Trifluoroethane</b> is not compatible with FINELY POWDERED METALS and OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).

### SPILL/LEAKS

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers for disposal.

Wash all contaminated surfaces with *alcohol* followed by washing with a strong soap and water solution.

DO NOT wash into sewer.

**1,1,2-Trichloro-1,2,2-Trifluoroethane** is toxic to aquatic life and impacts the ozone layer.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	45 ppm
<b>Flash Point:</b>	Noncombustible
<b>Auto Ignition Temp:</b>	1,256°F (680°C)
<b>Vapor Density:</b>	6.5 (air = 1)
<b>Vapor Pressure:</b>	285 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.57 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	118°F (48°C)
<b>Freezing Point:</b>	-31°F (-35°C)
<b>Ionization Potential:</b>	11.99 eV
<b>Molecular Weight:</b>	187.4

### EXPOSURE LIMITS

**OSHA:** 1,000 ppm, 8-hr TWA

**NIOSH:** 1,000 ppm, 10-hr TWA; 1,250 ppm STEL

**ACGIH:** 1,000 ppm, 8-hr TWA; 1,250 ppm STEL

**IDLH:** 2,000 ppm

The Protective Action Criteria values are:

PAC-1 = 1,250 ppm    PAC-2 = 1,500 ppm

PAC-3 = 2,000 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Insulated Butyl, Nitrile, Neoprene and Viton (>8-hr breakthrough)
<b>Coveralls:</b>	Tychem® BR, Responder® and TK (>8-hr breakthrough)
<b>Respirator:</b>	>1,000 ppm - SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation, frostbite, burns, rash and redness
<b>Inhalation:</b>	Nose, throat and lung irritation, with coughing, and severe shortness of breath (pulmonary edema) Headache, dizziness, confusion, recent memory loss, convulsions, and passing out. Very high levels can cause trouble breathing, irregular heart rhythms collapse and even death.

### FIRST AID AND DECONTAMINATION

<b>Remove</b>	the person from exposure.
<b>Flush</b>	eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
<b>Quickly</b>	remove contaminated clothing and wash contaminated skin with large amounts of soap and water.
<b>Immerse</b>	affected part in warm water. Seek medical attention.
<b>Transfer</b>	promptly to a medical facility.
<b>Medical</b>	observation is recommended as symptoms may be delayed.

Common Name: **TRICRESYL PHOSPHATE**

Synonyms: Cresyl Phosphate; Tritolyl Phosphate

CAS No: 1330-78-5

 Molecular Formula: C<sub>21</sub>H<sub>21</sub>O<sub>4</sub>P

RTK Substance No: 3130

Description: Colorless, odorless liquid that is a mixture of three different isomers

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>1 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 2574 ERG Guide #: 151 Hazard Class: 6.1 (Poison)	<b>Tricresyl Phosphate</b> may burn, but does not readily ignite. Extinguish fire using an agent suitable for type of surrounding fire. Water may not be effective in fighting fires. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Phosphorus Oxides</i> and <i>Phosphine</i> . CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool.	<b>Tricresyl Phosphate</b> reacts with REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES) to form highly toxic and flammable <i>Phosphine gas</i> . <b>Tricresyl Phosphate</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE), especially when heated.

## SPILL/LEAKS

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in dry sand, earth, or a similar material and place into sealed containers for disposal.

DO NOT wash into sewer.

**Tricresyl Phosphate** is expected to be very toxic to aquatic life.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	437°F (225°C)
<b>Auto Ignition Temp:</b>	770°F (410°C)
<b>Vapor Density:</b>	2.7 (air = 1)
<b>Vapor Pressure:</b>	1.7 x 10 <sup>-6</sup> mm Hg at 77°F (25°C)
<b>Specific Gravity:</b>	1.16 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	770°F (410°C)
<b>Freezing Point:</b>	-27°F (-33°C)
<b>Molecular Weight:</b>	368

## EXPOSURE LIMITS

**OSHA:** 0.1 mg/m<sup>3</sup> (0.0066 ppm), 8-hr TWA

**NIOSH:** 0.1 mg/m<sup>3</sup> (0.0066 ppm), 10-hr TWA

**ACGIH:** 0.1 mg/m<sup>3</sup> (0.0066 ppm), 8-hr TWA

**IDLH:** 40 mg/m<sup>3</sup> (2.65 ppm)

 (All of the above are for *Tri-o-Cresyl Phosphate*)

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl, Polyvinyl Alcohol, Polyvinyl Chloride and Viton (>8-hr breakthrough)
<b>Coveralls:</b>	Tychem® BR, CSM and TK (>8-hr breakthrough for <i>Organophosphorus compounds</i> )
<b>Respirator:</b>	SCBA

## HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose and throat irritation

## FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.



Common Name: **TRIETHANOLAMINE DODECYLBENZENE-SULFONATE**

Synonyms: Dodecylbenzenesulfonic Acid, Triethanolamine Salt

CAS No: 27323-41-7

Molecular Formula:  $C_{18}H_{20}O_3S \cdot C_6H_{15}NO_3$

RTK Substance No: 1905

Description: White colored, waxy solid that is often in a liquid solution

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b>  DOT#: None ERG Guide #: 171 Hazard Class: None	Extinguish fire using an agent suitable for type of surrounding fire. <b>Triethanolamine Dodecylbenzene-Sulfonate</b> itself does not burn, or burns with difficulty.  POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> and <i>Sulfur Oxides</i> .  Use water spray to keep fire-exposed containers cool.	<b>Triethanolamine Dodecylbenzene-Sulfonate</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES), ISOCYANATES; and STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC).

### SPILL/LEAKS

**Isolation Distance:**

Spill (Solid): 25 meters (75 feet)

Spill (Liquid): 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers for disposal.

Collect solid material in the most convenient and safe manner and place into sealed containers for disposal.

DO NOT wash into sewer.

**Triethanolamine Dodecylbenzene-Sulfonate** is hazardous to waterfowl and most fish.

### PHYSICAL PROPERTIES

**Flash Point:** >200°F (93°C)

**Vapor Pressure:** Negligible

**Specific Gravity:** 1.2 (water = 1)

**Water Solubility:** Soluble

**Boiling Point:** >507°F (264°C)

**Molecular Weight:** 475.6 (*Solution*)

### EXPOSURE LIMITS

No occupational exposure limits have been established for **Triethanolamine Dodecylbenzene-Sulfonate**.

### PROTECTIVE EQUIPMENT

**Gloves:** Nitrile and Natural Rubber (*solid*)  
Butyl, Viton and SilverShield®/4H (*solutions*)

**Coveralls:** Tyvek® (*solid*)  
Tychem® BR, Responder® and TK (*solutions*)

**Respirator:** SCBA

### HEALTH EFFECTS

**Eyes:** Irritation and burns

**Skin:** Irritation and burns

**Inhalation:** Nose, throat and lung irritation, with coughing, wheezing and shortness of breath

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.



Common Name: **TRIETHYLAMINE**

Synonyms: (Diethylamino)Ethane; TEA

CAS No: 121-44-8

Molecular Formula: C<sub>6</sub>H<sub>15</sub>N

RTK Substance No: 1907

Description: Clear, colorless liquid with an *Ammonia* or fish-like odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>3 - Fire</b> <b>0 - Reactivity</b>  <b>DOT#:</b> UN 1296 <b>ERG Guide #:</b> 132 <b>Hazard Class:</b> 3 (Flammable)	<b>FLAMMABLE LIQUID</b> Use dry chemical, CO <sub>2</sub> , water spray or alcohol-resistant foam as extinguishing agents. <b>POISONOUS GASES ARE PRODUCED IN FIRE, including Nitrogen Oxides.</b> <b>CONTAINERS MAY EXPLODE IN FIRE.</b> Use water spray to keep fire-exposed containers cool. Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source. <b>Triethylamine</b> may form an ignitable vapor/air mixture in closed tanks or containers.	<b>Triethylamine</b> is a strong base which may react violently with <b>STRONG ACIDS</b> (such as HYDROCHLORIC, SULFURIC and NITRIC) and <b>OXIDIZING AGENTS</b> (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).  <b>Triethylamine</b> reacts with <b>REDUCING AGENTS</b> (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES) to form flammable and explosive <i>Hydrogen gas</i> .  <b>Triethylamine</b> is not compatible with <b>ISOCYANATES; EPOXIDES; PHENOLS; and ACID HALIDES</b> (such as TRICHLOROACETIC ACID).  <b>Triethylamine</b> can form toxic <i>N-Nitrosoamines</i> when in contact with <b>NITRIC ACID, NITRATES</b> or atmospheres with high <b>NITROUS OXIDE</b> concentrations.  <b>Triethylamine</b> is <b>CORROSIVE</b> to <b>ALUMINUM, COPPER</b> and <b>ZINC</b> and their <b>ALLOYS</b> in the presence of <b>MOISTURE</b> .

### SPILL/LEAKS

**Isolation Distance:**

Spill:

Fire: 800 meters (1/2 mile)

Absorb liquids in dry sand, earth, or a similar material and place into sealed containers for disposal.

DO NOT wash into sewer.

Use only non-sparking tools and equipment, especially when opening and closing containers of **Triethylamine**.

**Triethylamine** is harmful to aquatic organisms.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	0.1 to 0.48 ppm
<b>Flash Point:</b>	16°F (-9°C)
<b>LEL:</b>	1.2%
<b>UEL:</b>	8%
<b>Auto Ignition Temp:</b>	480°F (249°C)
<b>Vapor Density:</b>	3.5 (air = 1)
<b>Vapor Pressure:</b>	54 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	0.73 (water = 1)
<b>Water Solubility:</b>	Very slightly soluble
<b>Boiling Point:</b>	193°F (89°C)
<b>Freezing Point:</b>	-175°F (-115°C)
<b>Ionization Potential:</b>	7.5 eV
<b>Molecular Weight:</b>	101.2

### EXPOSURE LIMITS

**ACGIH:** 1 ppm, 8-hr TWA; 3 ppm STEL

**IDLH:** 200 ppm

The Protective Action Criteria values are:

PAC-1 = 3 ppm    PAC-2 = 3 ppm    PAC-3 = 200 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Nitrile, Polyvinyl Alcohol, Viton and Barrier® (>8-hr breakthrough)
<b>Coveralls:</b>	Tychem® fabrics; Trelchem® HPS and VPS (>8-hr breakthrough)
<b>Respirator:</b>	>1 ppm - SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns
<b>Inhalation:</b>	Nose, throat and lung irritation with coughing and severe shortness of breath (pulmonary edema)

### FIRST AID AND DECONTAMINATION

<b>Remove</b>	the person from exposure.
<b>Flush</b>	eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.
<b>Quickly</b>	remove contaminated clothing and wash contaminated skin with large amounts of soap and water.
<b>Begin</b>	artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b>	promptly to a medical facility.
<b>Medical</b>	observation is recommended as symptoms may be delayed.

Common Name: **TRIETHYLENE TETRAMINE**

Synonyms: 1,4,7,10-Tetrazadecane; Trientine

CAS No: 112-24-3

Molecular Formula: C<sub>6</sub>H<sub>18</sub>N<sub>4</sub>

RTK Substance No: 1908

Description: Colorless to yellow liquid with an *Ammonia* odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b>  <b>DOT#:</b> UN 2259 <b>ERG Guide #:</b> 153 <b>Hazard Class:</b> 8 (Corrosive)	CORROSIVE and COMBUSTIBLE LIQUID, but it does not readily ignite. Use dry chemical, CO <sub>2</sub> , water spray or alcohol-resistant foam as extinguishing agents.  POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> . Use water spray to keep fire-exposed containers cool.	<b>Triethylene Tetramine</b> is a STRONG BASE that reacts violently with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); ACID CHLORIDES; ACID ANHYDRIDES; and OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).  <b>Triethylene Tetramine</b> is not compatible with METALS (such as COPPER, COPPER ALLOYS, NICKEL, COBALT, ALUMINUM and ZINC); CYANIDES; NITRILES; EPOXIDES; CHLOROFORMATES; KETONES; and CHLORINATED HYDROCARBONS (such as METHYLENE CHLORIDE and TETRACHLOROETHANES).

### SPILL/LEAKS

**Isolation Distance:**  
 Spill: 50 meters (150 feet)  
 Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers for disposal.  
 DO NOT wash into sewer.

**Triethylene Tetramine** may cause long-term adverse effects in the aquatic environment.

### PHYSICAL PROPERTIES

**Odor Threshold:** *Ammonia* odor  
**Flash Point:** 275°F (135°C)  
**LEL:** 1%  
**UEL:** 6.5%  
**Auto Ignition Temp:** 640°F (338°C)  
**Vapor Density:** 5.04 (air = 1)  
**Vapor Pressure:** <0.01 mm Hg at 68°F (20°C)  
**Specific Gravity:** 0.98 (water = 1)  
**Water Solubility:** Soluble  
**Boiling Point:** 511°F (266°C)  
**Melting Point:** 54°F (12°C)  
**pH:** 10 (1% aqueous solution)  
**Molecular Weight:** 146.3

### EXPOSURE LIMITS

**AIHA:** 1 ppm, 8-hr WEEL

The Protective Action Criteria values are:  
 PAC-1 = 7.5 ppm  
 PAC-2 = 60 ppm  
 PAC-3 = 150 ppm

### PROTECTIVE EQUIPMENT

**Gloves:** Butyl, Nitrile and Neoprene (>8-hr breakthrough)

**Coveralls:** Tychem® BR, Responder®, and TK; and Trelchem® HPS and VPS (>8-hr breakthrough for *Amines, aliphatic tertiary and Polyamines*)

**Respirator:** SCBA

### HEALTH EFFECTS

**Eyes:** Severe irritation and burns  
**Skin:** Irritation and burns  
**Inhalation:** Nose, throat and lung irritation with coughing, wheezing and shortness of breath  
  
 Exposure to hot vapors can cause itching and swelling of the face

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention.  
**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water. Seek medical attention.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** promptly to a medical facility.

Common Name: **TRIFLURALIN**

Synonyms: Crisalin; Treflan

CAS No: 1582-09-8

Molecular Formula:  $C_{13}H_{16}F_3N_3O_4$

RTK Substance No: 1918

Description: Odorless, yellow or bright orange, crystalline solid

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b> DOT#: NA 3077 ERG Guide #: 171 Hazard Class: 9 (Environmentally Hazardous Substance)	COMBUSTIBLE SOLID Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. <b>Trifluralin</b> may be dissolved in a liquid carrier that is flammable. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> and <i>Hydrogen Fluoride</i> . Use water spray to keep fire-exposed containers cool.	<b>Trifluralin</b> reacts violently with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).

### SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Dampen spill with 60% to 70% *Ethyl Alcohol* and place into sealed containers for disposal.

Wash spill area with 60% to 70% *Ethyl Alcohol*.

DO NOT wash into sewer.

**Trifluralin** is toxic to honeybees, fish, and other aquatic organisms, and can bioaccumulate.

### PHYSICAL PROPERTIES

**Odor Threshold:** Odorless

**Flash Point:** >185°F (>85°C)

**Vapor Pressure:**  $1.9 \times 10^{-4}$  mm Hg at 85°F (29°C)

**Specific Gravity:** 1.3 (water = 1)

**Water Solubility:** Very slightly soluble

**Boiling Point:** 282° to 284°F (139° to 140°C) (Decomposes)

**Melting Point:** 115° to 117°F (46° to 47°C)

**Molecular Weight:** 335.3

### EXPOSURE LIMITS

No occupational exposure limits have been established for **Trifluralin**.

The Protective Action Criteria values are:

PAC-1 = 0.075 mg/m<sup>3</sup>

PAC-2 = 0.6 mg/m<sup>3</sup>

PAC-3 = 300 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

**Gloves:** Neoprene

**Coveralls:** Tyvek®

**Respirator:** Full facepiece APR with *P100 filter*  
>300 mg/m<sup>3</sup> - SCBA

### HEALTH EFFECTS

**Eyes:** Irritation

**Skin:** Irritation and rash

**Inhalation:** Nose and throat irritation with coughing and wheezing.

**Chronic:** Cancer (urinary tract, thyroid) in animals

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **2,4,6-TRINITROPHENOL**

Synonyms: Picric Acid; Carbazotic Acid; Phenol Trinitrate

CAS No: 88-89-1

Molecular Formula: C<sub>6</sub>H<sub>3</sub>N<sub>3</sub>O<sub>7</sub>

RTK Substance No: 1946

Description: Odorless, yellow-orange, crystalline solid when dry, or a bright yellow liquid when dissolved in water or an organic solvent

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>3 - Health</b></p> <p><b>4 - Fire</b></p> <p><b>4 - Reactivity</b></p> <p><b>DOT#:</b> UN 0154</p> <p><b>ERG Guide #:</b> 112</p> <p><b>Hazard Class:</b> 1.1D (Explosive)</p>	<p>FLAMMABLE and REACTIVE SOLID WHEN DRY and a DANGEROUS FIRE and EXPLOSION HAZARD.</p> <p><b>2,4,6-Trinitrophenol</b> may explosively decompose with heat, shock, friction or concussion.</p> <p><i>Water solutions of 2,4,6-Trinitrophenol are not combustible.</i></p> <p>Use dry chemical, CO<sub>2</sub>, water spray, alcohol-resistant foam or other foam as extinguishing agents.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i>.</p> <p>CONTAINERS MAY EXPLODE IN FIRE.</p> <p>Use water spray to keep fire-exposed containers cool. Flow or agitation may generate electrostatic charges.</p> <p><b>2,4,6-Trinitrophenol</b> may form an ignitable vapor/air mixture in closed tanks or containers.</p>	<p><b>2,4,6-Trinitrophenol</b> must be kept wet or in solution at all times as <i>dry or crystallized 2,4,6-Trinitrophenol</i> can be detonated by HEAT, SHOCK, FRICTION, STATIC ELECTRICITY or CONCUSSION.</p> <p><b>2,4,6-Trinitrophenol</b> will react with METALS (such as COPPER, IRON, LEAD, MERCURY and ZINC) to form <i>metal picrates</i> that are extremely shock sensitive and can be detonated by the slightest movement or vibration.</p> <p><b>2,4,6-Trinitrophenol</b> may react violently with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES); AMMONIA; CONCRETE; PLASTER; GELATIN; and NITROGEN CONTAINING COMPOUNDS.</p>

### SPILL/LEAKS

**Isolation Distance:**

Spills: 800 meters (1/2 mile)

Fire: 1,600 meters (1 mile)

DO NOT OPERATE transmitters within 100 meters (330 feet).

For *dry 2,4,6-Trinitrophenol*, consult a Specialist specifically trained in the clean-up of explosive materials.

Absorb liquids in dry sand, earth, or a similar material and place into sealed containers for disposal.

Use only non-sparking tools and equipment, especially when opening and closing containers of **2,4,6-Trinitrophenol**.

Keep spill wet at all times.

DO NOT wash into sewer.

**2,4,6-Trinitrophenol** is harmful to aquatic organisms.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	302°F (150°C)
<b>Auto Ignition Temp:</b>	572°F (300°C)
<b>Vapor Density:</b>	7.9 (air = 1)
<b>Vapor Pressure:</b>	<1 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.8 (water = 1)
<b>Water Solubility:</b>	Slightly soluble
<b>Boiling Point:</b>	Explodes above 572°F (300°C)
<b>Melting Point:</b>	252°F (122°C)
<b>Molecular Weight:</b>	229.1

### EXPOSURE LIMITS

**OSHA:** 0.1 mg/m<sup>3</sup>, 8-hr TWA

**NIOSH:** 0.1 mg/m<sup>3</sup>, 10-hr TWA; 0.3 mg/m<sup>3</sup>, STEL

**ACGIH:** 0.1 mg/m<sup>3</sup>, 8-hr TWA

**IDLH:** 75 mg/m<sup>3</sup>

The Protective Action Criteria values are:

PAC-1 = 0.3 mg/m<sup>3</sup>    PAC-2 = 15 mg/m<sup>3</sup>

PAC-3 = 75 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Nitrile and Neoprene (1 to 4-hr breakthrough)
<b>Coveralls:</b>	Tychem® Responder® (>8-hr breakthrough for <i>solutions</i> )
<b>Respirator:</b>	>0.1 mg/m <sup>3</sup> - full facepiece APR with <i>P100 filters</i> >1 mg/m <sup>3</sup> - SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns
<b>Inhalation:</b>	Nose and throat irritation Headache, dizziness, nausea and vomiting

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **2,4,6-TRINITROTOLUENE**

Synonyms: 1-Methyl-2,4,6-Trinitrobenzene; TNT

CAS No: 118-96-7

 Molecular Formula: C<sub>7</sub>H<sub>5</sub>N<sub>3</sub>O<sub>6</sub>

RTK Substance No: 1948

Description: Odorless, colorless to pale yellow, crystalline solid that may be transported in a slurry

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>4 - Fire</b> <b>4 - Reactivity</b> DOT#: UN 0209 ERG Guide #: 112 Hazard Class: 1 (Explosive)	<b>2,4,6-Trinitrotoluene</b> is an EXPLOSIVE that can be detonated by HEAT, LIGHT, FRICTION or SHOCK. <b>2,4,6-Trinitrotoluene</b> is a FLAMMABLE and REACTIVE SOLID. Use water or dirt for small fires. DO NOT attempt to extinguish large fires. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> . CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool.	<b>2,4,6-Trinitrotoluene</b> , especially <i>hot liquid</i> <b>2,4,6-Trinitrotoluene</b> may explosively decompose with SHOCK, FRICTION, IMPACT or HEAT (above 464°F (240°C)). <b>2,4,6-Trinitrotoluene</b> reacts violently or explosively with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); AMMONIA; REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); NITRIDES; NITRIC ACID; LEAD; IRON; and ORGANIC SOLVENTS.

## SPILL/LEAKS

## Isolation Distance:

Spill: 500 meters (1/2 mile)

Fire: 1,600 meters (1 mile)

DO NOT CLEAN-UP or DISPOSE of unless supervised by a specialist in explosives.

 Keep spilled **2,4,6-Trinitrotoluene** WET!

 Use only non-sparking tools and equipment, especially when opening and closing containers of **2,4,6-Trinitrotoluene**.

 Metal containers involving the transfer of **2,4,6-Trinitrotoluene** should be grounded and bonded.

DO NOT wash into sewer.

DO NOT OPERATE RADIO TRANSMITTERS within 100 meters (330 feet) of ELECTRICAL DETONATORS.

**2,4,6-Trinitrotoluene** is toxic to aquatic organisms and may cause long-term effects.

## PHYSICAL PROPERTIES

Odor Threshold: Odorless

Flash Point: Flammable Solid (Explodes)

Auto Ignition Temp: 887°F (474°C)

Vapor Pressure: 0.0002 mm Hg at 68°F (20°C)

Specific Gravity: 1.65 (water = 1)

Water Solubility: Very slightly soluble

Boiling Point: 464°F (240°C) (Explodes)

Melting Point: 176°F (80°C)

Ionization Potential: 10.59 eV

Molecular Weight: 227.15

## EXPOSURE LIMITS

 OSHA: 1.5 mg/m<sup>3</sup>, 8-hr TWA

 NIOSH: 0.5 mg/m<sup>3</sup>, 10-hr TWA

 ACGIH: 0.1 mg/m<sup>3</sup>, 8-hr TWA

 IDLH: 500 mg/m<sup>3</sup>

The Protective Action Criteria values are:

 PAC-1 = 1.25 mg/m<sup>3</sup> PAC-2 = 7.5 mg/m<sup>3</sup>

 PAC-3 = 500 mg/m<sup>3</sup>

## PROTECTIVE EQUIPMENT

 Gloves: Butyl (>8-hr breakthrough for *liquid Nitro compounds*)

 Coveralls: Tychem® CSM (>2-hr breakthrough for *liquid Nitro compounds*)  
 Flash protection or Turn-Out gear

Respirator: SCBA

## HEALTH EFFECTS

Eyes: Irritation

Skin: Irritation

Inhalation: Nose and throat irritation with coughing and wheezing

Headache, fatigue and blue color to the skin and lips (methemoglobinemia)

Chronic: Cancer (bladder) in animals

## FIRST AID AND DECONTAMINATION

Remove the person from exposure.

Flush eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

Quickly remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

Begin artificial respiration if breathing has stopped and CPR if necessary.

Transfer promptly to a medical facility.



Common Name: **2,3,5-TRIS(1-AZIRIDINYL)-p-BENZOQUINONE**

Synonyms: p-Benzoquinone, 2,3,5-Tris(1-Aziridiny)-; Triaziquone

CAS No: 68-76-8

Molecular Formula: C<sub>12</sub>H<sub>13</sub>N<sub>3</sub>O<sub>2</sub>

RTK Substance No: 1461

Description: Purple, needle-like solid

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>1 - Fire</b> <b>0 - Reactivity</b> DOT#: None ERG Guide #: None Hazard Class: None	<b>2,3,5-Tris(1-Aziridiny)-p-Benzoquinone</b> may burn, but does not readily ignite. Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE. Use water spray to keep fire-exposed containers cool.	<b>2,3,5-Tris(1-Aziridiny)-p-Benzoquinone</b> may react with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); ISOCYANATES; and ANHYDRIDES. <b>2,3,5-Tris(1-Aziridiny)-p-Benzoquinone</b> may react with REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES) to produce flammable <i>Hydrogen gas</i> .

### SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

Clean spill area with Acetone, followed by washing with soap and water.

### PHYSICAL PROPERTIES

**Flash Point:** May be combustible

**Water Solubility:** Slightly soluble

**Melting Point:** 324°F (180°C)

**Molecular Weight:** 231.25

### EXPOSURE LIMITS

No occupational exposure limits have been established for **2,3,5-Tris(1-Aziridiny)-p-Benzoquinone**.

### PROTECTIVE EQUIPMENT

**Gloves:** Nitrile, Neoprene and Natural Rubber

**Coveralls:** Tyvek®

**Respirator:** Spill: full facepiece APR with *P100 filters*  
 Fire: SCBA

### HEALTH EFFECTS

**Eyes:** Irritation

**Skin:** Irritation

**Inhalation:** Headache, nausea, vomiting, and dizziness

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.



Common Name: **URETHANE**

Synonyms: Ethyl Carbamate; Ethylurethane; Carbamic Acid, Ethyl Ester

CAS No: 51-79-6

Molecular Formula: C<sub>3</sub>H<sub>7</sub>NO<sub>2</sub>

RTK Substance No: 1986

Description: Odorless, colorless, crystalline solid or a white powder

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>2 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 3077 ERG Guide #: 171 Hazard Class: 9 (Miscellaneous Hazardous Substance)	<b>Urethane</b> is a COMBUSTIBLE SOLID. Use dry chemical, CO <sub>2</sub> , water spray or alcohol-resistant foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> . Use water spray to keep fire-exposed containers cool.	<b>Urethane</b> reacts with PHOSPHORUS PENTACHLORIDE to form an explosive product. <b>Urethane</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); CHLORAL HYDRATE; CAMPHOR; MENTHOL; GALLIUM; 2-NAPHTHOL; and THYMOL.

### SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

DO NOT wash into sewer.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	198°F (92°C)
<b>Vapor Density:</b>	3.07 (air = 1)
<b>Vapor Pressure:</b>	5 mm Hg at 150.4°F (66°C)
<b>Specific Gravity:</b>	0.98 (water = 1)
<b>Water Solubility:</b>	Slightly soluble
<b>Boiling Point:</b>	360° to 363°F (182° to 184°C)
<b>Melting Point:</b>	118° to 122°F (48° to 50°C)
<b>Molecular Weight:</b>	89.09

### EXPOSURE LIMITS

No occupational exposure limits have been established for **Urethane**.

The Protective Action Criteria values are:

PAC-1 = 500 mg/m<sup>3</sup>

PAC-2 = 500 mg/m<sup>3</sup>

PAC-3 = 500 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Nitrile or Natural Rubber
<b>Coveralls:</b>	Tyvek®
<b>Respirator:</b>	Full facepiece APR with <i>P100 filters</i> >500 mg/m <sup>3</sup> - SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation (skin absorbable)
<b>Inhalation:</b>	Nose and throat irritation Headache, dizziness, lightheadedness, and passing out
<b>Chronic:</b>	Cancer (lung, liver, and blood) in animals

### FIRST AID AND DECONTAMINATION

<b>Remove</b> the person from exposure.
<b>Flush</b> eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
<b>Quickly</b> remove contaminated clothing and wash contaminated skin with large amounts of water.
<b>Begin</b> artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b> promptly to a medical facility.

Common Name: **VANADIUM PENTOXIDE**

Synonyms: Vanadic Anhydride; Vanadium Oxide

CAS No: 1314-62-1

Molecular Formula: V<sub>2</sub>O<sub>5</sub>

RTK Substance No: 1993

Description: Odorless, yellow to rust-brown crystalline solid or fume

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> <b>DOT#:</b> UN 2862 <b>ERG Guide #:</b> 151 <b>Hazard Class:</b> 6.1 (Poison)	Extinguish fire using an agent suitable for type of surrounding fire. <b>Vanadium Pentoxide</b> itself does not burn. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Vanadium Oxide fumes</i> . Use water spray to keep fire-exposed containers cool.	<b>Vanadium Pentoxide</b> may react violently with CHLORINE TRIFLUORIDE; LITHIUM; and PEROXYFORMIC ACID. <b>Vanadium Pentoxide</b> is not compatible with ALUMINUM POWDER; STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); HALOGENS; and ALKALI METALS (such as LITHIUM, SODIUM and POTASSIUM). Mixtures of <b>Vanadium Pentoxide</b> with CALCIUM, SULFUR and WATER may ignite spontaneously.

### SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Collect powdered material in the most convenient and safe manner and place into sealed containers for disposal.

DO NOT wash into sewer.

**Vanadium Pentoxide** is toxic to aquatic organisms and may cause long-term adverse effects in the aquatic environment.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Nonflammable
<b>Vapor Pressure:</b>	0 mm Hg at 68°F (20°C) (approx.)
<b>Specific Gravity:</b>	3.56 (water = 1)
<b>Water Solubility:</b>	Slightly soluble
<b>Boiling Point:</b>	3,182°F (1,750°C)
<b>Melting Point:</b>	1,274°F (690°C)
<b>Molecular Weight:</b>	181.9

### EXPOSURE LIMITS

**NIOSH:** 0.05 mg/m<sup>3</sup>, 15-min Ceiling

**ACGIH:** 0.05 mg/m<sup>3</sup>, 8-hr TWA

**IDLH:** 35 mg/m<sup>3</sup> (as *Vanadium*)

The Protective Action Criteria values are:

PAC-1 = 1 mg/m<sup>3</sup>

PAC-2 = 1 mg/m<sup>3</sup>

PAC-3 = 35 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Nitrile and Natural Rubber
<b>Coveralls:</b>	Tyvek®
<b>Respirator:</b>	>0.05 mg/m <sup>3</sup> - Full facepiece APR with <i>High efficiency filters</i> >1 mg/m <sup>3</sup> - SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose, throat and lung irritation, with coughing, and severe shortness of breath (pulmonary edema)  Headache, dizziness, nausea and vomiting
<b>Chronic:</b>	Cancer (lung) in animals

### FIRST AID AND DECONTAMINATION

<b>Remove</b>	the person from exposure.
<b>Flush</b>	eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.
<b>Quickly</b>	remove contaminated clothing and wash contaminated skin with large amounts of soap and water
<b>Begin</b>	artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b>	promptly to a medical facility.
<b>Medical</b>	observation is recommended as symptoms may be delayed.

Common Name: **VINYL CHLORIDE**

Synonyms: Chloroethylene; Monochloroethylene; VCM  
 CAS No: 75-01-4  
 Molecular Formula: CH<sub>2</sub> = CHCl  
 RTK Substance No: 2001

Description: Colorless gas, with a sweet odor at high concentrations, that is usually handled as a liquid under pressure

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<p><b>4 - Health</b></p> <p><b>4 - Fire</b></p> <p><b>2 - Reactivity</b></p> <p><b>DOT#:</b> UN 1086</p> <p><b>ERG Guide #:</b> 116P</p> <p><b>Hazard Class:</b> 2.1 (Flammable Gas)</p>	<p>FLAMMABLE AND REACTIVE GAS that can EXPLOSIVELY POLYMERIZE if not inhibited.</p> <p>DO NOT attempt to extinguish fire unless flow can be stopped. Shut off supply or let burn.</p> <p>Use dry chemical or CO<sub>2</sub> for small fires.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Hydrogen Chloride</i> and <i>Phosgene</i>.</p> <p>CONTAINERS MAY EXPLODE IN FIRE.</p> <p>Use water spray to reduce vapors and to keep containers cool.</p> <p>Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source or flash back.</p> <p>Flow or agitation may generate electrostatic charges.</p> <p><b>Vinyl Chloride</b> may form an ignitable vapor/air mixture in closed tanks or containers.</p>	<p><b>Vinyl Chloride</b> can polymerize rapidly or explosively when exposed to elevated temperatures (over 125°F (52°C)), or when exposed to AIR or LIGHT in the presence of a CATALYST.</p> <p><b>Vinyl Chloride</b> reacts violently with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).</p> <p><b>Vinyl Chloride</b> is not compatible with WATER; METALS (such as COPPER, ALUMINUM, IRON and STEEL); METAL CARBIDES; and METAL ALLOYS as fires and/or explosions may occur.</p> <p><i>Phenol</i> should be used as an inhibitor to prevent violent polymerization of <b>Vinyl Chloride</b>.</p> <p><b>Vinyl Chloride</b> may accumulate static electricity.</p>

**SPILL/LEAKS**

**Isolation Distance:**  
 Spill: 100 meters (330 feet)  
 Fire: 800 meters (1/2 mile)

Stop flow of gas. If source of leak is a cylinder and the leak cannot be stopped in place, remove the leaking cylinder to a safe place in the open air, and repair leak or allow cylinder to empty.

Absorb liquids in dry sand, earth, or a similar material and place into sealed containers for disposal.

Keep **Vinyl Chloride** out of confined spaces, such as sewers, because of the possibility of an explosion.

Turn leaking cylinder with leak up to prevent escape of gas in liquid state.

Use nonsparking tools and ground and bond containers when transferring **Vinyl Chloride**.

**Vinyl Chloride** is hazardous to the environment.

**PHYSICAL PROPERTIES**

**Odor Threshold:** >3,000 ppm  
**Flash Point:** -108°F (-78°C)  
**LEL:** 3.6%  
**UEL:** 33%  
**Auto Ignition Temp:** 882°F (472°C)  
**Vapor Density:** 2.2 (air = 1)  
**Vapor Pressure:** 2,524 mm Hg at 68°F (20°C)  
**Specific Gravity:** 0.9 (water = 1)  
**Water Solubility:** Very slightly soluble  
**Boiling Point:** 17°F (-8.3°C)  
**Freezing Point:** -245° to -256°F (-154° to -160°C)  
**Ionization Potential:** 9.99 eV  
**Critical Temperature:** 306° to 317.3°F (152° to 158.5°C)  
**Molecular Weight:** 62.5

**EXPOSURE LIMITS**

**OSHA:** 1 ppm, 8-hr TWA; 5 ppm, Ceiling  
**NIOSH:** Lowest feasible concentration  
**ACGIH:** 1 ppm, 8-hr TWA

The Protective Action Criteria values are:  
 PAC-1 = 250 ppm    PAC-2 = 1,200 ppm  
 PAC-3 = 4,800 ppm

**PROTECTIVE EQUIPMENT**

**Gloves:** Insulated Viton, Viton/Butyl, Silver Shield®/4H® and Barrier® (>8-hr breakthrough)

**Coveralls:** Tychem® BR, CSM and TK; Trelchem HPS and VPS (8-hr breakthrough)  
 >10% of the LEL wear flash protection or turnout gear

**Respirator:** SCBA

**HEALTH EFFECTS**

**Eyes:** Irritation and burns, contact with *liquid* or *gas* may cause frostbite

**Skin:** Irritation and burns, contact with *liquid* or *gas* may cause frostbite

**Inhalation:** Nose, throat and lung irritation with coughing, wheezing and shortness of breath  
 Headache, dizziness, lightheadedness and passing out

**Chronic:** Cancer (liver, brain, and lung) in humans

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention.

**Immerse** affected part in warm water. Seek medical attention.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **VINYLDENE CHLORIDE**

Synonyms: 1-1-DCE; 1,1-Dichloroethene; 1,1-Dichloroethylene

CAS No: 75-35-4

 Molecular Formula:  $\text{CH}_2 = \text{CCl}_2$ 

RTK Substance No: 2006

Description: Clear, colorless liquid, or a gas above 89°F (32°C), with a mild, sweet odor

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>4 - Health</b> <b>4 - Fire</b> <b>2 - Reactivity</b> DOT#: UN 1303 ERG Guide #: 130P Hazard Class: 3 (Flammable)	FLAMMABLE AND REACTIVE <b>Vinylidene Chloride</b> is a <i>peroxide forming</i> chemical that can spontaneously decompose and become explosive with exposure to air. Use dry chemical, $\text{CO}_2$ , water spray or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Hydrogen Chloride</i> and <i>Phosgene</i> . CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool. Vapors may travel to a source of ignition and flash back. Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source. <b>Vinylidene Chloride</b> may form an ignitable vapor/air mixture in closed tanks or containers.	<b>Vinylidene Chloride</b> , when not inhibited, can violently polymerize (self-react), in the presence of HEAT, LIGHT, AIR and OXYGEN, to form a <i>peroxide Compound</i> that is shock-sensitive at very low temperatures (-40°F (-40°C)). <b>Vinylidene Chloride</b> reacts violently with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); OZONE; ALUMINUM; ALUMINUM ALLOYS; COPPER; COPPER ALLOYS; CHLOROSULFONIC ACID; OLEUM; and NITRIC ACID. <b>Vinylidene Chloride</b> may contain <i>Monomethyl Ether of Hydroquinone</i> as an inhibitor.

## SPILL/LEAKS

**Isolation Distance:**
**Spill:** 50 meters (150 feet)

**Fire:** 800 meters (1/2 mile)

Absorb liquids in cement powder, dry sand, earth, or a similar material and place into sealed containers for disposal.

 Use only non-sparking tools and equipment, especially when opening and closing containers of **Vinylidene Chloride**.

 Keep **Vinylidene Chloride** out of confined spaces, such as sewers, because of the possibility of an explosion.

DO NOT wash into sewer.

This substance is harmful to aquatic organisms.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	190 to 500 ppm
<b>Flash Point:</b>	0°F (-18°C)
<b>LEL:</b>	5.6%
<b>UEL:</b>	16%
<b>Auto Ignition Temp:</b>	1,058°F (570°C)
<b>Vapor Density:</b>	3.25 (air = 1)
<b>Vapor Pressure:</b>	500 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	1.2 (water = 1)
<b>Water Solubility:</b>	Very slightly soluble
<b>Boiling Point:</b>	89°F (32°C)
<b>Freezing Point:</b>	-188°F (-122°C)
<b>Ionization Potential:</b>	10 eV
<b>Molecular Weight:</b>	96.9

## EXPOSURE LIMITS

**ACGIH:** 5 ppm, 8-hr TWA

The Protective Action Criteria values are:

PAC-1 = 75 ppm    PAC-2 = 500 ppm

PAC-3 = 1,000 ppm

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Silver Shield®/4H® and Barrier® (>8-hr breakthrough)
<b>Coveralls:</b>	Tychem® BR, Responder®, and TK (>8-hr breakthrough)
<b>Respirator:</b>	SCBA

## HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns
<b>Inhalation:</b>	Nose and throat irritation with coughing and wheezing Headache, dizziness, drowsiness, depression and a "drunken" feeling that can lead to unconsciousness
<b>Chronic:</b>	Cancer (kidney) in animals

## FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.  
**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** promptly to a medical facility.

Common Name: **VINYL TOLUENE**

Synonyms: Methyl Styrene; Tolyethylene

CAS No: 25013-15-4

Molecular Formula: C<sub>9</sub>H<sub>10</sub>

RTK Substance No: 2010

Description: Clear, colorless liquid with a strong, disagreeable odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>2 - Fire</b> <b>2 - Reactivity</b> <b>DOT#:</b> UN 2618 <b>ERG Guide #:</b> 3 <b>Hazard Class:</b> (Flammable)	<b>Vinyl Toluene</b> is a COMBUSTIBLE LIQUID. Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. <b>Vinyl Toluene</b> polymerizes (self-reacts) at elevated temperatures when not stabilized. POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool. <b>Vinyl Toluene</b> may form an ignitable vapor/air mixture in closed tanks or containers.	<b>Vinyl Toluene</b> reacts violently with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and ALUMINUM CHLORIDE. <b>Vinyl Toluene</b> is not compatible with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) and IRON SALTS.

### SPILL/LEAKS

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and place into sealed containers for disposal.

For liquid spills use oil-skimming equipment and sorbent foams.

Keep **Vinyl Toluene** out of confined spaces, such as sewers, because of the possibility of an explosion.

DO NOT wash into sewer.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	50 ppm
<b>Flash Point:</b>	127°F (53°C)
<b>LEL:</b>	0.8%
<b>UEL:</b>	11%
<b>Auto Ignition Temp:</b>	1,000°F (538°C)
<b>Vapor Density:</b>	4.1 (air = 1)
<b>Vapor Pressure:</b>	1 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	0.9 (water = 1)
<b>Water Solubility:</b>	Very slightly soluble
<b>Boiling Point:</b>	334°F (168°C)
<b>Freezing Point:</b>	-94° to -103°F (-70° to -75°C)
<b>Ionization Potential:</b>	8.2 eV
<b>Molecular Weight:</b>	118.18

### EXPOSURE LIMITS

**OSHA:** 100 ppm, 8-hr TWA

**NIOSH:** 100 ppm, 10-hr TWA

**ACGIH:** 50 ppm, 8-hr TWA; 100 ppm STEL

**IDLH:** 400 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Silver Shield®/4H®, Viton and Barrier® (>8-hr breakthrough)
<b>Coveralls:</b>	Tychem® BR, Responder®, and TK; and Trelchem® HPS and VPS (>8-hr breakthrough for <i>Hydrocarbons, aromatic</i> )
<b>Respirator:</b>	>50 ppm - full facepiece APR with <i>Organic Vapor filters</i> >400 ppm - SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose and throat irritation with coughing and wheezing

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.  
**Remove** contaminated clothing and wash contaminated skin with soap and water.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** promptly to a medical facility.



Common Name: **VM & P NAPHTHA**

Synonyms: Varnish Makers' and Painters' Naphtha; Light Naphtha; Benzine

CAS No: 8032-32-4

Molecular Formula: (Blend of petroleum fractions)

RTK Substance No: 0206

Description: A colorless to yellow, liquid petroleum product with an odor like gasoline

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>3 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 1268 ERG Guide #: 128 Hazard Class: 3 (Flammable)	FLAMMABLE LIQUID. Use dry chemical, CO <sub>2</sub> , alcohol-resistant foam or other foaming agent as extinguishing agents, as water may not be effective in fighting fires. POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool. Vapors may travel to a source of ignition and flash back. Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source. Use a vapor suppressing foam to reduce vapors.	<b>VM &amp; P Naphtha</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).

**SPILL/LEAKS**
**Isolation Distance:**

Small Spill: 60 meters (200 feet)

Large Spill: 270 meters (900 feet)

Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.

 Keep **VM & P Naphtha** out of confined spaces, such as sewers, because of the possibility of an explosion.

Severe marine pollutant.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	0.86 ppm
<b>Flash Point:</b>	28° to 85°F (-2° to 29°C)
<b>LEL:</b>	0.9%
<b>UEL:</b>	6.7%
<b>Auto Ignition Temperature:</b>	450°F (232°C)
<b>Vapor Density:</b>	4.1 - 4.3 (air = 1)
<b>Vapor Pressure:</b>	2 to 20 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	<1 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	212° to 350°F (100° to 177°C)
<b>Molecular Weight:</b>	114

**EXPOSURE LIMITS**

<b>OSHA:</b>	None
<b>NIOSH:</b>	350 mg/m <sup>3</sup> , 10-hr TWA 1,800 mg/m <sup>3</sup> , 15-min STEL
<b>ACGIH:</b>	1,370 mg/m <sup>3</sup> , 8-hr TWA
<b>IDLH LEVEL:</b>	N/A

**PROTECTIVE EQUIPMENT**

<b>Gloves and Coveralls:</b>	Nitrile, Neoprene, and Viton (>8-hr breakthrough) DuPont Tychem® BR and LV, Responder® and TK (>8-hr breakthrough)
<b>Boots:</b>	Neoprene
<b>Respirator:</b>	350 mg/m <sup>3</sup> - full facepiece APR with Organic Vapor cartridges

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation, drying and cracking of the skin
<b>Acute:</b>	Irritation of the nose and throat with coughing and wheezing Headache, dizziness and passing out.
<b>Chronic:</b>	Cancer (Not Classifiable)

**FIRST AID AND DECONTAMINATION**

<b>Remove</b>	the person from exposure.
<b>Flush</b>	eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
<b>Quickly</b>	remove contaminated clothing and wash contaminated skin with large amounts of soap and water.
<b>Begin</b>	artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b>	to a medical facility.



Common Name: **XYLENES**

Synonyms: Dimethylbenzene; Methyl Toluene (mixed isomers); Xylol

CAS No: 1330-20-7

Molecular Formula: C<sub>6</sub>H<sub>4</sub>(CH<sub>3</sub>)<sub>2</sub>

RTK Substance No: 2014

Description: Colorless liquids with a faint, sweet odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>3 - Fire</b> <b>0 - Reactivity</b>  <b>DOT#:</b> UN 1307 <b>ERG Guide #:</b> 130 <b>Hazard Class:</b> 3 (Flammable)	<b>FLAMMABLE LIQUIDS</b> Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. <b>POISONOUS GASES ARE PRODUCED IN FIRE.</b> <b>CONTAINERS MAY EXPLODE IN FIRE.</b>  Use water spray to keep fire-exposed containers cool. Vapors are heavier than air and may travel a distance to cause a fire or explosion far from the source and flash back. Flow or agitation may generate electrostatic charges. <b>Xylenes</b> may form an ignitable vapor/air mixture in closed tanks or containers.	<b>Xylenes</b> react with <b>OXIDIZING AGENTS</b> (such as <b>PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE</b> and <b>FLUORINE</b> ) and <b>STRONG ACIDS</b> (such as <b>HYDROCHLORIC, SULFURIC</b> and <b>NITRIC</b> ).

### SPILL/LEAKS

**Isolation Distance:**

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb *liquids* in dry sand, earth, or a similar material and place into sealed containers for disposal.

Ground and bond containers when transferring **Xylenes**.

Use only non-sparking tools and equipment.

Keep **Xylenes** out of confined spaces, such as sewers, because of the possibility of an explosion.

DO NOT wash into sewer.

**Xylenes** are toxic to aquatic organisms.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	0.07 to 40 ppm
<b>Flash Point:</b>	63° to 77°F (17° to 25°C)
<b>LEL:</b>	0.9 to 1.1%
<b>UEL:</b>	6.7 to 7%
<b>Auto Ignition Temp:</b>	867° to 984°F (464° to 529°C)
<b>Vapor Density:</b>	3.7 (air = 1)
<b>Vapor Pressure:</b>	7 to 9 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	0.86 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	279° to 291°F (137° to 144°C)
<b>Freezing Point:</b>	-53°F (-47°C) to 55.4°F (13°C)
<b>Ionization Potential:</b>	8.44 to 8.56 eV
<b>Molecular Weight:</b>	106.2

### EXPOSURE LIMITS

**OSHA:** 100 ppm, 8-hr TWA

**NIOSH:** 100 ppm, 10-hr TWA; 150 ppm, STEL

**ACGIH:** 100 ppm, 8-hr TWA; 150 ppm, STEL

**IDLH:** 900 ppm

The Protective Action Criteria values are:

PAC-1 = 130 ppm PAC-2 = 920 ppm PAC-3 = 2,500 ppm

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Vinton/Butyl, Polyvinyl Alcohol, Silver Shield®/4H®, Viton and Barrier® (>8-hr breakthrough)
<b>Coveralls:</b>	Tychem® BR, CSM and TK (>8-hr breakthrough) <b>Use turnout gear or flash protection if ignition/fire is the greatest hazard</b>
<b>Respirator:</b>	>100 ppm - full facepiece APR with <i>Organic vapor cartridge</i> >900 ppm - SCBA

### HEALTH EFFECTS

**Eyes:** Irritation

**Skin:** Irritation (skin absorbable)

**Inhalation:** Nose and throat irritation with coughing and wheezing

Headache, dizziness, lightheadedness, and passing out

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **XYLENOL** (This Quick Reference can be used for all six isomers of Xylenol)

Synonyms: Cresylic Acid; Hydroxydimethylbenzene

CAS No: 1300-71-6

Molecular Formula: C<sub>8</sub>H<sub>10</sub>O

RTK Substance No: 2015

Description: White to yellowish-brown, crystalline solid or liquid with a sweet, tarry odor

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>2 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 2261 ERG Guide #: 153 Hazard Class: 6 (Toxic)	COMBUSTIBLE SOLID OR LIQUID Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE. Use water spray to keep fire-exposed containers cool.	<b>Xylenol</b> is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); ACID ANHYDRIDES; ACID CHLORIDES; STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); and IRON.

### SPILL/LEAKS

**Isolation Distance:**

Spill (liquid): 50 meters (150 feet)  
 (solid): 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Absorb *liquids* in dry sand, earth, or a similar material and place into sealed containers for disposal.

Collect *solid* material in the most convenient and safe manner and place into sealed containers for disposal.

DO NOT wash into sewer.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Sweet, tarry odor
<b>Flash Point:</b>	142° to 203°F (61° to 95°C)
<b>LEL:</b>	1.4%
<b>Auto Ignition Temp:</b>	1,110°F (599°C)
<b>Vapor Density:</b>	4.2 (air = 1)
<b>Vapor Pressure:</b>	0.102 to 0.274 mm Hg at 77°F (25°C)
<b>Specific Gravity:</b>	1.01 (water = 1)
<b>Water Solubility:</b>	Slightly soluble
<b>Boiling Point:</b>	397° to 437°F (203° to 225°C)
<b>Melting Point:</b>	77° to 167°F (25° to 75°C)
<b>Molecular Weight:</b>	122.18

### EXPOSURE LIMITS

No occupational exposure limits have been established for **Xylenol**.

The Protective Action Criteria values are:

(Liquid) PAC-1 = 1 mg/m<sup>3</sup> PAC-2 = 6 mg/m<sup>3</sup>  
 PAC-3 = 500 mg/m<sup>3</sup>

(Solid) PAC-1 = 2 mg/m<sup>3</sup> PAC-2 = 15 mg/m<sup>3</sup>  
 PAC-3 = 125 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Polyvinyl Alcohol, SilverShield®4/H®, Viton and Barrier® (>8-hr breakthrough for <i>Xylene</i> )
<b>Coveralls:</b>	Tychem® BR and TK (>8-hr breakthrough for <i>Xylene</i> )
<b>Respirator:</b>	>1 mg/m <sup>3</sup> - Full facepiece APR with <i>Organic vapor filters</i> >125 mg/m <sup>3</sup> - SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation and burns
<b>Inhalation:</b>	Nose, throat and lung irritation, with coughing, wheezing and shortness of breath  Headache, dizziness, nausea and vomiting

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.  
**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water. Seek medical attention..  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** promptly to a medical facility.

Common Name: **ZINC**

Synonyms: Blue Powder; Granular Zinc

CAS No: 7440-66-6

Molecular Formula: Zn

RTK Substance No: 2021

Description: Odorless, bluish-white, shiny metal or a gray to blue powder

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>1 - Health</b></p> <p><b>3 - Fire</b></p> <p><b>1W - Reactivity</b></p> <p><b>DOT#:</b> UN 1436</p> <p><b>ERG Guide #:</b> 138</p> <p><b>Hazard Class:</b> 4.3 (Water Reactive)</p>	<p><b>Zinc</b> is a <b>FLAMMABLE POWDER</b>.</p> <p>Use dry chemicals appropriate for extinguishing metal fires. <b>DO NOT USE WATER or FOAM.</b></p> <p><b>POISONOUS FUMES ARE PRODUCED IN FIRE,</b> including <i>Zinc Oxides</i>.</p> <p><b>CONTAINERS MAY EXPLODE IN FIRE.</b></p> <p>Use water spray to keep fire-exposed containers cool. <b>DO NOT</b> get water into containers.</p> <p>Flow or agitation may generate electrostatic charges.</p> <p><b>Zinc powder or dust</b> may form an ignitable dust/air mixture in closed tanks or containers.</p>	<p><b>Zinc powder</b> reacts with <b>WATER; MOIST AIR; STRONG ACIDS</b> (such as <b>HYDROCHLORIC, SULFURIC and NITRIC</b>); and <b>STRONG BASES</b> (such as <b>SODIUM HYDROXIDE and POTASSIUM HYDROXIDE</b>) to form flammable and explosive <i>Hydrogen gas</i>. The heat released may be sufficient to ignite the <i>Hydrogen</i> formed.</p> <p><b>Zinc powder</b> reacts violently with <b>OXIDIZING AGENTS</b> (such as <b>PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE</b>); <b>SULFUR; CARBON DISULFIDE; AMMONIUM NITRATE; HYDROXYLAMINE</b>; and many other substances. The reactions may lead to fires and explosions.</p>

### SPILL/LEAKS

**Isolation Distance:**

**Spill:** 25 meters (75 feet)

**Fire:** 800 meters (1/2 mile)

Cover spill with dry sand, earth, or a similar material and place into sealed containers for disposal.

Metal containers involving the transfer of **Zinc powder** should be grounded and bonded.

Use only non-sparking tools and equipment.

**DO NOT USE WATER OR WET METHOD.**

**DO NOT** wash into sewer.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Auto Ignition Temp:</b>	860°F (460°C)
<b>Vapor Density:</b>	7.14 (air = 1)
<b>Vapor Pressure:</b>	1 mm Hg at 909°F (487°C)
<b>Specific Gravity:</b>	77.14 (water = 1)
<b>Water Solubility:</b>	Reacts
<b>Boiling Point:</b>	1,665°F (907°C)
<b>Melting Point:</b>	786°F (419°C)
<b>Molecular Weight:</b>	65.41

### EXPOSURE LIMITS

No occupational exposure limits have been established for **Zinc**.

The Protective Action Criteria values are:

PAC-1 = 3 mg/m<sup>3</sup>    PAC-2 = 20 mg/m<sup>3</sup>

PAC-3 = 500 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Nitrile and Natural Rubber
<b>Coveralls:</b>	Tyvek® <b>Use turn out gear or flash protection if ignition/fire is the greatest hazard.</b>
<b>Respirator:</b>	Full facepiece APR with P100 filters >30 mg/m <sup>3</sup> or fire - SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation
<b>Inhalation:</b>	Nose and throat irritation with coughing and wheezing  Headache, fever and chills, aches, chest tightness and cough (" <i>metal fume fever</i> ")  Symptoms may be delayed

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

Common Name: **ZINC CHLORIDE**

Synonyms: Butter of Zinc; Tinning Flux; Zinc Dichloride

CAS No: 7646-85-7

Molecular Formula: ZnCl<sub>2</sub>

RTK Substance No: 2030

Description: Odorless, white, crystalline granule or powder

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>3 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> <b>DOT#:</b> UN 2331 <b>ERG Guide #:</b> 154 <b>Hazard Class:</b> 8 (Corrosive)	Extinguish fire using an agent suitable for type of surrounding fire. <b>Zinc Chloride</b> itself does not burn. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Hydrogen Chloride</i> and <i>Zinc Oxide fumes</i> .	<b>Zinc Chloride</b> may react violently or explosively with POTASSIUM. <b>Zinc Chloride</b> is not compatible with CYANIDES; SULFIDES; OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE). <b>Zinc Chloride</b> is corrosive to METALS.

### SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Collect powdered material in the most convenient and safe manner and place into sealed containers for disposal.

DO NOT wash into sewer.

**Zinc Chloride** is a severe marine pollutant that may cause long term adverse effects to the aquatic environment.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Noncombustible
<b>Vapor Density:</b>	4.7 (air = 1)
<b>Vapor Pressure:</b>	0 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	2.9 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	1,349.6°F (732°C)
<b>Melting Point:</b>	554°F (290°C)
<b>Molecular Weight:</b>	136.3

### EXPOSURE LIMITS

**OSHA:** 1 mg/m<sup>3</sup>, 8-hr TWA

**NIOSH:** 1 mg/m<sup>3</sup>, 10-hr TWA; 2 mg/m<sup>3</sup>, STEL

**ACGIH:** 1 mg/m<sup>3</sup>, 8-hr TWA; 2 mg/m<sup>3</sup>, STEL

**IDLH:** 50 mg/m<sup>3</sup>

(All the above are for **Zinc Chloride fume**)

The Protective Action Criteria values are:

PAC-1 = 2 mg/m<sup>3</sup> PAC-2 = 50 mg/m<sup>3</sup> PAC-3 = 50 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Butyl
<b>Coveralls:</b>	Tyvek®
<b>Respirator:</b>	>1 mg/m <sup>3</sup> - full facepiece APR with High efficiency filters >10 mg/m <sup>3</sup> - Supplied Air or SCBA >50 mg/m <sup>3</sup> - SCBA

### HEALTH EFFECTS

**Eyes:** Severe irritation, burns and possible eye damage

**Skin:** Irritation and burns

**Inhalation:** Nose, throat and lung irritation with coughing and severe shortness of breath (pulmonary edema)

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention immediately.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water. Seek medical attention immediately.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility. Medical observation is recommended as symptoms may be delayed.

Common Name: **ZINC NITRATE**

Synonyms: Zinc Dinitrate

CAS No: 7779-88-6

Molecular Formula:  $Zn(NO_3)_2$

RTK Substance No: 2036

Description: Colorless or white, odorless, crystalline solid or flake

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p><b>2 - Health</b></p> <p><b>0 - Fire</b></p> <p><b>0 - Reactivity</b></p> <p><b>DOT#:</b> UN 1514</p> <p><b>ERG Guide #:</b> 140</p> <p><b>Hazard Class:</b> 5.1 (Oxidizer)</p>	<p><b>Zinc Nitrate</b> is not combustible, but it is a <b>STRONG OXIDIZER</b> that enhances the combustion of other substances.</p> <p>Use water only. <b>DO NOT USE CHEMICAL</b> or <math>CO_2</math> as extinguishing agents.</p> <p><b>POISONOUS GASES ARE PRODUCED IN FIRE</b>, including <i>Nitrogen Oxides</i> and <i>Zinc Oxide fumes</i>.</p> <p>Use water spray to keep fire-exposed containers cool.</p> <p><b>Zinc Nitrate</b> may ignite combustibles (wood, paper and oil).</p>	<p><b>Zinc Nitrate</b> may react violently with <b>COMBUSTIBLES</b>; <b>REDUCING AGENTS</b> (such as <b>LITHIUM</b>, <b>SODIUM</b>, <b>ALUMINUM</b> and their <b>HYDRIDES</b>); <b>CARBONS</b>; <b>COPPER</b>; <b>METAL SULFIDES</b>; <b>PHOSPHORUS</b>; <b>SULFUR</b>; and <b>ALKYL ESTERS</b>.</p> <p><b>Zinc Nitrate</b> is not compatible with <b>OXIDIZING AGENTS</b> (such as <b>PERCHLORATES</b>, <b>PEROXIDES</b>, <b>PERMANGANATES</b>, <b>CHLORATES</b>, <b>NITRATES</b>, <b>CHLORINE</b>, <b>BROMINE</b> and <b>FLUORINE</b>); <b>CYANIDES</b>; <b>METAL POWDERS</b>; <b>AMINES</b>; <b>METAL SALTS</b> (such as <b>TIN CHLORIDE</b>); and <b>ACETIC ANHYDRIDES</b>.</p> <p>Keep away from all <b>COMBUSTIBLES</b> and <b>ORGANICS</b>.</p>

### SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Collect powdered material in the most convenient and safe manner and place into sealed containers for disposal.

DO NOT wash into sewer.

**Zinc Nitrate** is harmful to aquatic life in low concentrations.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Noncombustible
<b>Vapor Pressure:</b>	60 mm Hg at 1,292°F (700°C)
<b>Specific Gravity:</b>	2.07 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	221°F (105°C)
<b>Melting Point:</b>	97° to 108.5°F (36° to 42.5°C)
<b>Molecular Weight:</b>	189.39

### EXPOSURE LIMITS

No occupational exposure limits have been established for **Zinc Nitrate**.

The Protective Action Criteria values are:

PAC-1 = 15 mg/m<sup>3</sup>

PAC-2 = 125 mg/m<sup>3</sup>

PAC-3 = 500 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Nitrile and Natural Rubber
<b>Coveralls:</b>	Tyvek®
<b>Respirator:</b>	>15 mg/m <sup>3</sup> - Full facepiece APR with <i>High efficiency filters</i> >125 mg/m <sup>3</sup> - SCBA

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns
<b>Skin:</b>	Irritation, burns and rash
<b>Inhalation:</b>	Nose and throat irritation with coughing and wheezing  Headache, dizziness, fatigue and blue color to the skin and lips (methemoglobinemia)

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.  
**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water. Seek medical attention.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** promptly to a medical facility.

Common Name: **ZINC POTASSIUM CHROMATE**

Synonyms: Buttercup Yellow; Citron Yellow; Zinc Yellow

CAS No: 11103-86-9

Molecular Formula:  $KZn_2(CrO_4)_2(OH)$

RTK Substance No: 2042

Description: Green-yellow, odorless solid or powder

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>4 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> DOT#: None ERG Guide #: None Hazard Class: None	Extinguish fire using an agent suitable for type of surrounding fire. <b>Zinc Potassium Chromate</b> itself does not burn. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Zinc Oxide</i> and <i>Dipotassium Oxide</i> . Use water spray to keep fire-exposed containers cool.	Zinc Chromates are oxidizers which may react with REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES); ALCOHOLS; COMBUSTIBLES; ORGANIC MATERIALS; ETHERS; HYDRAZINES; and METAL POWDERS.

### SPILL/LEAKS

**Isolation Distance:**

Small Spills: 50 meters (150 feet)

Fires: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up.

This substance is very toxic to aquatic organisms.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Not combustible
<b>Auto Ignition:</b>	752°F (400°C)
<b>Specific Gravity:</b>	3.4 (water = 1) (as basic <i>Zinc Chromate</i> )
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	482°F (250°C) (as <i>Chromates</i> )
<b>Melting Point:</b>	600°F (316°C) (as basic <i>Zinc Chromate</i> )
<b>Molecular Weight:</b>	418

### EXPOSURE LIMITS

<b>OSHA:</b>	0.005 mg/m <sup>3</sup> , 8-hr TWA
<b>NIOSH:</b>	0.001 mg/m <sup>3</sup> , 10-hr TWA
<b>ACGIH:</b>	0.01 mg/m <sup>3</sup> , 8-hr TWA
<b>IDLH LEVEL:</b>	15 mg/m <sup>3</sup> (as <i>Chromates</i> )
	All the above are for <i>hexavalent Chromium (Cr VI)</i>

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Rubber or Nitrile
<b>Coveralls:</b>	DuPont Tychem® Polycoat, CPF 1, QC, CPF 2 and SL, or equivalent
<b>Respirator:</b>	>0.001 mg/m <sup>3</sup> - APR with High efficiency filters >0.01 mg/m <sup>3</sup> - Supplied air

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation, itching, rash and skin ulcers
<b>Inhalation:</b>	Nose, throat and lung irritation with cough, phlegm and/or shortness of breath
<b>Chronic:</b>	<i>Hexavalent Chromium (or Chromium VI) compounds</i> cause lung cancer in humans and animals

### FIRST AID AND DECONTAMINATION

<b>Remove</b>	the person from exposure.
<b>Flush</b>	eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
<b>Quickly</b>	remove contaminated clothing and wash contaminated skin with large amounts of soap and water.
<b>Begin</b>	artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b>	to a medical facility.



Common Name: **ZINC SULFATE**

Synonyms: White Vitriol; Zinc Vitriol

CAS No: 7733-02-0

 Molecular Formula:  $ZnSO_4$ 

RTK Substance No: 2044

Description: Colorless, odorless, crystalline powder

## HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>0 - Fire</b> <b>0 - Reactivity</b> DOT#: UN 3077 ERG Guide #: 171 Hazard Class: 9 (Environmentally Hazardous)	Extinguish fire using an agent suitable for type of surrounding fire. <b>Zinc Sulfate</b> itself does not burn. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Sulfur Oxides</i> and <i>Zinc Oxide</i> . Use water spray to keep fire-exposed containers cool.	<b>Zinc Sulfate</b> reacts violently with PHOSPHORUS and FINELY DIVIDED ALUMINUM or MAGNESIUM. <b>Zinc Sulfate</b> is not compatible with STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE).

## SPILL/LEAKS

**Isolation Distance:**

Spills: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

 Collect powdered material in the most convenient and safe manner and deposit in sealed containers.  
 DO NOT wash into sewer.

*Zinc* may be accumulated by some organisms and may be harmful to aquatic life.

## PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Nonflammable
<b>Vapor Density:</b>	1.95 (air = 1)
<b>Vapor Pressure:</b>	60 mm Hg at 1,292°F (700°C)
<b>Specific Gravity:</b>	3.54 (water = 1)
<b>Water Solubility:</b>	Soluble
<b>Boiling Point:</b>	>932°F (>500°C)
<b>Molecular Weight:</b>	161.5
<b>pH:</b>	4.5

## EXPOSURE LIMITS

No occupational exposure limits have been established.

## PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Rubber
<b>Coveralls:</b>	DuPont Tyvek® or equivalent
<b>Respirator:</b>	Full facepiece APR with High efficiency filters or Supplied air for unknown exposure levels

## HEALTH EFFECTS

<b>Eyes:</b>	Irritation and burns with possible eye damage
<b>Skin:</b>	Irritation and burns with rash, dryness and redness
<b>Inhalation:</b>	Nose and throat irritation with coughing and wheezing Headache, dizziness, nausea and vomiting

## FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** to a medical facility.

Common Name: **ZINEB**

Synonyms: Zinc Ethylenebis(dithiocarbamate); Parzate; Lodacol

CAS No: 12122-67-7

Molecular Formula: C<sub>4</sub>H<sub>6</sub>N<sub>2</sub>S<sub>4</sub>Zn

RTK Substance No: 2045

Description: Odorless, light-colored powder

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>2 - Health</b> <b>2 - Fire</b> <b>1 - Reactivity</b> <b>DOT#:</b> UN 2771 <b>ERG Guide #:</b> 151 <b>Hazard Class:</b> 6.1 (Poison)	<b>Zineb</b> is a COMBUSTIBLE SOLID. Use dry chemical, CO <sub>2</sub> , water spray or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nitrogen Oxides</i> , <i>Zinc Oxides</i> and <i>Sulfur Oxides</i> . Use water spray to keep fire-exposed containers cool.	<b>Zineb</b> is not compatible with STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE) and MERCURY COMPOUNDS. <b>Zineb</b> is unstable with exposure to HEAT, MOISTURE and LIGHT and may form toxic <i>Ethylenethiourea</i> .

### SPILL/LEAKS

**Isolation Distance:**

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Collect powdered material with a vacuum or a wet method and deposit in sealed containers.

DO NOT wash into sewer.

**Zineb** is moderately toxic to fish and degrades in soil in 16-23 days.

### PHYSICAL PROPERTIES

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	194°F (90°C)
<b>Auto Ignition Temp:</b>	300°F (149°C)
<b>Vapor Pressure:</b>	1 x 10 <sup>-7</sup> mm Hg at 77°F (25°C)
<b>Specific Gravity:</b>	1.74 (water = 1)
<b>Water Solubility:</b>	Very slightly soluble
<b>Boiling Point:</b>	Decomposes
<b>Melting Point:</b>	315°F (157°C)
<b>Molecular Weight:</b>	275.7

### EXPOSURE LIMITS

No occupational exposure limits have been established for **Zineb**.

### PROTECTIVE EQUIPMENT

<b>Gloves:</b>	Silver Shield®/4H®
<b>Coveralls:</b>	DuPont Tyvek®
<b>Respirator:</b>	Low exposure or outdoors - full facepiece APR with High efficiency filter or Supplied air

### HEALTH EFFECTS

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation, redness and rash
<b>Inhalation:</b>	Nose and throat irritation with coughing and wheezing Headache, dizziness, nausea and vomiting

### FIRST AID AND DECONTAMINATION

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.  
**Quickly** remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water.  
**Begin** artificial respiration if breathing has stopped and CPR if necessary.  
**Transfer** to a medical facility.



# RIGHT TO KNOW HAZARDOUS SUBSTANCE FACT SHEET

Emergency  
Responders  
Quick Reference

**Common Name: ZINOPHOS**

Synonyms: Thionazin; Cynem; Nemafos  
CAS Number: 297-97-2  
Molecular Formula: C<sub>8</sub>H<sub>13</sub>N<sub>2</sub>O<sub>3</sub>PS  
RTK Number: 2046  
Description: Amber liquid, was also available in granular formulations.

### HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<b>Health:</b> 3 <b>Fire:</b> 1 <b>Reactivity:</b> 1 <b>DOT #:</b> UN 3018 UN 2783 <b>ERG #:</b> 152 <b>DOT Hazard:</b> 6.1 (poison)	POISONOUS FUMES ARE PRODUCED IN FIRE, including <i>Sulfur Oxides, Nitrogen Oxides</i> and <i>Phosphorus Oxides</i> . CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool. Carrier solvents used in commercial formulations may change physical and toxicological properties.	<b>Zinophos</b> is susceptible to formation of <i>phosphine gas</i> in the presence of strong reducing agents such as <i>hydrides</i> . Partial oxidation by OXIDIZING AGENTS may result in the release of toxic <i>phosphorus oxides</i> .

### SPILLS/LEAKS

**Isolation Distances:**

**Liquid Spill:** 50 meters (150 feet)  
**Solid Spill:** 25 meters (75 feet)  
**Fire:** 800 meters (½ mile)

Evacuate personnel.  
Secure and control entrance to the area.  
If it is safe to do so, remove potential ignition sources.  
Collect *powdered* material in the most convenient and safe manner and deposit in sealed containers.  
Absorb *liquids* in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.  
Do not allow this substance to enter waterways, including sewers, as it is very toxic to aquatic life with long-lasting effects.  
Ventilate and wash area after clean-up is complete.

### PHYSICAL PROPERTIES

**Melting Point:** -1.7 °C (29 °F)  
**Vapor Pressure:** 0.003 mm Hg at 30 °C (86 °F)  
**Water Solubility:** Slightly soluble  
**Molecular Weight:** 248.2  
**Boiling Point:** 80 °C (176 °F)

### EXPOSURE LIMITS

There are no occupational exposure limits to **Zinophos**.

**PAC:** PAC-1 = 0.32 mg/m<sup>3</sup>  
PAC-2 = 3.5 mg/m<sup>3</sup>  
PAC-3 = 21 mg/m<sup>3</sup>

### PROTECTIVE EQUIPMENT

**Gloves:** Nitrile or Neoprene  
**Coverall:** Tychem® BR, CSM and TK, or the equivalent  
**Respirator:** Supplied-air, full facepiece, pressure-demand or another positive-pressure mode

### ACUTE HEALTH EFFECTS

**Eyes:** Blurred vision  
**Skin:** Skin irritation  
**Inhalation:** Headache, dizziness, blurred vision, chest tightness, twitching, loss of coordination, convulsions, coma, death

### FIRST AID AND DECONTAMINATION

Immediately flush with large amounts of water for at least 15 minutes.  
Quickly remove contaminated clothing. Immediately wash area with large amounts of soap and water.  
Shampoo hair promptly if contaminated.  
Remove the person from exposure.  
Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.  
Transfer promptly to a medical facility.  
Medical observation is recommended for several days as symptoms may be delayed.

June 2023

Common Name: **ZIRCONIUM**

Synonyms: None

CAS No: 7440-67-7

Molecular Formula: Zr

RTK Substance No: 2047

Description: Soft, gray to gold solid, bluish-black powder, or grayish-white platelet or flake

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<p><b>2 - Health</b> <b>4 - Fire</b> <b>1 - Reactivity</b></p> <p><b>DOT#:</b> UN 1358 UN 2008</p> <p><b>ERG Guide #:</b> 170/135</p> <p><b>Hazard Class:</b> 4.1/4.2 (Flammable solid/ spontaneously combustible)</p>	<p><b>Zirconium</b> powder, dust or granule is <b>HIGHLY FLAMMABLE</b> and can <b>EXPLODE SPONTANEOUSLY</b> IN AIR.</p> <p>Use dry chemicals appropriate for extinguishing metal fires (such as dry lime, soda ash and graphite).</p> <p>USE WATER with care as <b>Zirconium</b> re-ignites in the presence of WATER and burns more violently.</p> <p>DO NOT USE CO<sub>2</sub> or HALOGEN extinguishing agents.</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE.</p> <p>Use water spray to keep fire-exposed containers cool. DO NOT get water inside containers.</p>	<p><b>Zirconium</b> reacts violently or explosively with BORAX; CARBON TETRACHLORIDE and ALKALI METAL HYDROXIDES (such as POTASSIUM HYDROXIDE and SODIUM HYDROXIDE) when heated, and also reacts violently with COPPER OXIDE and LEAD OXIDE. Dusts of pure <b>Zirconium</b> will ignite or explode when in contact with WATER.</p> <p>Forms explosive mixtures with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); PHOSPHORUS; OXYGEN; LEAD; POTASSIUM NITRATE; POTASSIUM CHLORATE; SODIUM BORATE; SULFATES; MOLYBDATES; CHROMATES; and DICHROMATES.</p> <p><b>Zirconium</b> is incompatible with BORON; CARBON; NITROGEN; and PLATINUM.</p>

**SPILL/LEAKS**

**Isolation Distance:**

Solids: 25 meters (75 feet)

Large Spill: 50 meters (160 feet)

Fire: 800 meters (1/2 mile)

Collect powdered material in the most convenient and safe manner and deposit in sealed containers.

Use only non-sparking tools and equipment, especially when opening and closing containers of **Zirconium**.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Spontaneously combustible powder, dust or granule
<b>Auto Ignition Temp:</b>	392°F (200°C)
<b>Vapor Pressure:</b>	0 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	6.5 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Boiling Point:</b>	6,471°F (3,577°C)
<b>Melting Point:</b>	3,375°F (1,857°C)
<b>Ionization Potential:</b>	6.6 eV
<b>Molecular Weight:</b>	91.2

**EXPOSURE LIMITS**

<b>OSHA:</b>	5 mg/m <sup>3</sup> , 8-hr TWA
<b>NIOSH:</b>	5 mg/m <sup>3</sup> , 10-hr TWA; 10 mg/m <sup>3</sup> , STEL
<b>ACGIH:</b>	5 mg/ m <sup>3</sup> , 8-hr TWA; 10 mg/m <sup>3</sup> , STEL
<b>IDLH LEVEL:</b>	25 mg/m <sup>3</sup>

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	No information
<b>Coveralls:</b>	DuPont Tyvek® or equivalent
<b>Boots:</b>	No information
<b>Respirator:</b>	>5 mg/m <sup>3</sup> - full facepiece APR with High efficiency filter <25 mg/m <sup>3</sup> - Supplied air

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Skin allergy with small nodules with repeated contact
<b>Inhalation:</b>	Lung irritation with coughing and/or shortness of breath

**FIRST AID AND DECONTAMINATION**

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

**Remove** contaminated clothing and wash contaminated skin with soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** to a medical facility.