



# Right to Know Hazardous Substance Fact Sheet

Common Name: **BORON TRIBROMIDE**

Synonyms: Tribromoborane; Boron Bromide

Chemical Name: Borane, Tribromo-

Date: July 1998

Revision: July 2007

CAS Number: 10294-33-4

RTK Substance Number: 0244

DOT Number: UN 2692

## Description and Use

**Boron Tribromide** is a colorless, fuming liquid with a strong odor. It is used to make *Diborane*, high purity *Boron*, and semiconductors.

## Reason for Citation

- ▶ **Boron Tribromide** is on the Right to Know Hazardous Substance List because it is cited by ACGIH, DOT, NIOSH and NFPA.
- ▶ This chemical is on the Special Health Hazard Substance List.

SEE GLOSSARY ON PAGE 5.

## FIRST AID

### Eye Contact

- ▶ Immediately flush with large amounts of cool water. Continue for at least 30 minutes, occasionally lifting upper and lower lids. Remove contact lenses, if worn, while rinsing. Immediate medical attention is necessary.

### Skin Contact

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

### Inhalation

- ▶ 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, as pulmonary edema may be delayed.

## EMERGENCY NUMBERS

Poison Control: 1-800-222-1222

CHEMTREC: 1-800-424-9300

NJDEP Hotline: 1-877-927-6337

National Response Center: 1-800-424-8802

EMERGENCY RESPONDERS >>>> SEE BACK PAGE

## Hazard Summary

Hazard Rating	NJDOH	NFPA
HEALTH	-	3
FLAMMABILITY	-	0
REACTIVITY	-	2-W
CORROSIVE WATER REACTIVE POISONOUS GASES ARE PRODUCED IN FIRE		

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

- ▶ **Boron Tribromide** can affect you when inhaled.
- ▶ Contact can severely irritate and burn the skin and eyes.
- ▶ Inhaling **Boron Tribromide** can irritate the nose and throat.
- ▶ Inhaling **Boron Tribromide** can irritate the lungs. Higher exposures may cause a build-up of fluid in the lungs (pulmonary edema), a medical emergency.
- ▶ **Boron Tribromide** may affect the nervous system.
- ▶ **Boron Tribromide** is REACTIVE and a DANGEROUS EXPLOSION HAZARD.

## Workplace Exposure Limits

NIOSH: The recommended airborne exposure limit (REL) is **1 ppm**, which should not be exceeded at any time.

ACGIH: The threshold limit value (TLV) is **1 ppm**, which should not be exceeded at any time.

## Determining Your Exposure

- ▶ Read the product manufacturer's Material Safety Data Sheet (MSDS) and the label to determine product ingredients and important safety and health information about the product mixture.
- ▶ For each individual hazardous ingredient, read the New Jersey Department of Health Hazardous Substance Fact Sheet, available on the RTK website ([www.nj.gov/health/eoh/rtkweb](http://www.nj.gov/health/eoh/rtkweb)) or in your facility's RTK Central File or Hazard Communication Standard file.
- ▶ You have a right to this information under the New Jersey Worker and Community Right to Know Act, the Public Employees Occupational Safety and Health (PEOSH) Act if you are a public worker in New Jersey, and under the federal Occupational Safety and Health Act (OSHA) if you are a private worker.
- ▶ The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard (29 CFR 1910.1200) requires private employers to provide similar information and training to their employees.

This Fact Sheet is a summary of available information regarding the health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

## Health Hazard Information

### Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Boron Tribromide**:

- ▶ Contact can severely irritate and burn the skin and eyes with possible eye damage.
- ▶ Inhaling **Boron Tribromide** can irritate the nose and throat.
- ▶ Inhaling **Boron Tribromide** can irritate the lungs causing coughing and/or shortness of breath. Higher exposures may cause a build-up of fluid in the lungs (pulmonary edema), a medical emergency, with severe shortness of breath.

### Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Boron Tribromide** and can last for months or years:

### Cancer Hazard

- ▶ According to the information presently available to the New Jersey Department of Health, **Boron Tribromide** has not been tested for its ability to cause cancer in animals.

### Reproductive Hazard

- ▶ According to the information presently available to the New Jersey Department of Health, **Boron Tribromide** has not been tested for its ability to affect reproduction.

### Other Effects

- ▶ **Boron Tribromide** can irritate the lungs. Repeated exposure may cause bronchitis to develop with cough, phlegm, and/or shortness of breath.
- ▶ **Boron Tribromide** may affect the nervous system.

## Medical

### Medical Testing

Before beginning employment and at regular times after that, for those with frequent or potentially high exposures, the following are recommended:

- ▶ Lung function tests

If symptoms develop or overexposure is suspected, the following are recommended:

- ▶ Consider chest x-ray after acute overexposure
- ▶ Exam of the nervous system

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under the OSHA Access to Employee Exposure and Medical Records Standard (29 CFR 1910.1020).

### Mixed Exposures

- ▶ Because smoking can cause heart disease, as well as lung cancer, emphysema, and other respiratory problems, it may worsen respiratory conditions caused by chemical exposure. Even if you have smoked for a long time, stopping now will reduce your risk of developing health problems.

## Workplace Controls and Practices

Very toxic chemicals, or those that are reproductive hazards or sensitizers, require expert advice on control measures if a less toxic chemical cannot be substituted. Control measures include: (1) enclosing chemical processes for severely irritating and corrosive chemicals, (2) using local exhaust ventilation for chemicals that may be harmful with a single exposure, and (3) using general ventilation to control exposures to skin and eye irritants. For further information on workplace controls, consult the NIOSH document on Control Banding at [www.cdc.gov/niosh/topics/ctrlbanding/](http://www.cdc.gov/niosh/topics/ctrlbanding/).

The following work practices are also recommended:

- ▶ Label process containers.
- ▶ Provide employees with hazard information and training.
- ▶ Monitor airborne chemical concentrations.
- ▶ Use engineering controls if concentrations exceed recommended exposure levels.
- ▶ Provide eye wash fountains and emergency showers.
- ▶ Wash or shower if skin comes in contact with a hazardous material.
- ▶ Always wash at the end of the workshift.
- ▶ Change into clean clothing if clothing becomes contaminated.
- ▶ Do not take contaminated clothing home.
- ▶ Get special training to wash contaminated clothing.
- ▶ Do not eat, smoke, or drink in areas where chemicals are being handled, processed or stored.
- ▶ Wash hands carefully before eating, smoking, drinking, applying cosmetics or using the toilet.

In addition, the following may be useful or required:

- ▶ Before entering a confined space where **Boron Tribromide** may be present, check to make sure that an explosive concentration does not exist.

## Personal Protective Equipment

The OSHA Personal Protective Equipment Standard (29 CFR 1910.132) requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

### Gloves and Clothing

- ▶ Avoid skin contact with **Boron Tribromide**. Wear personal protective equipment made from material which can not be permeated and/or degraded by this substance. Safety equipment suppliers/manufacturers can provide recommendations on the most protective glove/clothing material for your operation.
- ▶ Safety equipment manufacturers recommend DuPont *Tychem® BR, LV, Responder®, TK, and Reflector®*, and ChemFab *Challenger® 5200* as protective materials for *Inorganic Acid Halides*.
- ▶ All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

### Eye Protection

- ▶ Wear indirect-vent, impact and splash resistant goggles when working with liquids.
- ▶ Wear a face shield along with goggles when working with corrosive, highly irritating or toxic substances.
- ▶ Contact lenses should not be worn when working with this substance.

### Respiratory Protection

**Improper use of respirators is dangerous.** Such equipment should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing, and medical exams as described in the OSHA Respiratory Protection Standard (29 CFR 1910.134).

- ▶ Where the potential exists for exposure over **1 ppm**, use a NIOSH approved full facepiece respirator with an acid gas cartridge which is specifically approved for **Boron Tribromide**. Increased protection is obtained from full facepiece powered-air purifying respirators.
- ▶ Leave the area immediately if (1) while wearing a filter or cartridge respirator you can smell, taste, or otherwise detect **Boron Tribromide**, (2) while wearing particulate filters abnormal resistance to breathing is experienced, or (3) eye irritation occurs while wearing a full facepiece respirator. Check to make sure the respirator-to-face seal is still good. If it is, replace the filter or cartridge. If the seal is no longer good, you may need a new respirator.
- ▶ Consider all potential sources of exposure in your workplace. You may need a combination of filters, prefilters or cartridges to protect against different forms of a chemical (such as vapor and mist) or against a mixture of chemicals.
- ▶ Where the potential exists for exposure over **10 ppm**, use a NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.

## Fire Hazards

If employees are expected to fight fires, they must be trained and equipped as stated in the OSHA Fire Brigades Standard (29 CFR 1910.156).

- ▶ **Boron Tribromide** is not combustible but it decomposes in heat and may explode.
- ▶ Use dry chemical or CO<sub>2</sub> extinguishing agents. **DO NOT USE WATER.**
- ▶ **POISONOUS GASES ARE PRODUCED IN FIRE**, including *Hydrogen Bromide* and *Boron Oxides*.
- ▶ Use water to cool intact containers only.

### Spills and Emergencies

If employees are required to clean-up spills, they must be properly trained and equipped. The OSHA Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120) may apply.

If **Boron Tribromide** is spilled or leaked, take the following steps:

- ▶ Evacuate personnel and secure and control entrance to the area.
- ▶ Eliminate all ignition sources.
- ▶ Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.
- ▶ Ventilate area after clean-up is complete.
- ▶ DO NOT USE WATER OR WET METHOD.
- ▶ Keep **Boron Tribromide** out of a confined space, such as a sewer, because of the possibility of an explosion.
- ▶ It may be necessary to contain and dispose of **Boron Tribromide** as a HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.

### Handling and Storage

Prior to working with **Boron Tribromide** you should be trained on its proper handling and storage.

- ▶ **Boron Tribromide** reacts violently and explosively with WATER or STEAM and decomposes on contact with ALCOHOLS. These reactions produce *Hydrogen Bromide gas*.
- ▶ Mixtures of **Boron Tribromide** and POTASSIUM or SODIUM can explode on impact.
- ▶ **Boron Tribromide** 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.
- ▶ Store in tightly closed containers in a cool, well-ventilated area away from WOOD, BAKELITE, METALS, and RUBBER.
- ▶ **Boron Tribromide** should be stored under *Nitrogen* and protected from SHOCK, HEAT and LIGHT.

### Right to Know Information Resources

The New Jersey Department of Health offers multiple services in occupational health. These services include providing informational resources, educational materials, public presentations, and industrial hygiene and medical investigations and evaluations.

#### For more information, please contact:

New Jersey Department of Health  
Right to Know  
PO Box 368  
Trenton, NJ 08625-0368  
Phone: 609-984-2202  
Fax: 609-984-7407  
E-mail: [rtk@doh.state.nj.us](mailto:rtk@doh.state.nj.us)  
Web address: <http://www.nj.gov/health/eoh/rtkweb>

*The Right to Know Hazardous Substance Fact Sheets  
are not intended to be copied and sold  
for commercial purposes.*

## GLOSSARY

**ACGIH** is the American Conference of Governmental Industrial Hygienists. They publish guidelines called Threshold Limit Values (TLVs) for exposure to workplace chemicals.

**Boiling point** is the temperature at which a substance can change its physical state from a liquid to a gas.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is unique, identifying number, assigned by the Chemical Abstracts Service, to a specific chemical.

**CFR** is the Code of Federal Regulations, which are the regulations of the United States government.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes destruction of human skin or severe corrosion of containers.

**DEP** is the New Jersey Department of Environmental Protection.

**DOT** is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

**EPA** is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

**ERG** is the Emergency Response Guidebook. It is a guide for emergency responders for transportation emergencies involving hazardous substances.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

**IARC** is the International Agency for Research on Cancer, a scientific group.

**Ionization Potential** is the amount of energy needed to remove an electron from an atom or molecule. It is measured in electron volts.

**IRIS** is the Integrated Risk Information System database maintained by federal EPA. The database contains information on human health effects that may result from exposure to various chemicals in the environment.

**LEL** or **Lower Explosive Limit** is the lowest concentration of a combustible substance (gas or vapor) in the air capable of continuing an explosion.

**mg/m<sup>3</sup>** means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

**NFPA** is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

**NIOSH** is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

**NTP** is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

**OSHA** is the federal Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

**PEOSHA** is the New Jersey Public Employees Occupational Safety and Health Act, which adopts and enforces health and safety standards in public workplaces.

**Permeated** is the movement of chemicals through protective materials.

**PIH** is a DOT designation for chemicals which are Poison Inhalation Hazards.

**ppm** means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

**STEL** is a Short Term Exposure Limit which is usually a 15-minute exposure that should not be exceeded at any time during a work day.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

**UEL** or **Upper Explosive Limit** is the highest concentration in air above which there is too much fuel (gas or vapor) to begin a reaction or explosion.

**Vapor Density** is the ratio of the weight of a given volume of one gas to the weight of another (usually *Hydrogen*), at the same temperature and pressure.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.

Common Name: **BORON TRIBROMIDE**

Synonyms: Tribromoborane; Boron Bromide

CAS No: 10294-33-4

 Molecular Formula:  $BBr_3$ 

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 $CO_2$ . 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

**Remove** the person from exposure.  
**Flush** eyes with large amounts of water for at least 30 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.  
**Observation** is recommended as symptoms may be delayed.