



Right to Know Hazardous Substance Fact Sheet

Common Name: **VANADIUM PENTOXIDE**

Synonyms: Vanadic Anhydride; Vanadium Oxide

Chemical Name: Vanadium Oxide (V₂O₅)

Date: October 1998 Revision: January 2010

CAS Number: 1314-62-1

RTK Substance Number: 1993

DOT Number: UN 2862

Description and Use

Vanadium Pentoxide is an odorless, yellow to rust-brown crystalline (sand-like) solid or a fume when heated. It is used as a catalyst, photographic developer and coating for welding electrodes, and in pesticides, inks and dyes.

Reasons for Citation

- ▶ **Vanadium Pentoxide** is on the Right to Know Hazardous Substance List because it is cited by OSHA, ACGIH, DOT, NIOSH, DEP, IARC, IRIS and EPA.
- ▶ 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 water for at least 15 minutes, lifting upper and lower lids. Remove contact lenses, if worn, while flushing. Seek medical attention.

Skin Contact

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

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 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 LAST PAGE

Hazard Summary

Hazard Rating	NJDOH	NFPA
HEALTH	3	-
FLAMMABILITY	0	-
REACTIVITY	0	-
CARCINOGEN POISONOUS GASES ARE PRODUCED IN FIRE DOES NOT BURN		

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

- ▶ **Vanadium Pentoxide** can affect you when inhaled.
- ▶ **Vanadium Pentoxide** should be handled as a CARCINOGEN--WITH EXTREME CAUTION.
- ▶ Contact can irritate the skin and eyes with possible eye damage.
- ▶ Exposure can irritate the eyes, nose and throat.
- ▶ **Vanadium Pentoxide** can cause a greenish-black discoloration of the tongue.
- ▶ Contact may cause skin allergy and an asthma-like allergy.
- ▶ Exposure to **Vanadium Pentoxide** can cause headache, dizziness, nausea and vomiting.
- ▶ Inhaling **Vanadium Pentoxide** can irritate the lungs. Higher exposures may cause a build-up of fluid in the lungs (pulmonary edema), a medical emergency.
- ▶ **Vanadium Pentoxide** may affect the liver and kidneys.

Workplace Exposure Limits

OSHA: The legal airborne permissible exposure limit (PEL) is **0.5 mg/m³** (as the *respirable fraction*), and **0.1 mg/m³** (as the *fume*) not to be exceeded at any time.

NIOSH: The recommended airborne exposure limit (REL) is **0.05 mg/m³** (as *Vanadium*), which should not be exceeded during any 15-minute work period.

ACGIH: The threshold limit value (TLV) is **0.05 mg/m³** (as the *inhalable fraction*) averaged over an 8-hour workshift.

- ▶ **Vanadium Pentoxide** may be a CARCINOGEN in humans. There may be no safe level of exposure to a carcinogen, so all contact should be reduced to the lowest possible level.

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) 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 and 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) and the PEOSH Hazard Communication Standard (N.J.A.C. 12:100-7) require 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 **Vanadium Pentoxide**:

- ▶ Contact can irritate the skin and eyes with possible eye damage.
- ▶ Exposure can irritate the eyes, nose and throat with nasal discharge, sore throat, cough and phlegm.
- ▶ **Vanadium Pentoxide** can cause a greenish-black discoloration of the tongue.
- ▶ Exposure to **Vanadium Pentoxide** can cause headache, dizziness, nausea and vomiting.
- ▶ Inhaling **Vanadium Pentoxide** 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 **Vanadium Pentoxide** and can last for months or years:

Cancer Hazard

- ▶ **Vanadium Pentoxide** may be a CARCINOGEN in humans since it has been shown to cause lung cancer in animals.
- ▶ Many scientists believe there is no safe level of exposure to a carcinogen.

Reproductive Hazard

- ▶ There is limited evidence that **Vanadium Pentoxide** is a teratogen in animals. Until further testing has been done, it should be treated as a possible teratogen in humans.
- ▶ There is limited evidence that **Vanadium Pentoxide** may damage the male reproductive system (including decreasing the sperm count) in animals.

Other Effects

- ▶ **Vanadium Pentoxide** can irritate the lungs. Repeated exposure may cause bronchitis to develop with coughing, phlegm, and/or shortness of breath.
- ▶ Skin allergy may occur with itching, redness and/or an eczema-like rash. If allergy develops, very low future exposure can trigger symptoms.
- ▶ **Vanadium Pentoxide** may cause an asthma-like allergy. Future exposure can cause asthma attacks with shortness of breath, wheezing, coughing, and/or chest tightness.
- ▶ **Vanadium Pentoxide** may affect the liver and kidneys.

Medical

Medical Testing

For frequent or potentially high exposure (half the PEL or greater), the following are recommended before beginning work and at regular times after that:

- ▶ Liver and kidney function tests

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

- ▶ Chest x-ray and lung function tests
- ▶ Evaluation by a qualified allergist can help diagnose skin allergy.

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

- ▶ Smoking can cause heart disease, 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.
- ▶ More than light alcohol consumption can cause liver damage. Drinking alcohol can increase the liver damage caused by **Vanadium Pentoxide**.

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/.

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:

- ▶ Use a vacuum or a wet method to reduce dust during clean-up. DO NOT DRY SWEEP.

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 **Vanadium Pentoxide**. Wear personal protective equipment made from material which can not be permeated or degraded by this substance. Safety equipment suppliers and manufacturers can provide recommendations on the most protective glove and clothing material for your operation.
- ▶ Safety equipment manufacturers recommend Nitrile and Natural Rubber for gloves, and Tyvek®, or the equivalent, as a protective clothing material.
- ▶ All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

- ▶ Wear eye protection with side shields or goggles.
- ▶ If additional protection is needed for the entire face, use in combination with a face shield. A face shield should not be used without another type of eye protection.

Respiratory Protection

Improper use of respirators is dangerous. Respirators should only be used if the employer has implemented 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 **0.05 mg/m³**, use a NIOSH approved negative pressure, air-purifying, particulate filter respirator with an N, R or P100 filter. More protection is provided by a full facepiece respirator than by a half-mask respirator, and even greater protection is provided by a powered-air purifying respirator.
- ▶ Leave the area immediately if (1) while wearing a filter or cartridge respirator you can smell, taste, or otherwise detect **Vanadium Pentoxide**, (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 **2.5 mg/m³**, 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 or an emergency escape air cylinder.
- ▶ Exposure to **35 mg/m³** (as *Vanadium*) is immediately dangerous to life and health. If the possibility of exposure above **35 mg/m³** exists, use a NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode equipped with an emergency escape air cylinder.

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).

- ▶ Extinguish fire using an agent suitable for type of surrounding fire. **Vanadium Pentoxide** itself does not burn.
- ▶ POISONOUS GASES ARE PRODUCED IN FIRE, including *Vanadium Oxide fumes*.
- ▶ Use water spray to keep fire-exposed containers cool.

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 **Vanadium Pentoxide** is spilled, take the following steps:

- ▶ Evacuate personnel and secure and control entrance to the area.
- ▶ Eliminate all ignition sources.
- ▶ Collect powdered material in the most convenient and safe manner and place into sealed containers for disposal.
- ▶ Ventilate and wash area after clean-up is complete.
- ▶ DO NOT wash into sewer.
- ▶ It may be necessary to contain and dispose of **Vanadium Pentoxide** 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 **Vanadium Pentoxide** you should be trained on its proper handling and storage.

- ▶ **Vanadium Pentoxide** may react violently with CHLORINE TRIFLUORIDE; LITHIUM; and PEROXYFORMIC ACID.
- ▶ **Vanadium Pentoxide** 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 **Vanadium Pentoxide** with CALCIUM, SULFUR and WATER may ignite spontaneously.
- ▶ Store in tightly closed containers in a cool, well-ventilated area.

Occupational Health 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
Web address: <http://www.nj.gov/health/eoh/rtkweb>

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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.

Acute Exposure Guideline Levels (AEGs) are established by the EPA. They describe the risk to humans resulting from once-in-a-lifetime, or rare, exposure to airborne 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 a 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.

The **critical temperature** is the temperature above which a gas cannot be liquefied, regardless of the pressure applied.

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.

Emergency Response Planning Guideline (ERPG) values provide estimates of concentration ranges where one reasonably might anticipate observing adverse effects.

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 on human health effects that may result from exposure to various chemicals, maintained by federal EPA.

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/m³ 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.

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

Protective Action Criteria (PAC) are values established by the Department of Energy and are based on AEGs and ERPGs. They are used for emergency planning of chemical release events.

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 *Air*), at the same temperature and pressure.

The **vapor pressure** is a force exerted by the vapor in equilibrium with the solid or liquid phase of the same substance. The higher the vapor pressure the higher concentration of the substance in air.

Common Name: **VANADIUM PENTOXIDE**

Synonyms: Vanadic Anhydride; Vanadium Oxide

CAS No: 1314-62-1

 Molecular Formula: V_2O_5

RTK Substance No: 1993

Description: Odorless, yellow to rust-brown crystalline solid or fume

HAZARD DATA

Hazard Rating	Firefighting	Reactivity
3 - Health 0 - Fire 0 - Reactivity DOT#: UN 2862 ERG Guide #: 151 Hazard Class: 6.1 (Poison)	Extinguish fire using an agent suitable for type of surrounding fire. Vanadium Pentoxide 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.	Vanadium Pentoxide may react violently with CHLORINE TRIFLUORIDE; LITHIUM; and PEROXYFORMIC ACID. Vanadium Pentoxide 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 Vanadium Pentoxide 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

Odor Threshold:	Odorless
Flash Point:	Nonflammable
Vapor Pressure:	0 mm Hg at 68°F (20°C) (approx.)
Specific Gravity:	3.56 (water = 1)
Water Solubility:	Slightly soluble
Boiling Point:	3,182°F (1,750°C)
Melting Point:	1,274°F (690°C)
Molecular Weight:	181.9

EXPOSURE LIMITS

NIOSH: 0.05 mg/m³, 15-min Ceiling

ACGIH: 0.05 mg/m³, 8-hr TWA

IDLH: 35 mg/m³ (as *Vanadium*)

The Protective Action Criteria values are:

 PAC-1 = 1 mg/m³

 PAC-2 = 1 mg/m³

 PAC-3 = 35 mg/m³

PROTECTIVE EQUIPMENT

Gloves:	Nitrile and Natural Rubber
Coveralls:	Tyvek®
Respirator:	>0.05 mg/m ³ - Full facepiece APR with <i>High efficiency filters</i> >1 mg/m ³ - SCBA

HEALTH EFFECTS

Eyes:	Irritation
Skin:	Irritation
Inhalation:	Nose, throat and lung irritation, with coughing, and severe shortness of breath (pulmonary edema) Headache, dizziness, nausea and vomiting
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. 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.