



Right to Know Hazardous Substance Fact Sheet

Common Name: **STYRENE OXIDE**

Synonyms: (Epoxyethyl)Benzene; Epoxy Styrene

Chemical Name: Oxirane, Phenyl-

Date: December 1999 Revision: June 2008

CAS Number: 96-09-3

RTK Substance Number: 1749

DOT Number: UN 3082

Description and Use

Styrene Oxide is a colorless to pale, straw-colored liquid with a pleasant, sweet odor. It is used as a diluent or reactive plasticizer for epoxy resins and as a chemical intermediate in *Styrene Glycol* production, as surface coatings, and in fiber and textile treatment.

- ▶ **ODOR THRESHOLD = 0.06 to 0.4 ppm**
- ▶ Odor thresholds vary greatly. Do not rely on odor alone to determine potentially hazardous exposures.

Reasons for Citation

- ▶ **Styrene Oxide** is on the Right to Know Hazardous Substance List because it is cited by DOT, NTP, DEP, IARC, NFPA 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 rinsing.

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.

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	1
FLAMMABILITY	-	2
REACTIVITY	-	0
CARCINOGEN COMBUSTIBLE POISONOUS GASES ARE PRODUCED IN FIRE CONTAINERS MAY EXPLODE IN FIRE		

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

- ▶ **Styrene Oxide** can affect you when inhaled and may pass through the skin.
- ▶ **Styrene Oxide** should be handled as a CARCINOGEN and MUTAGEN--WITH EXTREME CAUTION.
- ▶ Contact can irritate the skin and eyes.
- ▶ Inhaling **Styrene Oxide** can irritate the nose, throat and lungs.
- ▶ Exposure can cause headache, dizziness, lightheadedness, and passing out.
- ▶ **Styrene Oxide** may cause a skin allergy.
- ▶ **Styrene Oxide** may affect the liver.

Workplace Exposure Limits

The following exposure limits are for *Styrene*:

OSHA: The legal airborne permissible exposure limit (PEL) is **100 ppm** averaged over an 8-hour workshift; **200 ppm** not to be exceeded at any time; and **600 ppm** as the 5-minute maximum peak which should never be exceeded in any 3-hour work period.

NIOSH: The recommended airborne exposure limit (REL) is **50 ppm** averaged over a 10-hour workshift and **100 ppm**, not to be exceeded during any 15-minute work period.

ACGIH: The threshold limit value (TLV) is **20 ppm** averaged over an 8-hour workshift and **40 ppm** as a STEL (short-term exposure limit).

- ▶ **Styrene Oxide** is a PROBABLE 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.
- ▶ The above exposure limits are for air levels only. When skin contact also occurs, you may be overexposed, even though air levels are less than the limits listed above.

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, 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 **Styrene Oxide**:

- ▶ Contact can irritate the skin and eyes.
- ▶ Inhaling **Styrene Oxide** can irritate the nose, throat and lungs causing coughing, wheezing and shortness of breath.
- ▶ Exposure can cause headache, nausea and vomiting, dizziness, lightheadedness, and passing out.

Chronic Health Effects

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

Cancer Hazard

- ▶ **Styrene Oxide** is a PROBABLE CARCINOGEN in humans since it has been shown to cause liver cancer in animals.
- ▶ Many scientists believe there is no safe level of exposure to a carcinogen.

Reproductive Hazard

- ▶ **Styrene Oxide** may damage the developing fetus.
- ▶ There is limited evidence that **Styrene Oxide** may affect female fertility in animals.

Other Effects

- ▶ **Styrene Oxide** may cause a skin allergy. If allergy develops, very low future exposure can cause itching and a skin rash.
- ▶ **Styrene Oxide** may affect the liver.

Medical

Medical Testing

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

- ▶ Liver function tests

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

- ▶ 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

- ▶ More than light alcohol consumption can cause liver damage, drinking alcohol may increase the liver damage caused by **Styrene Oxide**.

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.

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 **Styrene Oxide**. Wear personal protective equipment made from material that 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 Silver Shield®/4H® and *Viton* for gloves for *Styrene* and DuPont Tyvek® CPF 3, CPF 4, F, BR, LV, Responder® and TK; Kappler® Zytron® 300; and Saint-Gobain ONESuit® TEC, or the equivalent, for *Aromatic Hydrocarbons*.

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.
- ▶ Do not wear contact lenses when working with this substance.

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 **20 ppm** (as *Styrene*), use a NIOSH approved respirator with an organic vapor cartridge. 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 **Styrene Oxide**, (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 **200 ppm** (as *Styrene*), 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.
- ▶ Exposure to **700 ppm** (as *Styrene*) is immediately dangerous to life and health. If the possibility of exposure above **700 ppm** 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).

- ▶ **Styrene Oxide** is a COMBUSTIBLE LIQUID.
- ▶ Use dry chemical, CO₂, water spray, alcohol-resistant foam or other foam as extinguishing agents.
- ▶ POISONOUS GASES ARE PRODUCED IN FIRE.
- ▶ CONTAINERS MAY EXPLODE IN FIRE.
- ▶ 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 **Styrene Oxide** 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 and wash area after clean-up is complete.
- ▶ DO NOT wash into sewer.
- ▶ It may be necessary to contain and dispose of **Styrene Oxide** 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 **Styrene Oxide** you should be trained on its proper handling and storage.

- ▶ **Styrene Oxide** 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).
- ▶ **Styrene Oxide** may polymerize violently and release heat with compounds which easily release *Hydrogen* (such as WATER) when ACIDS, BASES, and some SALTS are also present.
- ▶ Store in tightly closed containers in a cool, well-ventilated area.
- ▶ Sources of ignition, such as smoking and open flames, are prohibited where **Styrene Oxide** is used, handled, or stored in a manner that could create a potential fire or explosion hazard.

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>

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.

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 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.

Emergency Response Planning Guideline (ERPG) values are intended to 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 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/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.

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: **STYRENE OXIDE**

Synonyms: (Epoxyethyl)Benzene; Epoxy Styrene; Phenyl Oxirane

CAS No: 96-09-3

Molecular Formula: C₈H₈O

RTK Substance No: 1749

Description: Colorless to pale, straw-colored liquid with a pleasant, sweet odor

HAZARD DATA

Hazard Rating	Firefighting	Reactivity
<p>3 - Health</p> <p>2 - Fire</p> <p>0 - Reactivity</p> <p>DOT#: UN 3082</p> <p>ERG Guide #: 171</p> <p>Hazard Class: 9 (Miscellaneous Hazardous Material)</p>	<p>COMBUSTIBLE LIQUID</p> <p>Use dry chemical, CO₂, 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>Styrene Oxide 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>Styrene Oxide 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.