

## Global Product Strategy (GPS) Safety Summary

### Ethylene Oxide

This GPS Safety Summary is a high-level summary intended to provide the general public with an overview of product safety information on this chemical substance. It is not intended to provide emergency response, medical or treatment information, nor to provide an overview of all safety and health information. This summary is not intended to replace the Safety Data Sheet. For detailed guidance on the use or regulatory status of this substance, please consult the Safety Data Sheet, the Product Safety Bulletin and the Product Stewardship Bulletin (PSB).

#### Chemical Identity

**Name:** Ethylene Oxide  
**Brand names:** Ethylene Oxide  
**Chemical name (IUPAC):** Oxirane  
**CAS number:** 75-21-8  
**EC number:** 200-849-9  
**Molecular formula:** C<sub>2</sub>H<sub>4</sub>O

#### Uses and Applications

Ethylene Oxide is primarily used as an intermediate in the manufacture of ethylene glycols, ethanol amines, glycol ethers, surface-active agents and polyether polyols. These chemicals have multiple uses in a variety of applications such as surfactants, industrial cleaners, cosmetics, emulsifiers, paint, heat transfer fluids and glycols for polyester fibers and film, PET resin and antifreeze.

There are no supported uses of Ethylene Oxide in direct consumer products. It is not used in a widespread or dispersive manner.

#### Physical / Chemical Properties

Ethylene Oxide is a colorless gas at room temperature with a sweet odor. It is soluble in organic solvents and miscible in water. The boiling and freezing points are 11°C (52°F) and -113°C (-171°F) respectively.

Ethylene Oxide is a highly flammable chemical with a flammability range of 2.6% to 100% in air. The presence of water, acetaldehyde and rust can cause auto ignition decomposition of Ethylene Oxide. Ethylene Oxide vapor, mixed well with air, can decompose explosively. Ethylene Oxide will react with water to produce high molecular weight glycols with a heat producing reaction. Laboratory tests have shown self-polymerization of Ethylene Oxide to have occurred at 160°C (320°F). However, there have been additional reports that thermal initiation of polymerization can occur at temperatures as low as 100°C (212°F) and when catalyzed, can occur at much lower temperatures including ambient. Polymer formation can, when catalyzed by potassium hydroxide

or other catalysts, result in a runaway reaction and an explosion. Liquid Ethylene Oxide conducts electricity.

Ethylene Oxide has been classified as a highly flammable gas under the Globally Harmonized System on Classification and Labeling (GHS).

### **Health Effects**

Ethylene Oxide has been classified as hazardous under GHS for its health effects.

The table below gives an overview of the health effects assessment results for Ethylene Oxide.

<b>Effect Assessment</b>	<b>Result</b>
Acute Toxicity Oral / inhalation / dermal	Acutely toxic after inhalation or ingestion, causing moderate to severe local irritation and CNS depression (including intoxication, convulsions, and possibly death).
Irritation / corrosion Skin / eye / respiratory tract	Skin or eye contact with liquid product may result in frostbite (due to rapid evaporative cooling) or chemical burns.
Sensitization	Reported to cause asthma, anaphylaxis and allergic contact dermatitis in humans.
Toxicity after repeated exposure Oral / inhalation / dermal	Repeated exposure may cause inflammation of the respiratory tract, mineralization (opacity) of the eyes and damage the nervous system.
Genotoxicity / Mutagenicity	Genotoxic.
Carcinogenicity	Multi-site carcinogen in animals, with epidemiological evidence of an increase in lymphatic and hematopoietic cancer in humans.
Toxicity for reproduction	Repeated inhalation exposure may adversely affect reproductive performance and the health of the developing fetus.

### **Environmental Effects**

Ethylene Oxide is acutely harmful to aquatic organisms. However, due to various mechanisms such as volatilization, biodegradation and rapid oxidation, it is generally not persistent in the environment. Ethylene oxide is classified as environmentally hazardous under GHS. However, under the European Union Classification, Labeling and Packaging Directive (CLP), Ethylene Oxide is not classified as hazardous to the environment.

The table below gives an overview of the environmental assessment results for Ethylene Oxide.

<b>Effect Assessment</b>	<b>Result</b>
Aquatic Toxicity	Harmful to aquatic organisms

Fate and behaviour	Result
Biodegradation	Readily biodegradable.
Bioaccumulation potential	Predicted not to bioaccumulate.

## **Exposure**

### **Human health**

Consumers generally will not come into contact with Ethylene Oxide, as there are no supported uses of Ethylene Oxide in direct consumer products.

Personnel exposure to Ethylene Oxide in manufacturing facilities is considered very low because the process, storage and handling operations are enclosed. It is not used in a widespread or dispersive manner. Also, transfer (loading and transport) of Ethylene Oxide is conducted with dedicated equipment in dedicated containers to prevent any release from the system. However, worker exposure can potentially occur during operations such as product transfer, product sampling, or maintenance / repair activities on product containing systems. The risk of accidental exposure should be controlled by selecting and applying the appropriate Risk Management Measures.

### **Environment**

The manufacture of Ethylene oxide is a closed and automated process with no aqueous effluent or gaseous effluent released to the environment. Also, transfer (loading and transport) of product is conducted with dedicated equipment in dedicated containers to prevent any release from the system.

However, exposure to the environment can potentially occur during operations such as product transfer, product sampling, and maintenance / repair activities on product-containing systems. The risk of accidental exposure should be controlled by selecting and applying the appropriate Risk Management Measures.

## **Risk Management Measures**

For detailed guidance on the use of Ethylene Oxide, the Safety Data Sheet and the Product Safety Bulletin should be consulted.

Ethylene Oxide should only be handled by knowledgeable and trained personnel.

### **Human health**

When using chemicals, make sure that there is adequate ventilation. Always use appropriate chemical-resistant gloves to protect your hands and skin, always wear eye protection such as chemical goggles and always wear flame-retardant clothing. Do not eat, drink, or smoke where chemicals are handled, processed, or stored. Wash hands and skin following contact. If the substance gets into your eyes, rinse eyes thoroughly for at least 15 minutes with tap water and seek medical attention.

In the case of transfer or maintenance operations, always clear transfer lines prior to decoupling, and flush/drain to a closed system for recycle prior to opening equipment.

In cases where engineering controls cannot maintain airborne substance concentrations below exposure limits, or in cases with a risk of accidental exposure, additional risk management measures may be necessary, such as the use of a complete suit protecting against chemicals and supplied air, a self-contained breathing apparatus or respirator.

### Spills and Leaks

Ethylene Oxide is a highly flammable gas. Eliminate all sources of ignition. Let evaporate. If possible, turn leaking container so that gas escapes rather than liquid. Do not direct water at spill or source. Use water spray curtain to divert vapor drift. Prevent entry into sewers, basements or confined areas. Isolate area until gas has dispersed.

### Regulatory Information / Classification and Labeling

Ethylene oxide is listed by IARC as carcinogenic in humans (Group 1).

Under the Globally Harmonized System on Classification and Labeling (GHS) substances are classified according to their physical, health and environmental hazards. The hazards are communicated via specific labels on the product packaging and the Safety Data Sheet. GHS attempts to standardize hazard communication so that the intended audience (workers, consumers, transport workers, and emergency responders) can better understand the hazards of the chemicals in use.

For a detailed overview of the regulatory status of this substance, please refer to the Product Stewardship Bulletin available on the LyondellBasell corporate website.

For a detailed overview of the classification and labeling of this substance, please refer to the regional Safety Data Sheet, which can be found on the LyondellBasell corporate website.

### Conclusion Statements

- Ethylene Oxide is used as a chemical intermediate and/or monomer for industrial purposes only. It has no supported uses in direct consumer products;
- Ethylene oxide has been classified as hazardous. The main hazards are flammability; acute toxicity; skin, eye and respiratory tract irritation; genotoxicity and carcinogenicity; and it is harmful to aquatic life;
- Exposure to human health and environment is considered very low as the Ethylene Oxide manufacturing process, storage and handling operations are enclosed.

### Contact Information within Company

For further information on this product in general, please consult the LyondellBasell corporate website ([www.lyb.com](http://www.lyb.com)).

## **Date of issue**

Date of issue: 4 June 2015.

## **Disclaimer**

Before using a product sold by a company of the LyondellBasell family of companies, users should make their own independent determination that the product is suitable for the intended use and can be used safely and legally.

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This product(s) may not be used in:

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(ii) the manufacture of any of the following, without prior written approval by Seller for each specific product and application: U.S. FDA Class II Medical Devices; Health Canada Class II or Class III Medical Devices; European Union Class II Medical Devices; film, overwrap and/or product packaging that is considered a part or component of one of the aforementioned medical devices; packaging in direct contact with a pharmaceutical active ingredient and/or dosage form that is intended for inhalation, injection, intravenous, nasal, ophthalmic (eye), digestive, or topical (skin) administration; tobacco related products and applications, electronic cigarettes and similar devices, and pressure pipe or fittings that are considered a part or component of a nuclear reactor. Additionally, the product(s) may not be used in: (i) U.S. FDA Class III Medical Devices; Health Canada Class IV Medical Devices; European Class III Medical Devices; (ii) applications involving permanent implantation into the body; (iii) life-sustaining medical applications; and (iv) lead, asbestos or MTBE related applications. All references to U.S. FDA, Health Canada, and European Union regulations include another country's equivalent regulatory classification.

Users should review the applicable Safety Data Sheet before handling the product.

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