



## MATERIAL SAFETY DATA SHEET (MSDS) ETHYLENE OXIDE

**EFELAB** request to users of this product to study slowly the material safety data sheet and to pay special attention to the risk that means the use and manage of ethylene oxide as well as the security information. To promote safe and responsible use of this product the user must: (1) Notify to their agents, employees, etc about the content of this sheet as well as whichever important information, relating with the danger and security of the product, (2) give the same information to each one of their clients and (3) request this clients to notify to their employees to remit the information.

### SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

#### 1.1. Product identifier

**Product Name:** EFELAB ETHYLENE OXIDE CARTRIDGES; EFELAB ETHYLENE OXIDE AMPOULES.

**Product:** Ethylene Oxide

**CASNR:** 75-21-8

**Chemical Group:** Epoxide

**Molecular Weight:** 44,05

**Formula:** CH<sub>2</sub> CH<sub>2</sub> O

**Weight by %:** 84 to 97 %

**Synonyms:** Ethylene Oxide, Alkene Oxide, Dimethylene Oxide, EO, ETO, Oxane, Dihydroxirene, Oxacyclopropane, Oxirane.

#### 1.2. Relevant uses of the substance or mixture and uses advised against

SU22: Professional Use

SU3: Industrial use

SU8: Manufactures in bulk,

SU9: Manufacture of special chemicals.

#### 1.3. Details of the supplier of the safety data sheet

**Manufacturer:** EFELAB SRL

**Address:** Costa Rica 449 / 1043, Itzaingo CP1714, Buenos Aires, Argentina.

Telephone: + 54 11 4623 3030 e-mail: [info@efelab.com](mailto:info@efelab.com) www.efelab.com

#### 1.4. Emergency Telephone Number:

Call us from 8:00 am to 17:30 pm: +54 114623 3030 or send a fax at any hour of the day: + 54 11 4624 2400

### SECTION 2: HAZARD IDENTIFICATION

#### 2.1. Classification of the substance or mixture

GHS-US classification. Flammable gas 1

Flammable gas 1 H220

Liquefied gas H280

Acute Tox. 3 H331

(Inhalation:gas)

Skin Irrit. 2 H315

Eye Irrit. 2A H319

Skin Sens. 1B H317

Muta. 1B H340

Carc. 1A H350

Repr. 1A H360

STOT SE 3 H335

STOT RE 1 H372

## 2.2. Label elements GHS-US labeling

Hazard pictograms (GHS- US)



**Signal word; (GHS-US) : DANGER**

**Hazard statements (GHS-EE-UU):**

H220 - EXTREMELY FLAMMABLE GAS

H280 - CONTAINS GAS UNDER PRESSURE; MAY EXPLODE IF HEATED

H315+H320 - CAUSES SKIN AND EYE IRRITATION

H317 - MAY CAUSE AN ALLERGIC SKIN REACTION

H331 - TOXIC IF INHALED

H335 - MAY CAUSE RESPIRATORY IRRITATION

H340 - MAY CAUSE GENETIC DEFECTS

H350 - MAY CAUSE CANCER

H360 - MAY DAMAGE FERTILITY OR THE UNBORN CHILD

H372 - CAUSES DAMAGE TO ORGANS (NERVOUS SYSTEM, KIDNEYS) THROUGH PROLONGED OR REPEATED EXPOSURE

CGA-HG04 - MAY FORM EXPLOSIVE MIXTURES WITH AIR

CGA-HG11 - SYMPTOMS MAY BE DELAYED

**Precautionary statements (GHS-US):**

P201 - Obtain special instructions before use

P202 - Do not handle until all safety precautions have been read and understood

P210 - Keep away from Heat/Open flames/Sparks/Hot surfaces. - No smoking

P260 - Do not breathe gas

P262 - Do not get in eyes, on skin, or on clothing

P271+P403 - Use and store only outdoors or in a well-ventilated place

P280+P284 - Wear protective gloves, protective clothing, eye protection, respiratory protection, and/or face protection

P377 - Leaking gas fire: Do not extinguish, unless leak can be stopped safely

P381 - Eliminate all ignition sources if safe to do so

P405 - Store locked up

P501 - Dispose of contents/container in accordance with container Supplier/owner instructions

CGA-PG05 - Use a back flow preventive device in the piping

CGA-PG20+CGA-PG10 - Use only with equipment of compatible materials of construction and rated for cylinder pressure

CGA-PG12 - Do not open valve until connected to equipment prepared for use

CGA-PG06 - Close valve after each use and when empty

CGA-PG02 - Protect from sunlight when ambient temperature exceeds 52°C (125°F)

**Specific Physic Form:** gas

**Appearance and odor:** Colorless liquid and gas in normal temperature and pressure. Odor not detectable except at concentrations greater than 500 ppm. Non residual ether-like odor above 500 – 700 ppm concentrations.

**Immediate Health, Physic and environmental hazard:** Cartridges and ampoules contain flammable liquefied gas under pressure which could burn in absence of oxygen and can explode when exposed at high temperatures. Causes severe skin and eye irritation or burn and respiratory tract irritation. Effects may be delayed. Harmful if swallowed, ingested or absorbed through the skin.

**POTENCIAL HEALTH EFFECTS / OVEREXPOSURE EFFECTS (ACUTE / CRHONIC):**

**Ingestion:** It is a non common way of exposure. May cause serious irritation and ulceration of the mouth and throat, gastrointestinal irritation, Stomach upset, vomiting, nausea, diarrhea, , abdominal pain, collapse and coma.

**Skin Contact:** Sustained contact with the skin is unlikely, but can cause redness, itching, swelling, dryness, blistering, pain. Ethylene oxide may be absolved by the skin and sustained contact may produce adverse effects such as headache, vomiting, dizziness. Dissolved solutions may penetrate skin, producing a chemical burn.

With liquid or solutions in water may cause: local erythema, edema, and vesicles. There might be a latent period of several hours to the onset of these signs. Large volumes of ETO spilled onto the skin may produce a frostbite-like effect.

**Inhalation:** May cause irritation of the respiratory tract. Depending on the degree of exposure, there might be stinging of the nose and throat, cough, sneezing, nasal discharge, headache, nausea, vomiting, diarrhea and hoarseness. It may produce lung injury, weakness, difficulty breathing, chest tightness, permanent lung injury, weakness, drowsiness, blueish colored skin (cyanosis), increased heart rate, loss of coordination, convulsions and coma.

**Eye contact:** May cause severe stinging on the eye, profuse tear discharge, redness and swelling of the conjunctive. Moderate irritation of the eye in high concentrations of ethylene oxide vapors. Liquid ethylene oxide is severely irritating and corrosive to the eyes and may cause corneal injury.

**Overexposure effects (chronic):** Allergic contact with dermatitis may occur in a small proportion of exposed workers. In various reports involving recurrent exposures to high concentrations of ETO vapor, peripheral neurotoxic effects, and, in some cases, indications of central nervous system toxicity were described. In most cases, there was marked improvement on removal from further exposure. A few cases of cataract formation have also been linked to such exposures. Although one epidemiological study has suggested that ETO exposed woman may have an increased of abortions. Several studies on ETO exposed workers have demonstrated an increase incidence of chromosomal aberrations and sister chromatid exchanges; the relevance of such effects to human health hazard evaluation is currently uncertain. OSHA considers that, at excessive levels, ETO may present reproductive, mutagenic, genotoxic, neurotoxic and sensitization hazards.

**Significant laboratory data with possible relevance to human health hazard evaluation:**

Ethylene oxide has been shown to produce mutagenic and cytogenetic effects in a variety of test systems. Animals exposed to ethylene oxide vapor for up to two years have shown an increase in the incidence of certain malignant tumors in comparison to non-exposed controls.

In human, an increased occurrence of leukemia and stomach cancer has been reported by one group of investigators who pooled results from three Swedish facilities producing or using ETO, among other materials. Based on experimental and observational data ETO is a suspect cancer hazard, and should be treated as possibly causing cancer in humans. Laboratory studies with mice have shown that acute exposure to ETO vapor at concentrations of 300 ppm and above cause testicular injury as evidence by concentration-related increased embryonic deaths following the mating of exposed males to nonexposed females (dominant lethal test). Also, a one-generation reproduction study in rats showed decreased numbers of pups at 100 but not at 33 ppm. Inhalation teratology studies have shown fetotoxicity at 100ppm and above, but no evidence for birth defects.


**Medical conditions aggravated by overexposure:** A knowledge of the available toxicology information and the physical and chemical properties of the material suggest that overexposure is unlikely to aggravate existing medical conditions.

**Carcinogenic and mutagenic assessment:** EO is considered by OSHA, IARC, and NTP as a potential human carcinogen and mutagen. Refer to OSHA 29 CFR 1910.1047 for additional information.

**2.3. Other Hazards:** Asphyxiating in high concentrations.

**2.4. Unknown acute toxicity (GHS US):** No information available.

**2.5 NFPA 704**

Diamond	Hazard	Value	Description
	Health	4	Can cause serious or permanent injury.
	Flammability	3	Burns readily. Rapidly or completely vaporizes at atmospheric pressure and normal ambient temperature.
	Instability	3	Capable of detonation or explosive decomposition or explosive reaction but requires a strong initiating source or must be heated under confinement before initiation.
	Special	-	

(NFPA, 2010)

**SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS**

**3.1. Substance**

Ethylene oxide ( MAIN COMPONENT) CAS No 75-21-8 >=99 %

### 3.2. Mixture

Not applicable

## SECTION 4: FIRST AID MEASURES

### 4.1. Description of first aid measures

**Swallowing / Ingestion:** Give at least 2 glasses of water. Do not induce vomiting. Call a physician.

**Skin:** Immediately remove contaminated clothing and wash skin copiously with soap and water. Aerate, wash or clean contaminated clothing. Discard leather goods and shoes. Call a physician.

**Inhalation:** Remove to fresh air, and administer Oxygen if breathing is difficult. If breathing stops, start artificial respiration. Call a physician.

**Eyes:** Flush immediately with water and continue for at least 15 minutes. The help of an ophthalmologist should be sought urgently.

### 4.2. Most important symptoms and effects, both acute and delayed

No information available.

### 4.3. Indication of any immediate medical attention and special treatment needed

**Notes to Physician:** (1) Persons exposed to ETO may develop severe and intractable vomiting, requiring the use of antiemetics given intravenously. (2) Prolonged or high vapor concentration exposure may result in the development of pulmonary edema after a latent phase of several hours. Also, respiratory tract injury caused by ETO may predispose to the development of a secondary respiratory infection. Consider oxygen administration, (3) If a chemical burn is present decontaminate skin and treat as any thermal burn. Following skin contact, primary irritation and blister formation may be delayed in onset. (4) When introduced directly into blood stream, ETO may act as a hap ten and lead to the development of a anaphylactoid reactions of varying severity. This has been noted in a few hemodialysis and plasmapheresis patients due to desorption of ETO from the sterilized equipment. There appears to be a close association to the presence of Ig E antibodies to Albumin/ETO conjugates.

## SECTION 5: FIRE FIGHTING MEASURES

### 5.1. Extinguishing media

Suitable extinguishing media : Carbon dioxide, Dry chemical, Water spray or fog.

### 5.2. Special hazards arising from the substance or mixture

Fire hazard: EXTREMELY FLAMMABLE GAS.

Explosion hazard : EXTREMELY FLAMMABLE GAS.

It forms explosive mixtures with air and oxidizing agents.

Reactivity: Exothermic polymerization is possible (see incompatible materials)

**Flash Point :** -4 ° F ; -20 ° C (Test method TAG Closed Cup)

**Autoignition:** 804° F (in air); 1058° F (pure ETO)

**Upper Flammable Limit in Air ( % by volume):** 100% (via decomposition)

**Lower Flammable Limit in Air ( % by volume):** 3% (30.000 ppm )

**Extinguishing media:** Use water spray, Carbon Dioxide, dry chemical, alcohol-type or universal foams applied by manufacturer's recommended technique. Use fire extinguishers with class B extinguishing agent. Evacuate all personnel from danger area.

**Special fire fighting procedures:** Evacuate all personnel from danger area. Immediately cool containers with water spray from maximum distance taking care of not to extinguish flames. Vapors formed from the product

may travel or be moved by air currents and be ignited by pilot lights, other flames, smoking, sparks, heaters, electrical equipment, static discharges or other ignition sources at locations distant from product handling point. Remove ignition sources if without risk. If flames are accidentally, explosive, re-ignition may occur.. Stop flow of gas if without risk, while continuing cooling water spray. Remove all containers from area of fire if without risk. Allow fire to burn out. Dilution of ETO with 23 volumes of water renders it nonflammable, per OSHA29 CFR 1910.1047 appendix B. Union Carbide recommends dilution with 100 volumes of water as an additional safe practice. On site fire brigades should comply with OSHA 29 CFR 1910.156.

**Unusual fire and explosion hazards:** Can create explosive mixes with air. Do not extinguish the flames due to the possibility of explosive re ignition. Flammable vapors can emanate from spills. Check that the spill or the aqueous solution formed does not reach the drains. The waste should not be thrown into rivers or streams. It is recommended to make a contingency plan for the control of spills, leaks or emergencies

Extremely flammable. It may form explosive mixtures with air and oxidizing agents. Do not extinguish flames due to possibility of explosive re-ignition. Flammable vapors may spread from spill. Explosive atmosphere may linger. Before entering area, specially confined areas, check atmosphere with appropriate device. No part of a container should be subjected to a temperature higher than 52°C (Approximately 125°F). Containers are provided with pressure relief devices that are designed to vent the contents when they are exposed to elevated temperatures. Vapors can burn without the presence of air or oxidizing agents. ETO can decompose violently under certain conditions. Refer to DOT "EMERGENCY RESPONSE GUIDEBOOK" for isolation and evacuation distances. Vapor in air has very low ignition energy (0,6mJ) and is prone to static or other low energy ignition sources.

### 5.3. Advice for firefighters

Use full protection equipment (fireproof clothing against fire) and a self-contained breathing device, operated in pressure demand mode (SCBA / positive pressure)

Fire extinguishing instructions: DANGER! Cancer and reproductive risk.

DANGER! Flammable and toxic liquefied gas.

EXPLOSIVE FORMS AIR MIXTURES Evacuate all personnel from the danger zone. Use a self-contained breathing apparatus (SCBA) and protective clothing. Immediately cool the containers with water from the maximum distance. Remove sources of ignition if it is safe to do so. Remove containers from the fire area if it is safe to do so. Fire brigades on site must comply with provincial and local fire regulations. Special protective equipment for fire-fighters: standard clothing and protective equipment (self-contained breathing apparatus) for fires. Showers.

Other information: The containers are equipped with a pressure relief device. (Exceptions may exist where authorized by DOT.).

## SECTION 6: ACCIDENTAL RELEASE MEASURES

### 6.1. Personal precautions, protective equipment and emergency procedures

**Personal precautions:** Refer to other sections of this MSDS for information regarding physical and health hazards, respiratory protection, ventilation, and personal protective equipment.

**Spill response:** Evacuate unprotected and untrained personnel from hazard area. The spill should be cleaned up by qualified personnel. Remove all ignition sources such as flames, smoking materials, and electrical spark sources. Reduce vapors with fog or fire water spray. Shut off leak if without risk. Ventilate area of leak or move leaking assembly to well ventilated area. Prevent runoff, collect for disposal Use only non-sparking tools. Ventilate the area with fresh air. Contain spill. If possible, seal leaking container. Flood spills with water spray. Place leaking containers in a well-ventilated area, preferably an operating exhaust hood, or if necessary outdoors on an impermeable surface until appropriate packaging for the leaking container or its contents is available. Close cylinder. If the cylinder can't be closed, place in a well-ventilated area, preferably an operating exhaust hood, or if necessary outdoors. Avoid contact with incompatible materials listed in the Reactivity Data Section. Cover spill area with fire-extinguishing foam designed for use on solvents, such as alcohols and acetone, which can dissolved in water. An AR - AFFF type foam is recommended. Clean up residue with an appropriate organic solvent. Read and follow safety precautions on the solvent label and MSDS. Place in a metal container approved for transportation by appropriate authorities. Seal the container. Dispose of collected material as soon as possible. **Danger:** May form explosive mixtures with air. Immediately evacuate all personnel from danger area. Wear self-Contained breathing apparatus operated in the pressure demand mode and protective clothing.

#### **6.1.1. For non-emergency personnel**

No additional information available

#### **6.1.2. For emergency responders**

No additional information available

**6.2. Environmental precautions:** Try to stop release. Reduce vapor with fog or fine water spray. Prevent waste from contaminating the surrounding environment. Prevent soil and water pollution. Dispose of contents/container in accordance with local/regional/national/international regulations. Contact supplier for any special requirements.

#### **6.3. Methods and material for containment and cleaning up**

No additional information available

**6.4. Reference to other sections** See also sections 8 and 13.

## **SECTION 7: HANDLING AND STORAGE**

### **7.1. Precautions for safe handling**

**Danger:** Be sure to read and understand all labels and other instructions supplied with all containers of this product. For industrial and professional use only. Extremely flammable liquefied gas under pressure. May form explosive mixtures with air. Do not breathe vapor. Can cause rapid suffocation due to oxygen deficiency. Avoid contact with eyes, skin or clothing. Safety showers and eyewash fountains should be immediately available. Use piping and equipment adequately designed to withstand pressures to be encountered. Ground all equipment. Only use spark-proof tools and explosion-proof equipment. Keep away from heat, sparks and open flame. Store and use with adequate ventilation at all times. Use only in a closed system. Close valve when not in use and when empty. Wash thoroughly after handling. It may be feasible to convert aqueous solutions of ethylene oxide to ethylene glycol (under the correct conditions pH, temperature and pressure) and dispose of glycol solution. Under certain conditions EO will evolve from water solutions.

**Mixtures:** When two or more gases or liquefied gases are mixed, their hazardous properties may combine to create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an industrial hygienist or other trained person when you make your safety evaluation of the end product. Remember, gases and liquids have properties which can cause serious injury or death.

#### **Other handling and storage conditions:**

Never work on a pressurized system. If there is a leak, close the cylinder valve, blow down the system by venting to a safe place, then repair the leak. Do not incinerate EO cartridges, tanks or other containers. Compatibility with plastics should be confirmed prior to use.

**Storage recommendations:** Store cartridges and ampoules in an upright position. Have established handling and emergency response procedures in place prior to use. Protect containers from physical damage and regularly inspect them for cracks or leaks. Store Ethylene oxide in a dry, cool and well ventilated area away from incompatible sources of ignition like Aqueous Alkalines; Amines; Mineral Acids; Metal Chlorides; and Metal Oxides. Store away from acids; Keep away from heat, sparks, lighted cigarettes, matches, open flame, pilot lights and all sources of ignition. DO NOT STORE IN DIRECT SUNLIGHT.

**7.2. Conditions for safe storage, including any incompatibilities:** Because of the potential for violent decomposition, containers of ethylene oxide must be properly blanketed with an inert gas and given extraordinary protection against fire exposure. Store only where temperature will not exceed 125°F (52°C). Post "No Smoking/No Open Flames" signs in storage and use areas. There must be no sources of ignition. Separate packages and protect against potential fire and/or explosion damage following appropriate codes and requirements (e.g., NFPA 30, NFPA 55, NFPA 70, and/or NFPA 221 in the U.S.) or according to

requirements determined by the Authority Having Jurisdiction (AHJ). Always secure containers upright to keep them from falling or being knocked over. Install valve protection cap, if provided, firmly in place by hand when the container is not in use. Store full and empty containers separately. Use a first-in, first-out inventory system to prevent storing full containers for long periods. For other precautions in using this product, see section 16 All equipment in storage areas must be explosion-proof. Electric installation in storage areas must meet the requirements of National Electric Code (NEC) Article 500. This material is a static accumulator. To avoid ignition of vapors by static discharge, all metal parts and equipment must be grounded. Follow NFPA 77, Recommended Practice on Static Electricity ([www.nfpa.org](http://www.nfpa.org)), and API Recommended Practice 2003, Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents

### 7.3. Specific end use(s)

None.

## SECTION 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

### 8.1. Control Parameters

CAS	NAME	CODE	Mg/m2	PPM	REMARK/
75-21-8	Ethylene oxide	WEL / 8HS	9.2	5	EH40/UK
75-21-8	Ethylene oxide	PEL / 8HS	1.8	1	OSHA/USA
75-21-8	Ethylene oxide	STEL /15min	9.2	5	OSHA/USA
75-21-8	Ethylene oxide	TLV / 8HS	1.8	1	ACGIH/USA
75-21-8	Ethylene oxide	STEL /15min	9.2	3	ACGIH/USA
75-21-8	Ethylene oxide	REL / 8HS	0.18	0.1	NIOSH/USA
75-21-8	Ethylene oxide	STEL /15min	9.2	5	NIOSH/USA

### 8.2. Exposure control

#### Exposure Limits: ETHYLENE OXIDE (75-21-8)

OSHA ACTION LEVEL (8 HR TWA)	0.5 PPM
OSHA PEL (8 HR TWA)	1 PPM
OSHA 15 MIN EXCURSION LIMIT STEL	5 PPM
ACGIHTVL / TWA	1 PPM
IDHL	800 PPM

**Eye protection:** Avoid eye contact. Avoid eye contact with vapors, mists, or spray. The following should be worn alone or in combination, as appropriate, to prevent eye contact: Never wear contact lenses when working with ethylene oxide. Indirect vented goggles usage recommended.

**Hand protection:** Select and use gloves and/or protective clothing to prevent skin contact based on the results of an exposure assessment. Consult with your glove and/or protective clothing manufacturer for selection of appropriate compatible materials.

**Skin protection:** Avoid skin contact.

**Ingestion (Prevention):** Do not eat, drink or smoke when using this product. Wash exposed areas thoroughly with soap and water. Not an expected route of exposure.

**Respiratory protection:** When necessary, select one approved respirator based on airborne concentration of contaminants and in accordance with regulations. Select and use in accordance with OSHA 29CFR 1910.134 and 1910.1047. Refer to OSHA 29CFR 1910.1047 (g) for specific respirator selection criteria.

**Ventilation:** Use with appropriate local exhaust ventilation. Provide appropriate local exhaust ventilation on open containers. Use in an enclosed process area is recommended. Do not use in a confined area or areas with little or no air movement. Use general dilution ventilation and/or local exhaust ventilation to control airborne exposures to below Occupational Exposure Limits. If ventilation is not adequate, use respiratory protection equipment.

AAMI / ANSI ST41 Good Hospital Practice: Ethylene Oxide Sterilization and Sterility Assurance guideline, Section 3.4 recommends a minimum of 10 room makeup air changes per hour. Emission controls must be in

accordance with local or Federal Regulations. Ventilations should be designed in such a manner that no person is exposed to concentrations of ETO exceeding the OSHA PEL of 1 ppm or the OSHA excursion limit of 15 ppm.

**Special instructions:** The OSHA EO standard (29 CFR 1910.1047) requires a written emergency plan for spills or leaks. The plan must include procedures for alerting, evacuating, rescuing, training, and medically treating personnel overcome by EO. Procedures for reporting an emergency to appropriate authorities and determining when it is safe to re-enter a spill area must be included. Do not confuse EO leakage with swelling of the gasket material under the cartridge cap or an oily residue that sometimes appears on the cartridge.

**SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES**

**9.1. Information on basic physical and chemical properties**

Boling Point @ 760 mmhg 10,4° C (50,7° F)	Freezing Point -112,06° C (-170,7° F)
Density (Water=1) 0,8719 to 20 (at 20° C)	Vapor Pressure @ 21° C 1,095 mmHG (21,1 psig)
Vapor Density (air=1) 1,52	Solubility in water: 100 % (very soluble)
Percent Volatiles by Volume 100 %	Evaporation rate (Butyl acetate =1) 72
Vapor pressure: 1094 mm Hg @ 20°C	FLASH POINT: -21° C

STABILITY		EO is stable for extended periods of time in closed airtight pressurized containers at room temperature, under normal storage and handling conditions. Vapors may explode when exposed to normal ignition sources.
STABLE X	UNSTABLE	

**Conditions to avoid:** Material will decompose violently at temperatures above 800° F in air. This temperature can vary depending upon time pressure and conditions of the systems. The temperature required for decomposition is reduced as pressure is increased. Trace polymers may be present under ordinary conditions of temperature, pressure, etc. However, ETO will polymerize violently if contaminated with aqueous alkalis, mineral acids, metal chlorides or metal oxides.

**Incompatibility (materials to avoid):** Dangerous runaway reactions can result from contact with copper, silver, magnesium mercury, and their salts, oxidizers of all types, alkalis and acids, alcohols, mercaptans and alkali metals.

**Hazardous decomposition products:** Thermal decomposition may produce Carbon Monoxide and/or Carbon Dioxide.

HAZARDOUS POLIMERIZATION	
MAY OCCUR X	SHALL NOT OCCUR

**SECTION 10: STABILITY AND REACTIVITY**

**10.1. Reactivity:**

Reactivity Exothermic polymerization is possible (see incompatible materials)



## 10.2. Chemical stability:

Stable under normal conditions.

## 10.3. Possibility of hazardous reactions:

May occur.

Strong exothermic reaction with acids.

Polymerization risk,

Reaction with light metals,

Reaction with alkali metals

## 10.4. Conditions to avoid:

Contamination, especially by incompatible materials (see 10.5). Heat. Sparks. Ignition sources. Pure ethylene oxide decomposes violently if exposed to a high enough temperature. The temperature required for decomposition can vary depending on time, pressure, and conditions within the system and is reduced as pressure and volume-to-surface ratios are increased. Decomposition temperatures ranging from 842°F-1040°F (450°C-560°C) have been observed in experimental apparatus. .

## 10.5. Incompatible materials:

Oxidizing agents. Mercaptans. Alcohols. Alkali metals, Alkaline-earth-metals, Light metals, Copper bronze and other copper alloys, Acetylide forming metals, Chromium, Titanium > 1022°F (550°C), Uranium (U) > 1382°F (750°C), Magnesium > 1427°F (775°C). . Will polymerize violently if contaminated with:. Amines. alkalis. Acids. Mineral acids. Metal chlorides. Metal oxides. Water. Organic materials.

## 10.6. Hazardous decomposition products:

Carbon dioxide. Carbon monoxide.

Hydrogen

Methane

Thermal decomposition: observation > = 560 ° C

# SECTION 11: TOXICOLOGICAL INFORMATION

## 11.1. Information on toxicological effects

Ethylene Oxide ( f ) 75-21-8

LD 50 Acute Oral: 330 mg / kg (Rat)

LC50 Inhalation Acute 1420 ppm / 4h (Rat, male).

LC50 2900 ml/m<sup>3</sup> (Packing instruction P200/ADR)

Acute toxicity Inhalation: gas: Toxic if inhaled.

Acute Dermatological Toxicology: It is expected to be corrosive to rabbit skin.

Chronic Toxicology Dermatological: There is no chronic dermatological information for this product.

Ocular Toxicology: Eye irritation 24/48 hs (Rabbit).

Toxicology Acute ingestion: The acute oral value for this LC product is 72 mg / kg in rats.

Toxicology Chronic ingestion: The effects of chronic ingestion of this product are unknown.5029 (rat-combined sex) Various mammalian species exposed to lethal concentrations had symptoms of mucous membrane irritation, central nervous system depression, lacrimation, nasal discharge, salivation, nausea, vomiting, diarrhea, respiratory irritation, incoordination, and convulsions.

**Toxicological-chronic inhalation:** Symptoms of chronic exposure are similar to those observed in acute studies, including lung, kidney and liver damage and testicular tube degeneration in some species. Studies demonstrated neuromuscular effects as the most sensitive indicator of ethylene oxide over exposure.

**Carcinogenicity: Warning:** Contains a chemical which can cause cancer. (75-21-8) (NTP anticipated human carcinogen, IARC human carcinogen 1, ACGIH suspected human carcinogen A2)

**Mutagenicity:** No data available.

**Reproductive Effects:** Contains a chemical or chemicals which can cause birth defects or other reproductive harm.

**Other effects & information:** Endocrine Tissue Effects: Signs/symptoms may include disruption of gonadal, thyroid, adrenal or pancreatic function.

**Gastrointestinal effects:** Signs/symptoms may include stomach upset; nausea, vomiting and diarrhea.

**Liver effects:** Signs/symptoms may include loss of appetite, weight loss, fatigue, weakness, abdominal tenderness and jaundice.

**Central nervous system (CNS) depression:** Signs/symptoms may include headache, dizziness, drowsiness, incoordination, nausea, slowed reaction time, slurred speech, giddiness, and unconsciousness.

**Peripheral neuropathy:** Signs/symptoms may include tingling or numbness of the extremities, incoordination, weakness of the hands and feet, tremors and muscle atrophy.

**Olfactory effects:** Signs/symptoms may include decreased ability to detect odors and/or complete loss of smell.

**Kidney Effects:** Signs/symptoms may include reduced or absent urine production, increased serum creatinine, lower back pain, increased protein in urine, and increased blood urea nitrogen (BUN).

**Pulmonary edema:** Signs/symptoms may include chest discomfort, shortness of breath, significant cough with frothy sputum production, bluish colored skin (cyanosis), increased heart rate, respiratory failure and may be fatal.

## SECTION 12: ECOLOGICAL INFORMATION

### 12.1. Toxicity

**Biological treatment:** ETO is amenable to disposal in standard bacteriological waste treatment facilities under controlled conditions after proper acclimation of system.

**Aquatic toxicity:** Ethylene oxide is moderately toxic to aquatic life as indicated by a 96-hour median lethal concentration (LC<sub>50</sub>)\* of 84 mg/L with fathead minnows and a 48-hours LC<sub>50</sub> of about 200 mg/L with Daphnia. Laboratory biological treatment plants have effectively treated industrial wastewater containing concentrations of ethylene oxide up to 250mg/L. Rather sensitive bacterial growth inhibition tests with mixed bacterial cultures (sewage) have indicated some growth inhibition from ethylene oxide concentrations ranging from 10 to 100 mg/L \*Test concentration that kills 50% of the exposed test organism.

**Biodegradation:** Biochemical oxygen demand (BOD) studies show that ethylene oxide and its derivatives biodegrade at a fairly rapid rate (20-day BOD 50% complete), which would prevent persistence and reduce any potential for long-term toxic concentrations.

**Hydrolysis:** In fresh water, ethylene oxide hydrolyzes to ethylene glycol with a measured half-life of 14 days. A hydrolysis half-life on nine days was measured in salt water, yielding ethylene glycol and ethylene chlorohydrin in a 4:1 ratio. A High adsorptivity in soil is expected.

**Volatilization:** Ethylene oxide volatilizes from water to the atmosphere at a rate 40% that oxygen. Literature indicates that ethylene oxide is nonpersistent in air due to washout by rain and degradation via free-radical processes. This substance is expected to be rapidly removed from the aquatic and terrestrial compartments by vaporization.

### 12.2. Persistencia y degradabilidad

No ecological damage.

Summary of environmental effects: Ethylene oxide is a non-persistent chemical structure that is expected not to accumulate in the environment. Its moderate level of aquatic toxicity contrasted with this non-persistence of the substance prevents any long-term toxicity effect on aquatic systems.

#### **Environmental precautions:**

Try to stop the release, prevent its entry into sewers and work stations, or in any other place where its accumulation could be dangerous.

### 12.3. Bioaccumulative potential

Due to the distribution coefficient of n-octanol / water (log K<sub>ow</sub>) accumulation in organisms is not expected. There is no known ecological damage to this product.

### 12.4. Mobility in the soil

High mobility in the soil, adsorption in the soil is not expected, KOC: 0.51 - 0.67.

### 12.5. PBT and vPvB evaluation results

The PBT and vPvB scope is not met (Annex XIII).

### 12.6. Other adverse effects

Effect on the ozone layer: None

Behavior in wastewater plants, When small concentrations are correctly dumped in biologically adapted wastewater plants, interference with activated sludge degradation activity is not expected.

## SECTION 13: DISPOSAL CONSIDERATIONS

### 13.1. Waste treatment methods.

Disposal code: 16 05 04 \* waste marked with an asterisk is considered hazardous waste according to Directive 2008/98 / EC on hazardous waste.

Gases in containers, containing dangerous substances.

This chemical is a pesticide product registered by the Environmental Protection of the United States Agency and is subject to certain labeling requirements under the federal pesticide law. These requirements differ from the classification criteria and hazard information required for safety data sheets (SDS), and for workplace labels of non-pesticide chemicals. The information on the hazards required on the pesticide label is reproduced below. The pesticide label too.

It includes other important information, including instructions for use.

**Waste management / disposal:** Discard any product, waste or waste container or bag in an environmentally acceptable manner, in accordance with local, state or federal regulations. Ethylene oxide is highly toxic to most life forms and is considered a potential environmental pollutant. The indiscriminate discharge in sewers or waterways should be avoided. Avoid discharge into the atmosphere. Incineration is the preferred method of disposal. Do not discard it in places where its accumulation could be dangerous. Do not discharge it in places where there is a risk of explosive mixing with air. Additionally it can be arranged in suitable plants for its treatment.

## SECTION 14: TRANSPORT INFORMATION

**14.1. Identification Number DOT / UN / IMDG:** UN 1040

**TDG Classification:** Regulated Material.

**14.2. Proper Shipping Name:** Ethylene Oxide

**14.3. Transportation Hazard Class / Division (DOT / UN / IMDG):** 2.3 - Poisonous gas 49 CFR 173.115 (2.1) Subsidiary Risk: 2.1. **(ADR):** 2TF (Toxic / Flammable)

**14.4. Packing Group:** ADR / RID (-), IMDG (-), IATA / DGR (1)

**Packing instruction:** P 200.

UN 1040, ethylene oxide, can also be packaged in hermetically sealed and adequately cushioned inner packagings of glass or metal in cartons, wood or metal, which reach the level of performance of the packaging of the packaging. Group I. The maximum amount allowed for any inner glass packaging is 30 g and the maximum amount allowed in a metallic inner packaging is 200 g. After filling, the tightness of each inner package should be determined by placing it in a hot water bath at the temperature and for a sufficient time to ensure that an internal pressure equal to the vapor pressure of the ethylene oxide has been achieved. 55 ° C. The maximum net mass in an outer packaging shall never exceed 2.5 kg.

**14.5. Environmental Hazard:** ADR / RID (No), IMDG (NO), IATA / DGR (NO)

**Marine Polutante:** No

**14.6. Special cautions for the user:** consider points 6 and 7 and 8 of this safety data sheet. Special provisions of the DOT (49 CFR 172.102) Special provisions of the DOT (49 CFR 172.102) 4 - This material is poisonous by inhalation (see 171.8 of this subchapter) in 4 - This material is poisonous by inhalation (see 171.8 of this subchapter) in Danger Zone D (see 173.116 (a) of this subchapter), and should be described as an inhalation hazard under the provisions of this subchapter **342 -** T50 - When the instruction for portable tank T50 is mentioned in the Column (7) ) of Table 172.101, the applicable liquefied compressed gases are authorized to be transported in portable tanks in accordance with the requirements of 173.313 of this subchapter.

### 14.7 Special Provisions

**(ICAO-TI / IATA-DGR):** A2/A131.

Passenger and cargo transport: exempted quantities: packaging compliance, maximum net quantity per inner and outer package.

**49 CFR 172.102: 342.**

Glass inner packagings (such as ampoules or capsules) intended only for use in sterilization devices, when containing less than 30 mL of ethylene oxide per inner packaging with not more than 300 mL per outer

packaging, may be transported in accordance with § 173.4a of this subchapter, irrespective of the restriction of § 173.4a(b) and the indication of “forbidden” in columns (9A) and (9B) of the § 172.101 table provided that:

- After filling, each glass inner packaging must be determined to be leak-tight by placing the glass inner packaging in a hot water bath at a temperature and for a period of time sufficient to ensure that an internal pressure equal to the vapor pressure of ethylene oxide at 55 °C is achieved. Any glass inner packaging showing evidence of leakage, distortion or other defect under this test must not be transported under the terms of this special provision;
- In addition to the packaging required in § 173.4a, each glass inner packaging must be placed in a sealed plastic bag compatible with ethylene oxide and capable of containing the contents in the event of breakage or leakage of the glass inner packaging; and
- Each glass inner packaging is protected by a means of preventing puncture of the plastic bag (e.g., sleeves or cushioning) in the event of damage to the packaging (e.g., by crushing).

#### 14.7. Transportation and bulk according to Annex II of MARPOL 73/78 and the IBC code:

Not applicable. Not applicable to bulk according to IBC.

**Land transport and inland navigation. ADR Class: 2 ADR Hazard Label (s): 2.3 (Toxic Gas) + 2.1 (Flammable Gas)**

**ADR / RID Danger Nr: 236, CEFIC Treamcard Nr: 16, CEFIC Groupcard Nr: 20g43**

**Classification code: 2TF**



**Emergency File: IMDG: F-D, S-U**

**Other transport information:** It is recommended to transport in vehicles where the cargo is separated from the conduit compartment. Ensure that the ducts are aware of the potential hazards of the cargo and know what to do in the event of an accident or emergency. Identification images: 2.3 - Poisonous gas 2.1 – Flammable gas.

## SECCION 15: REGULATORY INFORMATION

### 15.1. Regulations applicable in the United States (USA), European Community (EC) and Europe

**TESCA status:** Listed

CERCLA Section 103 (40 CFR 302.4): listed

10lb. Reportable Quantity

SARA Section 304 (40 CFR 356. 40): listed

1lb. Reportable Quantity

SARA Section 311/312 (40 CFR 370, 21) Hazard categories met:

Acute, Chronic, Fire, reactive, Sudden Release

SARA Section 313 (40 CFR 372, 65); listed

OSHA (29 CFR 1910. 1200): Meets criteria as a hazardous material

OSHA (29 CFR 1910. 1047): Ethylene Oxide Standard

EPA list of Pesticide Chemicals (40 cfr 180. 151): Listed

VOC Rule:  $\geq 99\%$  VOC , 20° C 1440 hPa

Regulation (EC): No. 1907/2006 concerning the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH)) Annex XVII No. 28-30 Regulation (EU): No. 528/2012: Concerning the marketing and use of biocides Regulation (EU): No. 649/2012 Concerning the export and import of dangerous chemicals Regulation (EU): No. 1907/2006 concerning the registration, evaluation, authorization and restriction of chemical substances and preparations (REACH)

### 15.2. Regulations applicable in MERCOSUR:

MERCOSUR / GMC / RES. No. 40/00: Not listed

ANMAT N ° 2318/02 (To 2004): Not intervened.

## SECTION 16: OTHER INFORMATION / GLOSSARY

Health hazard according to NFPA: 3 - Short exposure could cause a Residual injury despite prompt medical attention was given.

Fire risk NFPA: 4 - Will evaporate quickly or completely at normal pressure and the temperature, or it disperses easily in the air and will burn easily.

Reactivity NFPA: 3 - Capable of detonation or explosive reaction, but requires a strong initiating source or must be heated under confinement before initiation, or reacts explosively with water.

HMIS III rating Health: 1 Minor hazard - Irritant irritations or minor injuries may occur

Flammability: 4 Severe

Hazard Physical: 3 Serious Hazard

SDS US (GHS HazCom 2012)

### Glossary:

ACGIH- American Conference of Governmental Industrial Hygienists

CERCLA- Comprehensive Environmental Response, Compensation and Liability Act.

CAS- Chemical Abstract Service

CFR- Code of Federal Regulations

CNS- Central Nervous System

DOT- U.S. Environmental Protection Agency

HMIS- Hazardous Materials information Sheet

IARC- International Agency for Research on Cancer

IDL- Ingredient Disclosure List

IDLH- Immediately dangerous to life and health

HAP- Hazardous Air Pollutant

LC50- Median lethal dose that kills 50 % of an exposed population by the inhalation route

LC50- Median lethal dose that kills 50 % of an exposed population by oral (or dermal) route

NESHAPS- National Emission standards for Hazardous Air Pollutants

NFPA- National fire Protection Association

NIOSH- National Institute of Occupational Safety and health

NTP- National Toxicology Program

OSHA- Occupational Safety and health Administration

P/P- parts per part

PEL- Permissible Exposure Limit

PVC- Polyvinyl chloride

PPM- Parts per million

P.S.I.G- Pounds per square inch (gauge pressure)

RCRA- resource, Conservation and recovery Act

SARA- Superfund Amendment and Reauthorization Avt of 1990

STEL- Short- term exposure limit

TDG- Transportation of Dangerous Goods

TVL- Threshold Limit Value

TSCA- Toxic Substance Control Act

TWA- Time Weighted Average

VOC- Volatile Organic compound

WHMIS- Workplace Hazardous Material Information System

### SECTIONS:

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### **DISCLAIMER**

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