



SAFETY DATA SHEET
MIXTURE ETHYLENE OXIDE 90%
CARBON DIOXIDE 10%

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Revised Date : 2/11/20

1. IDENTIFICATION OF THE SUBSTANCE / PREPARATION AND OF THE COMPANY

Product name Mixture Ethylene Oxide 90% / Carbon Dioxide 10%
Chemical formula $C_2H_4O + CO_2$
Uses Medical sterilization: chemical intermediate
Synonyms **Ethylene Oxide:** Oxirane; 1, 2-Epoxy ethane; EO; EtO; Ethene Oxide
Carbon dioxide: Carbonic acid gas; carbon anhydride

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2. HAZARDS IDENTIFICATION

2.1 GHS classification

Hazards Identification

GHS02 – Extremely flammable gas	H220 / category 1
GHS04 – Gas under pressure: may explode if heated	H280 / liquefied gas
GHS06 – Toxic by inhalation	H331 / category 3
GHS08 – Irritating to eyes, respiratory system and skin	H335 / category 3
GHS08 – May cause cancer	H350 / category 1B
GHS08 – May cause inheritable genetic defects	H340 / category 1B

GHS classification

Hazard pictograms / symbols


2.2 Classified as dangerous according to the criteria of Regulation EC No 1272/2008
Hazard Statement for physical hazards

H220	Extremely flammable gas.
H230	Chemically unstable gas (may react explosively even in the absence of air)
H280	Liquefied gas (may contain gas under pressure)

Hazard Statements for Health Hazards

H302	Harmful if swallowed.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H331	Toxic if inhaled.
H335	May cause respiration irritation.
H340	May cause genetic defects.
H350	May cause cancer.
H372	Causes damage to the nervous system and to blood forming organs through prolonged or repeated exposure by inhalation.

Prevention

P202	Do not handle until all safety precautions have been read and understood.
P210	Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P260	Do not breathe gas/vapours.
P280	Wear protective gloves/protective clothing/eye protection/face protection.

Response

P377	Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
P304 + P340	IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P332 + P337 + P313	If skin or eye irritation occurs: Get medical advice/ attention.
P333 + P313	If skin irritation or rash occurs: Get medical advice/attention.



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Storage

P405 Store locked up.
P410 + P403 Protect from sunlight. Store in well-ventilated place

Other hazards

Carbon dioxide component is under high pressure but is generally non-toxic. Ethylene oxide is liquified gas at room temperature. Ethylene oxide is highly flammable even in this mixture with carbon dioxide. Beside hazard due to compressed gas of carbon dioxide, other hazards are due to ethylene oxide, which is highly flammable and generally toxic.

3. COMPOSITION / INFORMATION ON INGREDIENTS

Substance/Preparation

Compressed gases mixture

Components/Impurities

Contains a mixture of liquified ethylene oxide and compressed carbon dioxide gas. Chemical toxicities are mainly due to ethylene oxide while carbon dioxide is generally non-toxic.

CAS Number	EC Number (from EINECS)	Name	%(Weight)
75-21-8	200-849-9	Ethylene oxide	90
124-38-9	200-696-9	Carbon Dioxide	10

4. FIRST AID MEASURES

General Information

Take appropriate steps to avoid fire, explosion and inhalation hazards.
Remove contaminated soaked clothing immediately
Adhere to personal protective measures when giving first aid.
Seek medical treatment immediately.

Inhalation

Remove the casualty into fresh air and keep him immobile.
In the event of pulmonary irritation treat initially with corticoid spray, e.g. Ventolair or Pulmicort- metered-dose aerosol (Ventolair and Pulmicort are registered trademarks).
Seek medical treatment immediately.
In case of respiratory standstill give artificial respiration by respiratory bag (Ambu bag) or respirator.



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Send for a doctor.

Skin / eye contact

In case of frostbite spray with lukewarm (not hot) water for at least 15 minutes. Do not remove clothing frozen to the skin. Thaw it with lukewarm water. Apply a sterile dressing. Obtain medical assistance. Seek medical treatment immediately.

In case of contact with skin wash off immediately and for a long time (at least 15 minutes) with plenty of water.

In case of eye contact, rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

Call for a doctor immediately.

Ingestion

Ingestion is not considered a potential route of exposure.

5. FIRE FIGHTING MEASURES

Specific Hazards	Exposure to fire may cause containers to rupture/explode
Hazard combustion products	Incomplete combustion may form carbon monoxide
Suitable extinguishing media	All known extinguishers can be used
Unsuitable extinguishing	Full water jet (MUST NOT be used for safety reason)
Specific Methods	If possible. Stop flow of product Continue water spray from protected position until container stays cool. Spontaneous / explosive re-ignition may occur. Extinguish any other fire.
Protective equipment	Use self-contained breathing apparatus Use chemically protective clothing.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions	Evacuate area
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Use self-contained breathing apparatus and chemically protective clothing
Eliminate ignition sources
Wear self-contained breathing apparatus when entering area.
Ensure adequate air ventilation

Environmental precautions

Try to stop release
Prevent from entering sewers, and water systems as ethylene oxide is very soluble in water.
Reduce vapor with fog or fine water spray.

Clean up methods

Keep area evacuated
Ventilate area
Remove any source of ignition
Let any spill evaporate. Apply exhaust fan if possible.
Hose down area with water.
Wash contaminated equipment or sites of leaks with large quantities of water.

7. HANDLING AND STORAGE

Handling

Use ONLY in thoroughly ventilated areas.
Ensure equipment is adequately earthed to prevent any spark from static discharge.
Protect cylinder from any physical damage. Do not drop, drag, roll or slide cylinder.
Do not let any water to be introduced into container with EtO.
Purge dry air into container and gas-flow system before introducing gas.

Use only specified equipment to handle this product with specified safe pressure and temperature.
Refer to supplier's handling instructions.
Contact gas supplier if in doubt.

Storage

Secure cylinders to the correct positioning.
Keep in dry well-ventilated area.
The gas cylinders must be adequately earth during storage.
Segregate from oxidant gases and other oxidizing agents

Keep containers tightly closed and dry.

Storage condition: -

- In a cool, dry and well-ventilated area
- Away from direct sunlight. Protect from the heat (storage temperature $\leq 50^{\circ}\text{C}$)



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- Away from any source of ignition (including static discharge)

8. EXPOSURE CONTROL / PERSONAL PROTECTION

Exposure Limit value

Ethylene Oxide:

OSHA Time Weighted Average exposure limit (TWA): 1 ppm

OSHA Short Term Exposure Limit (STEL): 5 ppm

Carbon Dioxide:

OSHA Time Weighted Average exposure limit (TWA): 5,000 ppm

OSHA Short Term Exposure Limit (STEL): 30,000 ppm

Engineering measure

Provide adequate general and local exhaust ventilation to maintain concentrations below exposure and flammable limits.

Personal protective equipment

Respiratory protection may not be required unless in case of leakage, use self – contained breathing apparatus.

Use appropriate gloves and protective clothing for hand and skin protection.

Use safety glasses or ventilated goggle for eye protection.

A safety shower and eyewash station should be readily available.

For body and skin protection, wear coveralls, boots and/or other chemical resistant protective clothing.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical and chemical properties of the mixture as a product are not available. However, physical and chemical properties of each component are provided here as a guide.

Physical state at 20°C	High pressure liquefied gases mixture
Colour	Colourless gas mixture
Odour	CO ₂ : Odourless EtO : sweet, ether-like smell



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Flammability	EtO is extremely flammable and mixture with CO ₂ is also flammable
Melting Point	CO ₂ : -75.5 °C (sublimation point) EtO: -112 °C
Boiling Point	CO ₂ sublime directly to gaseous form at -78.5 °C EtO: 10.6 °C
Flash Point	CO ₂ does not combust at any temperature. EtO: -18 °C (open cup)
Vapour pressure, 20°C	CO ₂ is a gas at 20 °C EtO: 1.4 Bar
Relative Vapour Density	CO ₂ : 1.5 (Air = 1) EtO: 1.52 (Air = 1)
Relative density, 20°C	EtO: 0.82 (water = 1) CO ₂ is a gas at 20 °C.
Solubility in water	CO ₂ : 0.7 mole ratio at 20 °C and 1 atm pressure EtO: completely miscible in water (1,000 g/L)
Flammability range	CO ₂ is not combustible EtO: 3 to 100 (vol % in air)
Auto-ignition temperature	CO ₂ is not combustible EtO: 429 °C
Other data	Gases mixture is heavier than air. May accumulate in confined spaces, particularly at or below ground level.

10. STABILITY AND REACTIVITY

Stability

EtO can form explosive mixture with air even in the presence of 10% CO₂. This EtO mixture may also decompose violently at high temperature and/or pressure in the presence at catalyst such as iron rust or other metal oxides EtO may polymerize.

Conditions to avoid

Air or oxygen
Water, humidity
High temperatures



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Materials to avoid

Oxidizing agents, acids, organic bases, amines, ammonia and certain salts.
Reacts explosively with certain alcohols or mercaptans.
Reacts with HCl to form highly toxic ethylene chlorohydrins.
Avoid copper, silver, magnesium, mercury and their salts.

11. TOXICOLOGICAL INFORMATION

Acute toxicity

Ethylene Oxide

LD₅₀/oral/rat; 72 mg/kg
LC₅₀/inhal/rat: 2.92 mg/ l / 15 min
1.44 mg / l / 4h

Carbon dioxide

Relatively non-toxic
IDLH conc: 40,000 ppm (IDLH: Immediate Danger to Life and Health)

Skin Irritation/Sensitization

Ethylene oxide is very irritating and may cause allergy reaction

Eye Irritation/Damage

Ethylene Oxide cause serious eye irritation

**Inhalation/Respiratory
Sensitization**

Ethylene Oxide cause respiratory tract irritation and may cause allergy reaction.
Carcinogenic risk to cancer by inhalation is well documented for EtO.

Carcinogenicity

Ethylene Oxide IARC Classification Group 1: Carcinogenic to Human.
Carbon Dioxide is non-carcinogenic.

Mutagenicity

Ethylene oxide has been shown to be an effective mutagen in a variety of organisms from bacterial to mammals.

Teratogenicity

Ethylene oxide is included in the Catalog of Teratogenic Agent by Thomas Shepard based on one study. Medical counseling is recommended for exposure of pregnant women to ethylene oxide.

Further information

Studies showed that most toxicological impact exposure of EtO were through inhalation. Exposure to a mixture of 90% EtO and 10% CO₂ is still result is substantial exposure to EtO.



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12. ECOLOGICAL INFORMATION

General Ecological Impact	Carbon Dioxide is a major green-house gas which contribute to Climate Change and other ecological impact of Green-house gases. Other than that carbon dioxide is not harmful to the environment. Ethylene Oxide is toxic and harmful to the environment according to the following criteria;
Environmental Fate	Ethylene oxide is highly reactive. Thus, it does not persist indefinitely in the environment. It is also very soluble in water. EtO will be converted gradually to ethylene glycol in the environment.
Aquatic Toxicity	LC ₅₀ (Fat Minnow): 84 mg/L (96 hr exposure) LC ₅₀ (Daphnia magna): 137 – 300 mg/L (48hr exposure)
Mobility	Atmosphere: Somewhat persistent in the atmosphere but will ultimately degrade by process of photolysis. Soil: Does not readily dissolved in soil and gradually will convert to ethylene glycol. Water: Very soluble in water but easily convert to ethylene glycol.
Persistence/degradability	Readily undergoes biodegradation and hydrolysis in water and soil.
Bio-accumulation	Does not bio-accumulate significantly.

13. DISPOSAL CONSIDERATION

Waste Disposal	Do not dispose remaining gas to the environment. Return container and cylinder to supplier.
Additional Information	Ethylene oxide is also used as fumigant. Regulation of disposal of pesticides and containers of pesticides may apply. Do not attempt to refill cylinder with other gases or chemicals.

14. TRANSPORT INFORMATION

Proper shipping name Ethylene Oxide and Carbon Dioxide mixture



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UN Number	UN3300
Hazard Class	2 – Flammable Gas
ADR/RID Classification Code	2TF
ADR/RID Hazard Nr	263
Packing Group	None
Labeling ADR	Label 2.3: Toxic substance Label 2.1 : Flammable gas
IMDG EmS codes	F-D, S-U
IMDG Marine pollutant	No
Passenger Aircraft	Forbidden

SPECIAL SHIPPING INFORMATION: Cylinders should be transported in a secure position, in a well-ventilated vehicle. Cylinders transported in an enclosed, non-ventilated compartment of vehicle can present serious safety hazards.

15. REGULATORY INFORMATION

Department of Occupational Safety and Health, Ministry of Human Resources, Malaysia
Industrial Code of Practice on Chemicals Classification and Hazard Communication, 2014.

Chemical Name:	ETHYLENE OXIDE	
CAS No.	75-21-8	
Classification	<u>H-Code</u>	<u>Classification Code</u>
	H280/281	Pressurized Gas
	H220	Flam. Gas 1
	H350	Car. 1B
	H340	Muta. 1B
	H331	Acute Tox. 3 (inh)
	H319	Eye Irrit. 2
	H335	STOT SE 3
	H315	Skin Irrit. 2

Chemical Name:	CARBON DIOXIDE
CAS No.	124-38-9
Classification	Not listed

16. OTHER INFORMATION



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The information and opinion presented herein are based on data and scientific information currently available. Since the use of information in this Safety Data Sheet and the conditions of use are not within the control of Balchem Sdn Bhd., it is the user's obligation to determine the conditions for safe use of this product.

Ensure all national and local regulations are observed. Ensure operators and handlers of this product understand the hazard and toxicological effect from accidental and unnecessary exposure.

While proper care has been taken in the preparation of this document, no liability for injury or damage resulting from its use can be accepted by the manufacturer.

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