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Ethylene Oxide in Nitrogen

0.0005-0.2%

MATERIAL SAFETY DATA SHEET

Identification

Formula: C₂H₄O

Document Number: MSDS 104

Revision Date 01-01-12

Composition and Information on Ingredients

Chemical Name	CAS #	Mole %	Exposure Limits in Air					Other Ppm
			ACGIH		OSHA			
			TLV ppm	STEL ppm	PEL ppm	STEL Ppm	IDLH ppm	
Ethylene Oxide	75-21-8	0.0005 - 0.2%	1,A2	NE	1	5 (15 minute excursion)	800	NIOSH:<0.1REL;5C (10 minute/day); Carcinogen IARC-2A;MAK; NTP- 2A; OSHA-X
Nitrogen	7727-37-9	Balance	There are no specific exposure limits for Nitrogen. Nitrogen is a simple Asphyxiant (SA). Oxygen levels should be maintained above 19.5%.					

NE= Not Established. C=Ceiling Limit. A4=Not Classifiable as a Human Carcinogen. See Section 16 for Definitions of Terms Used.

Note: All WHMIS required information is included.

Hazardous Identification

Hazardous Material Information

❖ HEALTH	(Blue)	2
❖ FLAMMABILITY	(Red)	0
❖ REACTIVITY	(Yellow)	0

The presence of Ethylene Oxide in this gas mixture in concentrations of 5–200 ppm, inhalation over-exposures may cause upper respiratory system irritation. Symptoms of such over-exposure may include coughing, sneezing, and nasal congestion. Additionally, prolonged inhalation of low concentrations of Ethylene Oxide can cause nausea, vomiting, and numbing of the sense of smell.

- Contact with Eyes: Due to the presence of Ethylene Oxide in this gas mixture, over-exposures to the eyes may cause irritation (i.e. redness, stinging).
- Acute: Symptoms of oxygen deficient include respiratory difficulty, ringing in ears, headache, shortness of breathing, wheezing, headaches, dizziness, indigestion, nausea, unconsciousness, and death. The skin of a victim of over-exposure may have a blue color. Due to the presence of Ethylene Oxide (<200 ppm) in the gas mixture, inhalation over-exposures may cause upper respiratory system and eye irritation. Over-exposure to low levels of Ethylene Oxide can cause nausea, vomiting, and numbing of the sense of smell.
- Chronic: Due to the presence of Ethylene Oxide, this product must be considered a potential carcinogen and reproductive hazard to humans.
- Target Organs: Respiratory system

First Aid Measures

Rescuers should not attempt to retrieve victims of exposure to this product without adequate protective equipment. If necessary, Self - Contained Breathing Apparatus must be worn. If any adverse symptom develops after over-exposure to this product, remove victim(s) to fresh air as quickly as possible. Only trained personnel should administer supplemental oxygen and/or cardio-pulmonary resuscitation if necessary. Victim(s) who experience any adverse effect after over-exposure to this product must be taken for medical attention.

EYE EXPOSURE: If irritation of the eye develops after exposure to this gas mixture, open victim's eyes while under gently running water. Use sufficient force to open eyelids. Have victim "roll" eyes. Minimum flushing is 15 minutes

Fire Fighting Measures

Flash Point, (method): Not applicable.

Autoignition Temperature: Not applicable.

Flammable Limits (in air by volume %):

Lower (LEL): Not applicable

Upper (LEL): Not applicable

- Fire Extinguishing Materials: Use extinguishing media appropriate for surrounding fire.
 - Unusual Fire and Explosion Hazards: This gas mixture is not flammable; however, containers, when involved in fire, may rupture or burst in the heat of the fire. Additionally, mixtures of this gas for which Air is the balance gas, can support combustion.
 - Special Fire – Fighting Procedures: Structural firefighters must wear Self – Contained Breathing Apparatus and full protective equipment.
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Accidental Release Measures

Leak Response: Due to the small size and content of the cylinder, an accidental release of this product presents significantly less risk of over-exposure to Ethylene Oxide, an oxygen deficiency environment and other safety hazards than a similar release from a larger cylinder. However, as with any chemical release, extreme caution must be used during emergency response procedures. In the event of a release in which the atmosphere is unknown, and in which other chemicals are potentially involved, evacuate immediately area. Such release should be responded to by trained personnel using pre – planned procedures. Proper protective equipment should be used. In case of a leak, clear the affected area, protect people, and respond with trained personnel. Allow the gas mixture to dissipate. If necessary, monitor the surrounding area for levels of Ethylene Oxide and Oxygen. Oxygen levels must be above 19.5% before non – emergency personnel are allowed to re – enter area. If leaking comes from the cylinder, contact your supplier.

Handling and Use

- Work Practices and Hygiene Practice: Be aware of any signs of dizziness or fatigue; exposures to fatal concentrations of this product could occur without any significant warning symptom, due to oxygen deficiency. Do not attempt to repair or adjust the cylinders contained with this gas mixture. If there is a malfunction or another type of operational problem, contact nearest distributor immediately.
- Storage and Handling Practices: Entrances to regulated areas must be posted with legible signs which read as follow:

DANGER ETHYLENE OXIDE CANCER HAZARD AND REPRODUCTIVE HAZARD
AUTHORIZED PERSONNEL ONLY
RESPIRATORS AND PROTECTIVE CLOTHING MAYBE REQUIRED TO BE WORN IN THIS AREA

Cylinders should be firmly secured to prevent falling or being knocked over. Cylinders must be protected from the environment, and preferably kept at room temperature (approximately 21°C; 70°F). Cylinders should be stored in dry, well – ventilated areas, away from sources of heat, ignition, and direct sunlight. Protect cylinders against physical damage. Full and empty cylinders should be segregated. Use a first – in, first – out inventory system to prevent full containers from being stored for long periods of time. These cylinders are not refillable. ***WARNING! Do not refill CT 39(DOT 39) cylinders. To do so may cause personal injury or property damage.***

- Special Precautions for Handling Gas Cylinders: WARNING! Compressed gases can present significant safety hazards. During cylinder use, use equipment designed for these specific cylinders. Ensure all lines and equipment is rated for proper service pressure.
- Protective Practices During Maintenance of Contaminated Equipment: Follow practices indicated in Section 6 (Accidental Release Measures). Make certain that application equipment is locked and tagged – out safely. Always use product in areas where adequate ventilation is provided.

Exposure Controls – Personal Protection

Ventilation and Engineering Controls: No specific ventilation systems or engineering controls are needed under normal circumstances of use. As with all chemicals, use this product in well – ventilated areas. If this product is used in a poorly – ventilated area, install automatic monitoring to detect the levels of oxygen.

Respiratory Protection: Maintain exposure levels of Ethylene Oxide below the levels listed in Section 2 (Composition and Information on Ingredients) and Oxygen levels above 19.5% in the workplace. Use supplied air respiratory protection if Ethylene Oxide levels exceed exposure limits and if Oxygen levels are below 19.5% or unknown during emergency response to a release of this product. If respiratory protection is required for emergency response to this product, follow the requirements of the Federal OSHA Respiratory Protection Standard (29 CFR 1910.134) or equivalent State standards.

Up to 5ppm: Gas mask with canister to protect against Ethylene Oxide; or full- face piece Self - Contained Breathing Apparatus (SCAB); or full -face piece Supplied Air Respirator (SAR).

- **Eye Protection:** Safety glasses
- **Hand Protection:** No special protection is needed under normal circumstances of use.
- **Body Protection:** No special protection is needed under normal circumstances of use.

Physical and Chemical Properties

GAS DENSITY @32°F (0°C) and 1 atm: 0.072lbs/ft³ (1.153kg/m³)

BIOLING POINT: -320.4°F (-195.8°C)

FREEZING/MELTING POINT @ 10psig -345.8°F (-210°C)

SPECIFIC GRAVITY (air = 1) @ 70°F (21.1°C): 0.906

SOLUBILITY IN WATER vol./vol. @ 32°F (0°C) and 1 atm: 0.023

EVAPORATING RATE (nBuAc = 1): Not applicable.

pH: Not applicable.

ODOR THRESHOLD: 0.06 ppm (Chlorine)

MOLECULAR WEIGHT: 28.01

VAPOR PRESSURE @ 70°F (21.1°C) psig: Not applicable.

EXPANSION RATIO: Not applicable

COEFFICIENT WATER/OIL DISTRIBUTION: Not applicable.

SPECIFIC VOLUME (ft³/lb): 13.8

Appearance and Color: This product is colorless, odorless gas.

How to Detect this Substance (warning properties): In terms of leak detection, fittings and joints can be painted with a soap solution to detect leaks, which will be indicated by a bubble formation.

Stability and Reactivity

Stability: Normally stable in gaseous state.

Decomposition Products: The thermal decomposition products of Ethylene Oxide include carbon oxide. Nitrogen does not decompose, per se, but can react with other compounds in the heat of fire.

Materials with which Substance is Compatible: Titanium will burn in Nitrogen. Lithium reacts slowly with Nitrogen at ambient temperatures.

Hazardous Polymerization: Will no occur. Ethylene Oxide can undergo violent polymerization in the presence of an initiating agent (i.e. acids, alcohol, bases, and metals); however, due to this component's low concentration in the gas mixture, this is not anticipated to be a significant safety hazard.

Conditions to Avoid: Contact with incompatible materials. Cylinders exposed to high temperature or direct flame can rupture or burst.

Toxicological Information

ETHYLENE OXIDE:

Skin contact with a 1% solution in water causes visible reddening or blistering injury in 7 seconds.

Mutation in Microorganism-other microorganisms=540

Unscheduled DNA Syntesis-Human:leukocyte=4mmol/L.

Sister Chromatid Exchange-Human:lymphocyte=4pph

DNA Damage-Mouse-intraperitoneal=100mg/kg.

Sister Chromatid Exchange-Human:lymphocyte=10mg/L

Dominant Lethal Test-Mouse-Inhalation 500ppm/6hr/4days.

Inhalation-Rat TC:50 ppm/7H/2Y-I: Carcinogenic effects.

Oral-Rat TD:5112 mg/kg/2Y-I: carcinogenic effects.

Inhalation-Rat TC:33 ppm/6H/2Y-I: Equivocal tumorigenic agent.

Inhalation-Human TClO:12,500 ppm/10S: NOSE.
Inhalation-Rat TClO:33 ppm/6H/2Y-I: Carcinogenic effects.
Inhalation-Mouse TDL:750mg/kg (male 25D pre):Reproductive effects.
Inhalation-Mouse TClO:1200 ppm/90M (female 1D post): Teratogenic effects.
Subcutaneous-Mouse TDL:292 mg/kg/95W-I: Carcinogenic effects.
Subcutaneous-Mouse TD:1090 mg/kg/91W-I: Neoplastic effects.
Subcutaneous-Mouse TD:908 mg/kg/95W-I: Carcinogenic effects.
Intraperitoneal-Mouse TDL:750mg/kg (male 25D pre): Repoductive effects

- This gas mixture may be irritating to contaminated eyes and the upper respiratory system.
- This gas mixture is not known to cause sensitization in humans.
- Eye conditions and respiratory conditions may be aggravated by over-exposure to the components of this product.

Ecological Information

- Effects of Material on Plants or Animals: No evidence is currently available on this product's effects on plant and animal life.
- Effects of Chemical on Aquatic Life: No evidence is currently available on this product's effects on aquatic life.

Disposal Considerations

Waste disposal must be in accordance with appropriate Federal, State, and local regulations. Cylinders with undesired residual product may be safely vented outdoors with the proper regulator. For further information, refer to Section 16 (Other Information).

Transportation Information

Proper Shipping Name:	Compressed Gas N.O.S. (Nitrogen, Ethylene Oxide)
Hazard Class Number and Description:	2.2 (Non – Flammable Gas)
UN Identification Number:	UN 1956
CT (DOT) Label(s) Required:	Non – Flammable Gas

NON – FLAMMABLE GAS MISTURE MSDS – MSDS 104 PAGE 5 OF 5

Regulatory Information

Ethylene Oxide
SARA Section 302 (40CFR355.30): Yes
SARA Section 304 (40CFR355.40): Yes
SARA Section 313 (40CFR372.65): Yes

Other Information

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 injury or death.

CT 39 (DOT 39) cylinders ship as hazardous materials when full. Once the cylinders are relieved of pressure (empty) they are not considered hazardous material or waste. Residual gas in this type of cylinder is not an issue because toxic gas mixtures are prohibited. Calibration gas mixtures typically packed in these cylinders are Nonflammable n.o.s., UN 1956. A small percentage of calibration gases packed in CT 39 (DOT 39) cylinders are flammable or oxidizing gas mixtures.

For disposal of used CT 39 (DOT-39) cylinders, it is acceptable to place them in a landfill if local laws permit. Their disposal is no different than that employed with other CT (DOT) containers such as spray paint cans, household aerosols, or disposable cylinders of propane (for camping, torch etc.). When feasible, we recommended recycling for scrap metal content. Precision Gas Products Inc. will do this for any customer that wishes to return cylinders to us prepaid. All that is required is a phone call to make arrangements so we may anticipate arrival. Scrapping cylinders to valued customers who want to participate.

This Material Safety Data Sheet is offered pursuant to OSHA's Hazard Communication Standard, 29 CFR 1910.1200. Other government regulations must be reviewed for applicability to this product. To the best of Precision Gas Products Inc. knowledge, the information contained herein is reliable and accurate as of this date; however, accuracy, stability or completeness are not guaranteed and no warranties of any type, either express or implied, are provided. The information contained herein relates only to this specific product. If this product is combined with other materials, all component properties must be considered. Data may be changed from time to time.