

Praxair Material Safety Data Sheet

1. Chemical Product and Company Identification

Product Name: Ethylene, refrigerated liquid (MSDS No. P-4879-F)	Trade Names: Liquid Ethylene
Chemical Name: Ethylene	Synonyms: Ethene, olefiant gas, elayl, acetene, bicarburetted hydrogen, ethylene (cryogenic liquid)
Chemical Family: Alkene	Product Grades: None assigned.
Telephone:	Company Name: Praxair, Inc.
Emergencies: 1-800-645-4633*	39 Old Ridgebury Road
CHEMTREC: 1-800-424-9300*	Danbury, CT 06810-5113
Routine: 1-800-PRAXAIR	

*Call emergency numbers 24 hours a day only for spills, leaks, fire, exposure, or accidents involving this product. For routine information, contact your supplier, Praxair sales representative, or call 1-800-PRAXAIR (1-800-772-9247).

2. Hazards Identification

EMERGENCY OVERVIEW

DANGER! Extremely cold, flammable liquid and gas under pressure.
Can form explosive mixtures with air.
Can cause severe frostbite.
May cause dizziness and drowsiness.
Self-contained breathing apparatus and protective clothing may be required by rescue workers.
Under ambient conditions, this is a colorless cryogenic liquid with a faint, sweet, musty odor.

OSHA REGULATORY STATUS: This material is considered hazardous by the OSHA Hazard Communications Standard (29 CFR 1910.1200).

POTENTIAL HEALTH EFFECTS:

Effects of a Single (Acute) Overexposure

Inhalation. Asphyxiant. Effects are due to lack of oxygen. Moderate concentrations may cause headache, drowsiness, dizziness, excitation, excess salivation, vomiting, and unconsciousness. Lack of oxygen can kill.

Skin Contact. No harm expected from vapor. Cold gas or liquid may cause frostbite.

Swallowing. An unlikely route of exposure. This product is a gas at normal temperature and pressure, but frostbite of the lips and mouth may result from contact with the liquid.

Eye Contact. No harm expected from vapor. Cold gas or liquid may cause frostbite.

Effects of Repeated (Chronic) Overexposure. No harm expected.

Other Effects of Overexposure. Ethylene is an asphyxiant. Lack of oxygen can kill.

Medical Conditions Aggravated by Overexposure. The toxicology and the physical and chemical properties of this product suggest that overexposure is unlikely to aggravate existing medical conditions.

CARCINOGENICITY: Ethylene is not listed by NTP or OSHA. The IARC lists ethylene as Group 3, unclassifiable as to carcinogenicity to humans.

POTENTIAL ENVIRONMENTAL EFFECTS: None known. For further information, see section 12, Ecological Information.

3. Composition/Information on Ingredients

See section 16 for important information about mixtures.

COMPONENT	CAS NUMBER	CONCENTRATION
Ethylene <i>*The symbol > means "greater than."</i>	74-85-1	>99%*

4. First Aid Measures

INHALATION: Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, qualified personnel may give oxygen. Call a physician.

SKIN CONTACT: For exposure to liquid, immediately warm frostbite area with warm water not to exceed 105°F (41°C). In case of massive exposure, remove contaminated clothing while showering with warm water. Call a physician.

SWALLOWING: An unlikely route of exposure. This product is a gas at normal temperature and pressure.

EYE CONTACT: Immediately flush eyes thoroughly with warm water for at least 15 minutes. Hold the eyelids open and away from the eyeballs to ensure that all surfaces are flushed thoroughly. See a physician, preferably an ophthalmologist, immediately.

NOTES TO PHYSICIAN: *There is no specific antidote. Treatment of overexposure should be directed at the control of symptoms and the clinical condition of the patient.*

5. Fire Fighting Measures

FLAMMABLE PROPERTIES: Highly flammable, extremely cold cryogenic liquid and gas. Forms explosive mixtures with air and oxidizing agents.

SUITABLE EXTINGUISHING MEDIA: CO₂, dry chemical, water spray, or fog

PRODUCTS OF COMBUSTION: Carbon monoxide, carbon dioxide

PROTECTION OF FIREFIGHTERS: DANGER! Extremely cold, flammable liquid and gas under pressure. Evacuate all personnel from danger area. Self-contained breathing apparatus and protective clothing may be required by rescue workers. Immediately spray containers with water from maximum distance until cool. Take care not to extinguish flames. Shut off flow of gas if without risk, while continuing cooling water spray. Remove ignition sources if without risk. If flames are accidentally extinguished, explosive reignition may occur. All personnel including fire and rescue workers should leave the area immediately. Reapproach

with extreme caution. When containers have cooled, move them away from fire area if without risk. On-site fire brigades must comply with OSHA 29 CFR 1910.156.

Specific Physical and Chemical Hazards. Liquid causes frostbite, a freezing injury resembling a burn. Heat of fire can build pressure in container and cause it to rupture. Liquid ethylene containers are equipped with pressure relief devices. No part of a container should be subjected to a temperature higher than 125°F (52°C). Ethylene gas is continually vented from pressure-control valves on containers. If venting or leaking ethylene catches fire, do not extinguish flames. Flammable gas may spread from leak, creating an explosive reignition hazard. Vapors can be ignited by pilot lights, other flames, smoking, sparks, heaters, electrical equipment, static discharge, or other ignition sources at locations distant from product handling point. Explosive atmospheres may linger. Before entering area, especially confined areas, check atmosphere with approved explosion meter.

Protective Equipment and Precautions for Firefighters. Firefighters should wear self-contained breathing apparatus and full fire-fighting turnout gear.

6. Accidental Release Measures

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:

DANGER! Extremely cold, flammable liquid and gas under pressure.

Personal Precautions. May form explosive mixtures with air. (See section 5.) Immediately evacuate all personnel from danger area. Avoid contact with cold liquid or vapor; contact can cause frostbite, a burn-like injury. (See section 2.) Ethylene gas is continually vented from pressure-control valves on containers. Flammable gas may spread from leak. Liquid ethylene may condense moisture in the atmosphere, producing a vapor cloud. The zone of flammability may extend beyond this cloud, so personnel should be evacuated well beyond any visible moisture. Before entering area, especially confined areas, check atmosphere with an appropriate device. Use self-contained breathing apparatus and protective clothing where needed. Remove all sources of ignition if without risk. Reduce vapors with fog or fine water spray. Shut off flow if without risk. Ventilate area or move container to a well-ventilated area.

Environmental Precautions. Prevent waste from contaminating the surrounding environment. Keep personnel away. Discard any product, residue, disposable container, or liner in an environmentally acceptable manner, in full compliance with federal, state, and local regulations. If necessary, call your local supplier for assistance.

7. Handling and Storage

PRECAUTIONS TO BE TAKEN IN HANDLING: *Gas can cause rapid suffocation due to oxygen deficiency.* Store and use with adequate ventilation. *Liquid can cause severe frostbite.* Never allow any unprotected part of your body to touch uninsulated pipes or vessels containing cryogenic fluids. Flesh will stick to the extremely cold metal and will tear when you try to pull free. *Protect containers from damage.* Use a suitable hand truck to move containers. *Highly flammable liquid and vapor.* Keep away from heat, sparks, and open flame. Use only spark-proof tools and explosion-proof equipment. Ground all equipment.

PRECAUTIONS TO BE TAKEN IN STORAGE: Store and use with adequate ventilation. Do not store at temperatures above 125°F (52°C). Close container valve after each use; keep closed even when empty. *Do not store in a confined space.* Cryogenic containers are equipped with pressure relief devices to control internal pressure. Under normal conditions these containers will periodically vent product. *Use adequate pressure relief devices in*

systems and piping to prevent pressure buildup; entrapped liquid can generate extremely high pressures when vaporized by warming. **Separate containers from oxygen and other oxidizers** by at least 20 ft (6.1 m), or use a barricade of noncombustible material. This barricade should be at least 5 ft (1.53 m) high and have a fire resistance rating of at least ½ hour. **Post “No Smoking or Open Flames” signs in storage and use areas.** There must be no sources of ignition. All electrical equipment in storage areas must be explosion-proof. Storage areas must meet national electric codes for Class 1 hazardous areas. For other precautions in using ethylene, see section 16.

RECOMMENDED PUBLICATIONS: For further information on storage, handling, and use, see Praxair publication P-14-153, *Guidelines for Handling Gas Cylinders and Containers*. Obtain from your local supplier.

8. Exposure Controls/Personal Protection

COMPONENT	OSHA PEL	ACGIH TLV-TWA (2007)
Ethylene	Not established.	200 ppm

TLV-TWAs should be used as a guide in the control of health hazards and not as fine lines between safe and dangerous concentrations.

IDLH = Not available.

ENGINEERING CONTROLS:

Local Exhaust. An explosion-proof local exhaust system with sufficient airflow velocity to keep ethylene concentration below all applicable exposure limits is acceptable.

Mechanical (General). Under certain conditions, general exhaust ventilation may be acceptable if worker exposure is kept below all applicable limits.

Special. None

Other. None

PERSONAL PROTECTIVE EQUIPMENT:

Skin Protection. Wear loose-fitting cryogenic gloves. Metatarsal shoes for cylinder handling. Protective clothing where needed. Cuffless trousers should be worn outside the shoes. Select equipment in accordance with OSHA 29 CFR 1910.132 and 1910.133. Regardless of protective equipment, never touch live electrical parts.

Eye/Face Protection. Safety glasses and a full face shield are recommended. Select eye protection in accordance with OSHA 29 CFR 1910.133.

Respiratory Protection. None required under normal use. An air-supplied respirator must be used in confined spaces. Respiratory protection must conform to OSHA 29 CFR 1910.134. Select per OSHA 29 CFR 1910.134 and ANSI Z88.2.

9. Physical and Chemical Properties

APPEARANCE:	Colorless cryogenic liquid.
ODOR:	Faint, sweet, musty odor
ODOR THRESHOLD:	Not available.
PHYSICAL STATE:	Cryogenic liquid.
pH:	Not applicable.

MELTING POINT at 1 atm:	-272.45°F (-169.4°C)
BOILING POINT at 1 atm:	-154.62°F (-103.68°C)
FLASH POINT (test method):	-213°F (-136°C) CC
EVAPORATION RATE (Butyl Acetate = 1):	High
FLAMMABILITY:	Flammable
FLAMMABLE LIMITS IN AIR , % by volume:	LOWER: 2.7% UPPER: 36%
VAPOR PRESSURE at 68°F (20°C):	Not available.
VAPOR DENSITY at 32°F (0°C) and 1 atm:	0.0787 lb/ft ³ (1.261 kg/m ³)
SPECIFIC GRAVITY (H ₂ O = 1) at boiling point:	0.568
SPECIFIC GRAVITY (Air = 1) at 32°F (0°C) and 1 atm:	0.978
SOLUBILITY IN WATER vol/vol at 32°F (0°C) and 1 atm:	0.26
PARTITION COEFFICIENT: n-octanol/water:	Not available.
AUTOIGNITION TEMPERATURE:	914°F (490°C)
DECOMPOSITION TEMPERATURE:	Not available.
PERCENT VOLATILES BY VOLUME:	100
MOLECULAR WEIGHT:	28.05
MOLECULAR FORMULA:	C ₂ H ₄

10. Stability and Reactivity

CHEMICAL STABILITY: Unstable Stable

CONDITIONS TO AVOID: Elevated temperature and pressure

INCOMPATIBLE MATERIALS: Chlorine (reacts with explosively in sunlight or UV light), oxidizing agents, halogens, acids, aluminum chloride, halocarbons

HAZARDOUS DECOMPOSITION PRODUCTS: Thermal decomposition or burning may produce carbon monoxide/carbon dioxide.

POSSIBILITY OF HAZARDOUS REACTIONS: May Occur Will Not Occur

Highly flammable. May explode in the presence of certain incompatible materials.

11. Toxicological Information

ACUTE DOSE EFFECTS: Not available.

STUDY RESULTS: None known.

12. Ecological Information

ECOTOXICITY: No known effects.

OTHER ADVERSE EFFECTS: No adverse ecological effects expected. Ethylene does not contain any Class I or Class II ozone-depleting chemicals.

13. Disposal Considerations

WASTE DISPOSAL METHOD: Do not attempt to dispose of residual or unused quantities. Return cylinder to supplier.

14. Transport Information

DOT/IMO SHIPPING NAME: Ethylene, refrigerated liquid

HAZARD CLASS:	PACKING GROUP/Zone:	IDENTIFICATION NUMBER:	PRODUCT RQ:
2.1	NA/NA*	UN1038	None

SHIPPING LABEL(s): FLAMMABLE GAS

PLACARD (when required): FLAMMABLE GAS

*NA = Not applicable.

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

Shipment of compressed gas cylinders that have been filled without the owner's consent is a violation of federal law [49 CFR 173.301(b)].

MARINE POLLUTANTS: Ethylene is not listed as a marine pollutant by DOT.

15. Regulatory Information

The following selected regulatory requirements may apply to this product. Not all such requirements are identified. Users of this product are solely responsible for compliance with all applicable federal, state, and local regulations.

U.S. FEDERAL REGULATIONS:

EPA (ENVIRONMENTAL PROTECTION AGENCY)

CERCLA: COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT OF 1980 (40 CFR Parts 117 and 302):

Reportable Quantity (RQ): None

SARA: SUPERFUND AMENDMENT AND REAUTHORIZATION ACT:

SECTIONS 302/304: Require emergency planning based on Threshold Planning Quantity (TPQ) and release reporting based on Reportable Quantities (RQ) of Extremely Hazardous Substances (EHS) (40 CFR Part 355):

TPQ: None

EHS RQ (40 CFR 355): None

SECTIONS 311/312: Require submission of MSDSs and reporting of chemical inventories with identification of EPA hazard categories. The hazard categories for this product are as follows:

IMMEDIATE: Yes

DELAYED: No

PRESSURE: Yes

REACTIVITY: No

FIRE: Yes

SECTION 313: Requires submission of annual reports of release of toxic chemicals that appear in 40 CFR Part 372.

Ethylene is subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA) and 40CFR Part 372.

40 CFR 68: RISK MANAGEMENT PROGRAM FOR CHEMICAL ACCIDENTAL RELEASE PREVENTION: Requires development and implementation of risk management programs at facilities that manufacture, use, store, or otherwise handle regulated substances in quantities that exceed specified thresholds.

Ethylene is listed as a regulated substance in quantities of 10,000 lb (4536 kg) or greater.

TSCA: TOXIC SUBSTANCES CONTROL ACT: Ethylene is listed on the TSCA inventory.

OSHA: OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION:

29 CFR 1910.119: PROCESS SAFETY MANAGEMENT OF HIGHLY HAZARDOUS CHEMICALS: Requires facilities to develop a process safety management program based on Threshold Quantities (TQ) of highly hazardous chemicals.

Ethylene is not listed in Appendix A as a highly hazardous chemical. However, any process that involves a flammable liquid on site in one location in quantities of 10,000 lb (4536 kg) or greater is covered under this regulation unless the liquid is used as a fuel.

STATE REGULATIONS:

CALIFORNIA: Ethylene is not listed by California under the SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT OF 1986 (Proposition 65).

PENNSYLVANIA: Ethylene is subject to the PENNSYLVANIA WORKER AND COMMUNITY RIGHT-TO-KNOW ACT (35 P.S. Sections 7301-7320).

16. Other Information

Be sure to read and understand all labels and instructions supplied with all containers of this product.

OTHER HAZARDOUS CONDITIONS OF HANDLING, STORAGE, AND USE: *Extremely cold, flammable liquid and gas under pressure.* Store and use with adequate ventilation. **Use only in a closed system.** Use piping and equipment designed to withstand pressures and temperatures to be encountered. Use a backflow prevention device in any piping. Praxair recommends piping all vents to the exterior of the building. **All piped ethylene systems and associated equipment must be grounded.** Electrical equipment must be non-sparking or explosion-proof. **Never work on a pressurized system.** If a leak occurs, close the cylinder valve and blow the system down by venting vapor to a safe place; then repair the leak. Leak check with soapy water; never use a flame. **Never place a compressed gas cylinder where it may become part of an electrical circuit.**

NOTE: Prior to using any plastics, confirm their compatibility with ethylene.

Mixtures. When you mix two or more gases or liquefied gases, you can 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 evaluate the end product. Remember, gases and liquids have properties that can cause serious injury or death.

HAZARD RATING SYSTEMS:**NFPA RATINGS:**

HEALTH = 3
FLAMMABILITY = 4
INSTABILITY = 2
SPECIAL = None

HMIS RATINGS:

HEALTH = 3
FLAMMABILITY = 4
PHYSICAL HAZARD = 2

STANDARD VALVE CONNECTIONS FOR U.S. AND CANADA:

TREADED: CGA-350
PIN-INDEXED YOKE: Not applicable.
ULTRA-HIGH-INTEGRITY CONNECTION: Not applicable.

Use the proper CGA connections. **DO NOT USE ADAPTERS.** Additional limited-standard connections may apply. See CGA pamphlet V-1 listed below.

Ask your supplier about free Praxair safety literature as referred to in this MSDS and on the label for this product. Further information can be found in the following materials published by the Compressed Gas Association, Inc. (CGA), 4221 Walney Road, 5th Floor, Chantilly, VA 20151-2923, Telephone (703) 788-2700, <http://www.cganet.com/Publication.asp>.

AV-1 *Safe Handling and Storage of Compressed Gases*
P-1 *Safe Handling of Compressed Gases in Containers*
P-2 *Characteristics and Safe Handling of Medical Gases*
P-12 *Safe Handling of Cryogenic Liquids*
P-39 *Oxygen-Rich Atmospheres*
SB-2 *Oxygen-Deficient Atmospheres*
V-1 *Compressed Gas Cylinder Valve Inlet and Outlet Connections*
— *Handbook of Compressed Gases, Fourth Edition*

Praxair asks users of this product to study this MSDS and become aware of product hazards and safety information. To promote safe use of this product, a user should (1) notify employees, agents, and contractors of the information in this MSDS and of any other known product hazards and safety information, (2) furnish this information to each purchaser of the product, and (3) ask each purchaser to notify its employees and customers of the product hazards and safety information.

The opinions expressed herein are those of qualified experts within Praxair, Inc. We believe that the information contained herein is current as of the date of this Material Safety Data Sheet. Since the use of this information and the conditions of use of the product are not within the control of Praxair, Inc., it is the user's obligation to determine the conditions of safe use of the product.

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