

MATERIAL SAFETY DATA SHEET

SECTION 1. PRODUCT IDENTIFICATION

PRODUCT NAME: Ethylene

CHEMICAL NAME: Alkene; Unsaturated Aliphatic Hydrocarbon **FORMULA:** C₂H₄

SYNONYMS: Liquid Olefiant Gas, Ethene, Elayl, Etherin, Bicarburetted Hydrogen

MANUFACTURER: Air Products and Chemicals, Inc.

7201 Hamilton Boulevard

Allentown, PA 18195-1501

PRODUCT INFORMATION: (800) 752-1597

MSDS NUMBER: 1046 **REVISION:** 5

REVIEW DATE: July 1999 **REVISION DATE:** July 1999

SECTION 2. COMPOSITION / INFORMATION ON INGREDIENTS

Ethylene is sold as pure product (>98%).

CAS NUMBER: 74-85-1

EXPOSURE LIMITS:

OSHA: None established **ACGIH:** Simple asphyxiant **NIOSH:** None established

SECTION 3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW

Ethylene is a colorless, flammable gas with a slightly sweet odor. Ethylene poses an immediate fire hazard when mixed with air. The gas may spread long distances. Distant ignition and flashback are possible. This gas acts as a simple asphyxiant and presents a significant health hazard by displacing the oxygen in the atmosphere. High concentrations that can cause rapid suffocation are within the flammable range and must not be entered. Flame or high temperature impinging on a localized area of the cylinder of this product can cause the cylinder to burst or rupture without activating the cylinder's relief devices. This product can undergo a violent chemical reaction at elevated temperatures. Provide adequate fire protection during emergency response situations, and wear personal protective equipment to protect against potential health hazards posed by Ethylene. Do not attempt to extinguish fire without stopping the flow of the gas.

EMERGENCY TELEPHONE NUMBERS

(800) 523-9374 Continental U.S., Canada, and Puerto Rico

1. 481-7711 Other locations

ACUTE POTENTIAL HEALTH EFFECTS:

ROUTES OF EXPOSURE:

EYE CONTACT: Eye contact with Ethylene is not expected to cause symptoms, except possible freezing from the rapid release of the gas.

INGESTION: Ingestion of Ethylene is not a likely route of industrial exposure.

INHALATION: Exposure to very high concentrations of Ethylene (20% or greater) can cause anesthetic effects. High concentrations of this gas can also cause an oxygen-deficient environment. It should be noted that before suffocation could occur, the lower flammability limit of ethylene in air would be exceeded; causing both an oxygen-deficient and explosive atmosphere. Individuals breathing such an atmosphere may experience symptoms which include headaches, ringing in ears, dizziness, drowsiness, unconsciousness,

nausea, vomiting and depression of all the senses. Under some circumstances of over-exposure, death may occur. The skin of a victim of overexposure may have a blue color.

SKIN CONTACT: Contact with liquid or rapidly expanding gases (which are released under high pressure) may cause frostbite. Symptoms of frostbite include change in skin color to white or grayish-yellow. The pain after contact with liquid can quickly subside.

POTENTIAL HEALTH EFFECTS OF REPEATED EXPOSURE:

ROUTE OF ENTRY: None for repeated exposure.

SYMPTOMS: There are currently no known adverse health effects associated with chronic exposure to Ethylene.

TARGET ORGANS: None known

MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE: Acute or chronic respiratory conditions may be aggravated by over-exposure to this product.

CARCINOGENICITY: Ethylene is listed as an IARC Group 3 Compound (Not Classifiable in terms of Human Carcinogenicity).

SECTION 4. FIRST AID MEASURES

EYE CONTACT: If contact with Ethylene and the eyes results in damage, open victim's eyes while under gentle running water. Use sufficient force to open eyelids. Have victim "roll" eyes. Minimum flushing is for 15 minutes. Victim must seek immediate medical attention from an ophthalmologist.

INGESTION: Ingestion of Ethylene is not a likely route of industrial exposure.

INHALATION: Remove victim(s) to fresh air, as quickly as possible. Trained personnel should administer supplemental oxygen and/or cardio-pulmonary resuscitation, if necessary.

SKIN CONTACT: In case of frostbite, place the frostbitten part in warm water. DO NOT USE HOT WATER. If warm water is not available, or is impractical to use, wrap the affected parts gently in blankets. Alternatively, if the fingers or hands are frostbitten, place the affected area in the armpit. Encourage victim to gently exercise the affected part while being warmed. Seek immediate medical attention.

NOTES TO PHYSICIANS: Administer oxygen, if necessary and treat symptoms.

SECTION 5. FIRE FIGHTING MEASURES

FLASH POINT: AUTOIGNITION: FLAMMABLE RANGE:

Not applicable 842 ° F (450 ° C) (LEL): 2.7% (UEL): 36.0%

EXTINGUISHING MEDIA: Extinguish Ethylene fires by shutting-off the source of the gas. Use water spray or a foam agent to cool fire-exposed containers, structures, and equipment.

SPECIAL FIRE-FIGHTING PROCEDURES: Evacuate all personnel from area. If possible without risk, shut off source of gas, then fight fire according to types of materials burning. Extinguish fire only if gas flow can be stopped. This will avoid possible accumulation and reignition of a flammable gas mixture. Keep adjacent containers of this product cool by spraying with large amounts of water until the fire burns itself out. Use a water spray or fog to reduce or direct vapors. For small releases, if it is not possible to stop the leak, and it does not endanger personnel, let the fire burn itself out. Incipient fire responders should wear eye protection. Structural fire fighters must wear Self-Contained Breathing Apparatus and full protective equipment, including fire resistant clothing. Large fires should be fought from a distance with an unmanned hose holder or monitor nozzles. If necessary, decontaminate fire-response equipment with soap and water solution.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Most cylinders are designed to vent contents when exposed to elevated temperatures. Pressure in a cylinder can build-up due to heat and it may rupture if pressure relief devices should fail to function.

HAZARDOUS COMBUSTION PRODUCTS: If Ethylene is involved in a fire, it may ignite to yield toxic fumes of carbon monoxide.

SECTION 6. ACCIDENTAL RELEASE MEASURES

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED: Evacuate immediate area. Eliminate any possible sources of ignition and provide maximum explosion-proof ventilation. Shut off source of leak, if possible. Isolate any leaking cylinder. If leak is from container, pressure relief device or its valve, contact your supplier. If leak is in user's system, close cylinder valve, safely vent pressure and purge with inert gas before attempting repairs.

Protection of all personnel and the area must be maintained. All responders must be adequately protected from exposure. Monitoring should be done for the levels of Ethylene and oxygen. The atmosphere must have at least 19.5% oxygen before personnel can be allowed in the area without Self-Contained Breathing Apparatus. Combustible vapor levels must be below 0.54%, which is 20% of the LEL of Ethylene, prior to entry.

SECTION 7. HANDLING AND STORAGE

STORAGE: Store cylinders in a well-ventilated, secure area, protected from the weather. Cylinders should be stored up-right with valve outlet seals and valve protection caps in place. Storage should be away from heavily traveled areas and emergency exits. There should be no sources of ignition. All electrical equipment should be explosion-proof in the storage areas. Storage areas must meet National Electrical Codes for Class 1 hazardous areas. Flammable storage areas must be separated from oxygen and other oxidizers by a minimum distance of 20 ft. or by a barrier of non-combustible material at least 5 ft. high, having a fire resistance rating of at least 1/2 hour. Post "No Smoking or Open Flames" signs in the storage and use areas. Do not allow storage temperature to exceed 125 ° F (52 ° C). 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. Consideration should be taken to install leak detection and alarm equipment for storage areas.

HANDLING: Do not drag, roll, slide or drop cylinder. Use a suitable hand truck designed for cylinder movement. Never attempt to lift a cylinder by its cap. Secure cylinders at all times while in use. Use a pressure reducing regulator to safely discharge product from cylinder. Use a check valve to prevent reverse flow into cylinder. Use piping and equipment adequately designed to withstand pressures to be encountered. Never apply flame or localized heat directly to any part of the cylinder. Once cylinder has been connected to properly purged and inerted process, open cylinder valve slowly and carefully. If user experiences any difficulty operating cylinder valve, discontinue use and contact supplier. Never insert an object (e.g., wrench, screwdriver, etc.) into valve cap openings. Doing so may damage valve, causing a leak to occur. Use an adjustable strap-wrench to remove over-tight or rusted caps. All piped systems and associated equipment must be grounded. Electrical equipment should be non-sparking or explosion-proof.

SPECIAL PRECAUTIONS: Always store and handle compressed gas cylinders in accordance with Compressed Gas Association, Inc. (telephone 703-412-0900) pamphlet CGA P-1, *Safe Handling of Compressed Gases in Containers*. Local regulations may require specific equipment for storage and use.

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

ENGINEERING CONTROLS:

VENTILATION: Provide adequate natural or explosion-proof ventilation to prevent accumulation of gas concentrations and adequate to ensure Ethylene does not reach its lower flammability limit of 2.7%.

RESPIRATORY PROTECTION: High concentrations that can cause rapid suffocation are within the flammable range and must not be entered.

Emergency Use: Self-contained breathing apparatus (SCBA) should be used.

EYE PROTECTION: Chemical goggles or safety glasses. Ensure eyewash/safety shower stations are available near areas where this product is used.

SKIN PROTECTION: Work gloves are recommended when handling cylinders. Use fire-resistant gloves and clothing in emergency situations. Use a combination of leather over rubber gloves for spill response.

OTHER PROTECTIVE EQUIPMENT: Use personal protective equipment appropriate for task. Static-resistant clothing is recommended. Safety shoes are recommended when handling cylinders.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE, ODOR AND STATE: Colorless gas with a sweet odor.

MOLECULAR WEIGHT: 28.05

BOILING POINT (1 atm): -154.8 ° F (-103.8 ° C)

SPECIFIC GRAVITY (also called vapor density) (air = 1): 0.968

FREEZING/MELTING POINT: -272.5 ° F (-169.2 ° C)

VAPOR PRESSURE: Not applicable

GAS DENSITY (At 70 ° F (21.1 ° C) at 1 atm): 0.073 lb/ft³

SOLUBILITY IN WATER (vol/vol at 0 ° C (32 ° F)): 0.26

SECTION 10. STABILITY AND REACTIVITY

CHEMICAL STABILITY: Stable at standard temperatures and pressures. At high temperatures and pressures, this product can polymerize.

CONDITIONS TO AVOID: Cylinders should not be exposed to temperatures in excess of 125 ° F (52 ° C).

INCOMPATIBILITY (Materials to Avoid): Ethylene may react violently with the following materials: Strong oxidizers (such as chlorine, bromine pentafluoride, oxygen, oxygen difluoride, and nitrogen trifluoride); aluminum chloride, organic peroxides, nitrogen dioxide, and ozone. Can react violently with carbon tetrachloride, chlorine, mercury oxide, silver oxide, and copper at high temperatures.

REACTIVITY:

A) HAZARDOUS DECOMPOSITION PRODUCTS: Not applicable

B) HAZARDOUS POLYMERIZATION: May occur at elevated temperatures.

SECTION 11. TOXICOLOGICAL INFORMATION

LC₅₀ (Inhalation): The 4-hour LC₅₀ in rats is greater than 500,000 ppm.

LD₅₀ (Oral): No data currently available.

LD₅₀ (Dermal): No data currently available.

CARCINOGENICITY: Rats exposed to 3000 ppm of ethylene, 6 hours/day, 5 days/week for 106 days exhibited no chronic toxicological or carcinogenic effects.

SKIN CORROSIVITY: Ethylene is not corrosive to the skin.

ADDITIONAL NOTES: Ethylene is a CNS depressant and acts as a simple asphyxiant and anesthetic. Rats exposed to Ethylene at concentrations of up to 10,000 ppm, 6 hours/day, 5 days/week for 14 weeks, showed no toxic effects. Ethylene was not mutagenic in a bacterial (Ames salmonella) assay conducted with and without metabolic activation.

SECTION 12. ECOLOGICAL INFORMATION

AQUATIC TOXICITY: Currently, no aquatic toxicity data are available for Ethylene.

MOBILITY: No data is currently available on the mobility of Ethylene.

PERSISTENCE AND BIODEGRADABILITY: Water Solubility = 1 vol./4 vol. at 0° C and 1 vol./9 vol. at 25 ° C.

POTENTIAL TO BIOACCUMULATE: Log K_{ow} = 1.13, Ethylene does not bioconcentrate in aquatic organisms.

REMARKS: Ethylene does not contain any Class I or Class II ozone depleting chemicals (40 CFR Part 82).

SECTION 13. DISPOSAL CONSIDERATIONS

UNUSED PRODUCT / EMPTY CONTAINER: Return container and unused product to supplier. Do not attempt to dispose of residual or unused quantities.

DISPOSAL INFORMATION: Residual product in the system may be burned if suitable burning unit (flair incinerator) is available on-site. This shall be done in accordance with Federal, State and local regulations. Wastes containing this material may be classified by EPA as a hazardous waste by characteristic (such as Ignitability, Corrosivity, Toxicity, Reactivity). Waste streams must be characterized by the user to meet Federal, State and local requirements.

SECTION 14. TRANSPORT INFORMATION

DOT SHIPPING NAME: Ethylene, Compressed

HAZARD CLASS: 2.1

IDENTIFICATION NUMBER: UN1962

SHIPPING LABEL(S): Flammable Gas

PLACARD (When required): Flammable Gas

SPECIAL SHIPPING INFORMATION: Cylinders should be transported in a secure upright position in a well-ventilated truck. Never transport in passenger compartment of a vehicle. Ensure cylinder valve is properly closed, valve outlet cap has been reinstalled, and valve protection cap is secured before shipping cylinder.

CAUTION: Compressed gas cylinders shall not be refilled except by qualified producers of compressed gases. Shipment of a compressed gas cylinder which has not been filled by the owner or with the owner's written consent is a violation of Federal law (49 CFR 173.301).

NAERG (NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK) #: 116P

SECTION 15. REGULATORY INFORMATION

U.S. FEDERAL REGULATIONS:

EPA - ENVIRONMENTAL PROTECTION AGENCY:

CERCLA: Comprehensive Environmental Response, Compensation, and Liability Act of 1990

(40 CFR Parts 117 and 302).

Reportable Quantity (RQ): Not applicable

SARA TITLE III: Superfund Amendment and Reauthorization Act

SECTIONS 302/304: Emergency Planning and Notification (40 CFR Part 355)

Extremely Hazardous Substances: Ethylene is not listed.

Threshold Planning Quantity (TPQ): Not applicable

Reportable Quantity (RQ): Not applicable

SECTIONS 311/312: Hazardous Chemical Reporting (40 CFR Part 370)

IMMEDIATE HEALTH: No PRESSURE: Yes

DELAYED HEALTH: No REACTIVITY: Yes

FIRE: Yes

SECTION 313: Toxic Chemical Release Reporting (40 CFR 372)

Releases of Ethylene require reporting under Section 313.

CLEAN AIR ACT:

SECTION 112 (r): Risk Management Programs for Chemical Accidental Release

(40 CFR Part 68)

Ethylene is listed as a regulated substance under Section 112 (r).

Threshold Planning Quantity (TPQ): 10,000 lbs (4,553 kg)

TSCA: Toxic Substances Control Act

Ethylene is listed on the TSCA Inventory.

OSHA - OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION:

29 CFR Part 1910.119: Process Safety Management of Highly Hazardous Chemicals.

Ethylene is not listed in Appendix A as a highly hazardous chemical.

Threshold Planning Quantity (TPQ): Under this regulation, however, any process that involves a flammable gas on-site, in one location, in quantities of 10,000 lbs (4,553 kg) or greater is covered under this regulation unless it is used as a fuel.

STATE REGULATIONS:

CALIFORNIA:

Proposition 65: Ethylene is not a listed substance which the State of California requires warning under this statute.

SECTION 16. OTHER INFORMATION

NFPA RATINGS: HMIS RATINGS:

HEALTH: = 1 HEALTH: = 1

FLAMMABILITY: = 4 FLAMMABILITY: = 4

REACTIVITY: = 2 REACTIVITY: = 2

SPECIAL: None