

Material Safety Data Sheet

Material Name: Ethylene**MSDS ID: NOVA-0017**

Section 1 - Product and Company Identification

Synonyms: Ethylene, Ethene**Chemical Name:** Ethylene**Chemical Family:** Petrochemical**Material Use:** Feedstock for chemical and polymer synthesis**Chemical Formula:** C₂H₄**NOVA Chemicals**

P.O. Box 2518, Station M

Calgary, Alberta, Canada T2P 5C6

In Case of Emergency:**1-800-561-6682, 1-403-314-8767 (NOVA Chemicals)(24 hours)****1-800-424-9300 (CHEMTREC-USA)****1-613-996-6666 (Canutec-Canada)(24 hours)****Product Information:** 1-412-490-4063**General Comments**

This product has been assigned a CAS# of 74-85-1

Section 2 - Composition / Information on Ingredients

CAS #	Component	Percent by Wt.
74-85-1	Ethylene	>99.9

Additional Information

This product is considered to be hazardous under 29 CFR 1910.1200 (Hazard Communication).

This material is regulated as a hazardous material for transportation.

This material is a controlled product under Canadian WHMIS regulations.

See Section 8 for applicable exposure limits. See Section 11 for applicable toxicity data.

Section 3 - Hazards Identification

HMIS Ratings: Health: 1 Fire: 4 Physical Hazard: 2 Personal Protection: chemical goggles, gloves, respirator*Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe * = Chronic hazard***NFPA Ratings: Health: 1 Fire: 4 Reactivity: 2***Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe***Emergency Overview**

DANGER EXTREMELY FLAMMABLE LIQUEFIED GAS This product is a colourless liquefied gas while under high pressure with a sweet hydrocarbon odor. Ethylene is highly volatile, when released it will disperse as a highly flammable vapor cloud. Consider need for immediate emergency isolation and evacuation. Vapors may travel to some distant source and flash back. **DO NOT ATTEMPT TO EXTINGUISH A GAS FIRE UNLESS LEAK SOURCE CAN BE ISOLATED AND SHUT OFF.** Contact with liquefied gas may cause frostbite.

Excessive inhalation of this material causes headache, dizziness, nausea and loss of coordination and in extreme conditions coma and possibly death.

Potential Health Effects: Eyes

Contact of the eyes with the liquefied gas may cause severe injury or frostbite. Gas may be mildly irritating.

Potential Health Effects: Skin

Contact of the skin with the liquefied gas may result in severe blistering, injury or frostbite. Gas may be mildly irritating. Product does not penetrate through the skin.

Potential Health Effects: Ingestion

Ingestion of this product is extremely unlikely. However, contact of the mouth or throat with the liquefied gas may result in serious injury or frostbite.

Potential Health Effects: Inhalation

This product is a mildly narcotic asphyxiant gas that can cause unconsciousness/death if OXYGEN levels are sufficiently reduced. Excessive inhalation of this material causes headache, dizziness, nausea and loss of coordination, and in extreme conditions coma and possibly death. High concentrations may trigger heartbeat irregularities.

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Section 4 - First Aid Measures

First Aid: Eyes

Remove contact lenses, if worn. Immediately flush eyes with lukewarm water for at least 15 minutes, while holding eyelids open. Seek medical attention at once.

First Aid: Skin

Thaw frostbite slowly with lukewarm water. DO NOT RUB affected area. Do not pull off adherent clothing or objects. Seek medical attention at once.

First Aid: Inhalation

Remove affected individual to fresh air immediately. Loosen tight clothing such as a collar, tie, belt, or waistband to facilitate breathing. Seek immediate medical attention if the individual is not breathing.

First Aid: Ingestion

DO NOT induce vomiting. Examine the lips and mouth to ascertain whether the tissues are damaged. Thaw frostbite in mouth slowly with lukewarm water if the exposed individual is conscious, ensuring that the individual does not gag or choke. Loosen tight clothing such as a collar, tie, belt or waistband. If the exposed individual is not breathing, qualified personnel should perform emergency rescue resuscitation. Seek immediate medical attention.

First Aid: Notes to Physician

For more detailed medical emergency support information call 1-800-561-6682 (NOVA Chemicals Emergency Response, 24 hours).

Treat unconsciousness, frostbite nausea, hypotension, seizures and cardiac arrhythmias in the conventional manner. Sympathomimetics or catecholamines should be avoided or used with caution (lowest effective dose) because of possible cardiac sensitization. Administer oxygen by mask if there is respiratory distress.

Section 5 - Fire Fighting Measures

Flammability Class:	Extremely Flammable	Flash Point:	Extremely low: -136°C (-212°F)
Upper flammability limit:	28.6 to 36%	Flash Point Method:	Closed cup
Lower flammability limit:	2.3 to 3.02%	Auto Ignition:	450°C (842°F) to 490°C (914°F)

General Fire Hazards

Pipeline and container explosion hazards are extremely high when this product is exposed to heat or flame. May BLEVE explosively when heated or involved in a fire. Use massive quantities of water to cool fire-exposed pipelines or containers. Immediately withdraw in case of fire and tank venting or heat discoloration of a tank. Vapors may travel to some distant source of ignition and flash back. DO NOT ATTEMPT TO EXTINGUISH A GAS FIRE UNLESS LEAK SOURCE CAN BE ISOLATED AND SHUT OFF. Be aware of possibility of re-ignition. When pressure in a container needs to be controlled consider setting up emergency flaring. Consider need for immediate emergency isolation and evacuation for at least 800 meters (1/2 mile. If tank is involved in a fire, ISOLATE for 1600 meters (1 mile) in all directions.

Explosion Hazards

Highly explosive in the presence of sparks, fire, heat and oxidizing agents. Vapors may form an explosive mixture with air. Containers may explode when heated and rocket away. Keep containers away from source of heat or fire. Evacuate personnel 1/2 mile to one mile (2 kilometers) distance if during a fire, a rupture of a pipeline or major vessel is possible.

Hazardous Combustion Products

Upon decomposition, this product emits carbon monoxide, carbon dioxide, and/or low molecular weight hydrocarbons.

Extinguishing Media

Dry chemical, foam, carbon dioxide, and water fog. Do not use water jets. Adding water directly to pooled liquid will heat liquid and increase evolution of highly flammable gas. Foam cover may help suppress evolution of flammable gas.

DO NOT ATTEMPT TO EXTINGUISH A LEAKING GAS FIRE UNLESS LEAK SOURCE CAN BE ISOLATED AND SHUT OFF. Let uncontrolled fires burn off.

Use massive quantities of water to cool fire-exposed containers and to protect personnel. Monitor water run-off for flammability, and prevent from entering drains and sewers, or other confined or underground spaces.

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Fire Fighting Equipment/Instructions

Position upwind. Keep unnecessary personnel away. Set up to fight fire at a safe distance, using unmanned hose monitors where possible. If safe to do so, attempt to turn leaking containers so that gas instead of liquid escapes. Fire fighters should wear full-face, self-contained breathing apparatus and thermal protective clothing. Avoid inhaling combustion products. Immediately withdraw in case of fire and tank venting or heat discoloration of a tank. Let uncontrolled fires burn off. Maintain isolation until air testing confirms all gas has been dispersed.

Section 6 - Accidental Release Measures

Evacuation Procedures

Isolate area. Keep unnecessary personnel away.

Small Spills

Isolate spill or leak area for 50-100 meters (165-320 feet). Eliminate all potential ignition sources. Stop leak remotely or when safe to do so. Ground all approved equipment used in area. Keep area isolated until any detectable flammable gas has been dispersed.

Large Spills

Consider initial downwind evacuation for at least 800 meters (1/2 mile). Eliminate all potential ignition sources. Stop leak remotely or when safe to do so. Alert stand-by emergency and fire fighting personnel. Monitor surrounding area for build-up of flammable gas concentrations. Ground all approved equipment used in area. Evacuate personnel to upwind of the spill area, and position at a safe distance. Personnel who are required to enter the spill area must wear SCBA and other appropriate thermal protective equipment. Prevent flammable vapors or liquids from entering drains and sewers, or other confined or underground structures. High expansion foam cover may help suppress evolution of flammable gas. Accumulations of gas may persist in low areas. Keep area isolated until any detectable flammable gas has been dispersed.

Special Procedures

Contact local police/emergency services and appropriate emergency telephone numbers provided in Section 1. Ensure that statutory and regulatory reporting requirements in the applicable jurisdiction are met. Individuals without appropriate protective equipment should be excluded from area of spill until cleanup has been completed. Wear appropriate protective equipment and clothing during clean-up.

Section 7 - Handling and Storage

Handling Procedures

Handle in fully enclosed, grounded, properly designed and approved liquefied pressurized gas systems. Keep away from heat and ignition sources. Avoid skin and eye contact. Wear suitable protective equipment including thermally protective gloves. No smoking or open flames permitted in storage, use or handling areas. Dissipate static electricity during transfer by grounding and bonding containers and equipment. Where possible, collect and flare vents. If used in refrigeration- check drains are not plugged and valves are working and not plugged by ice formed from the vaporizing liquid.

Incompatibility

Product is moderately reactive, and may polymerize, decompose, or become self-reactive under certain conditions of shock, high temperatures, high pressures, or contamination. Product can react with water to form hydrates. Avoid strong acids, strong oxidizing agents, chlorine, halogens, organic peroxides, ozone and nitrogen dioxide. Many materials become brittle after contact with liquefied gases, and may fail without warning. Carefully select and test equipment, gaskets, and hoses periodically to ensure integrity and compatibility.

Storage Procedures

Storage area should be clearly identified, well illuminated, clear of obstruction and accessible only to trained and authorized personnel. Store in grounded, properly designed and approved pressure containers and away from incompatible materials. Store and use away from heat, sparks, open flame, or any other ignition source. Store according to applicable codes or regulations for liquefied pressurized gases as applicable to cylinders, vessels, piping, buildings, rooms, cabinets, allowable quantities and minimum storage distances. Have appropriate extinguishing capability in storage area (e.g. sprinkler system, portable fire extinguishers, and flammable gas detectors). Equip storage vessel vents with a flame arrestor. Storage pressure vessels should be above ground and diked. Keep cylinders secure while in storage or in transportation.

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Section 8 - Exposure Controls / Personal Protection

Exposure Guidelines

A: General Material Information

Refer to published exposure limits - utilize effective control measures and PPE to maintain worker exposure to concentrations that are below these limits. Maintain workplace air levels below the occupational exposure limits and 10% of the Lower Flammability Limit (LFL).

B: Component Exposure Limits

ACGIH, OSHA, NIOSH, EPA, TSCA, Alberta, and Ontario exposure limit lists have been checked for major components listed with CAS registry numbers. Other exposure limits may apply, check with proper authorities.

Ethylene (74-85-1)

ACGIH: 200 ppm TWA; A4 - Not Classifiable as a Human Carcinogen

ENGINEERING CONTROLS

Engineering control methods to reduce hazardous exposure are preferred. Methods include mechanical ventilation (dilution and local exhaust), process or personal enclosure, control of process conditions, and process modification. Administrative controls and personal protective equipment may also be required. Use a non-sparking grounded ventilation system separate from other process exhaust ventilation systems. Exhaust ventilation systems directly to the outside. Supply sufficient replacement air to make up for air removed by exhaust systems.

PERSONAL PROTECTIVE EQUIPMENT

Personal Protective Equipment: Eyes/Face

Use safety glasses. Use of chemical goggles under a full-face shield is recommended if contact with liquefied gas is possible.

Personal Protective Equipment: Skin/Hands/Feet

Wear special gloves, footwear and clothing designed to prevent freezing of body tissues if contact with liquefied gas is possible. Fire resistant or natural fiber clothing is recommended. Synthetic clothing can generate static electricity and is not recommended where flammable vapor release may occur.

Personal Protective Equipment: Respiratory

The use of respiratory protection is recommended only when airborne concentrations and oxygen content cannot be adequately controlled by ventilation or outdoor conditions. Use air-supplied breathing apparatus devices (NIOSH approved).

Personal Protective Equipment: General

Personal protective equipment (PPE) should not be considered a long-term solution to exposure control. Employer programs to properly select, fit, maintain, and train employees to use equipment must accompany PPE. Consult a competent industrial hygiene resource, the PPE manufacturer's recommendation, and/or applicable regulations to determine hazard potential and ensure adequate protection.

Section 9 - Physical & Chemical Properties

Physical state and appearance:	Gas at room temperature, liquefied under pressure	Color:	Colorless
Odor:	Sweet, faint	Odor threshold:	270-600 ppm
Heat of Vaporization at Critical Temperature:	3.07 BTU/lb @ 9.2°C (48.5 °F)	Vapor Pressure:	5168 kPa @10°C; 6470 kPa @21°C
Critical Pressure:	731 psia	Dispersion properties:	Partially dispersed in cold water, hot water, alcohols, ethers
Vapor Density (Air=1):	0.975	Melting Point:	-169°C (-270°F)
Boiling Point:	-104°C/-155°F	Specific Gravity (Water=1):	Estimates vary (gas) from 0.35 to 0.98
Solubility (H2O):	Negligible, 131mg/l @20°C	Evaporation Rate (n-Butyl Acetate=1):	Fast; gas at 20°C
Octanol/H2O Coeff.: Softening Point:	log Kow = 1.13Not applicable	Percent Volatile:	100%

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Section 10 - Stability & Reactivity Information

Chemical Stability

This is a stable material.

Chemical Stability: Conditions to Avoid

Product is moderately reactive, and may polymerize, decompose, or become self-reactive under certain conditions of shock, high temperatures, high pressures, or contamination. Keep away from heat, sparks, or open flame. Many materials become brittle after contact with liquefied gases, and may fail without warning. Carefully select and test equipment, gaskets, and hoses periodically to ensure integrity and compatibility.

Incompatibility

Product can react with water to form hydrates. Avoid strong acids, strong oxidizing agents, chlorine, halogens, organic peroxides, ozone and nitrogen dioxide. Many materials become brittle after contact with liquefied gases, and may fail without warning. Carefully select and test equipment, gaskets, and hoses periodically to ensure integrity and compatibility.

Hazardous Polymerization

Hazardous polymerization can occur at elevated temperature and pressure in the presence of a catalyst

Corrosivity

Not considered to be corrosive.

Hazardous Decomposition

Upon decomposition, this product emits carbon monoxide, carbon dioxide and/or low molecular weight hydrocarbons.

Special Remarks

May polymerize explosively when heated or involved in a fire. Vapors may form an explosive mixture with air. May react vigorously with oxidizing agents. Liquefied gas may explode on contact with hot water (45-75 °C).

Section 11 - Toxicological Information

A: Acute Toxicity - General Material Information

This product is not considered acutely toxic. The liquefied form will cause freezing burns (frostbite) to the eyes and skin. At very high exposures, ethylene gas produces an anesthetic effect. Excessive exposures may cause headache, muscular weakness, dizziness, nausea, loss of coordination, and in extreme conditions coma and possibly death. High concentrations may trigger heartbeat irregularities. Excessive amounts in the air in an enclosed space will decrease the amount of oxygen and may cause asphyxiation.

B: Acute Toxicity - LD50/LC50

Ethylene (74-85-1)

No LD50/LC50 information is available for ethylene.

C: Chronic Toxicity - General Material Information

Inhalation of ethylene by Sprague Dawley rats, in concentrations of 0, 300, 1000, 3000, or 10,000 ppm 6 hours/day, 5 days/week for 14 weeks, were not found to cause any toxic effects.

D: Chronic Toxicity - Carcinogenic Effects

ACGIH, IARC, OSHA, and NTP carcinogen lists have been checked for selected similar materials or those components with CAS registry numbers.

Ethylene (74-85-1)

ACGIH: A4 - Not Classifiable as a Human Carcinogen

IARC: Monograph 60, 1994 (Group 3 (not classifiable))

Section 12 - Ecological Information

Ecotoxicity

This product is not considered harmful to aquatic life, and has limited absorption into soil and sediment. Ethylene is produced at trace levels naturally by most plants and acts as a growth regulator. Plants show a wide variety of responses in ripening, growth and possible injury. Under certain conditions, emissions may contribute to photochemical smog formation.

Environmental Fate

Product is highly volatile and will partition rapidly to air on release to land or water. Product is largely insoluble in water, and evaporates rapidly from surface soils and water. Potential for mobility in soil is considered to be low.

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Persistence/Degradability

Ethylene will photo degrade in air in 6 to 14 days depending on atmospheric conditions. Degradation in soils by microorganisms is extensive.

Bioaccumulation/Accumulation

Bioconcentration potential is low. Log K_{ow} is 1.13.

Section 13 - Disposal Considerations

U.S./Canadian Waste Number & Descriptions

A: General Material Information

This product is known to be a hazardous waste according to US RCRA and Canadian CEPA regulations. The use, mixing or processing of this material may alter this product. Contact federal, provincial/state and local authorities in order to generate or ship a waste material associated with this product to ensure materials are handled appropriately and meet all criteria for disposal of hazardous waste. Vent to a burning flame at an approved facility. DO NOT ATTEMPT TO DISPOSE OF BY UNCONTROLLED IGNITION.

B: Component Waste Numbers

No EPA Waste Numbers are applicable for this product's components.

Section 14 - Transportation Information

US DOT Information

Shipping Name: Ethylene

UN# 1962 Hazard Class: 2.1 Required Label(s): FLAMMABLE GAS

Canadian TDG Information

Shipping Name: Ethylene, compressed

UN# 1962 Hazard Class: 2.1 Required Label(s): FLAMMABLE GAS

International Air Transport Association (IATA) and ICAO Regulations

Shipping Name: Ethylene

UN# 1962 Hazard Class: 2.1 Required Label(s): FLAMMABLE GAS

International Maritime Dangerous Goods (IMDG) Regulations

Shipping Name: Ethylene

UN# 1962 Hazard Class: 2.1 Required Label(s): FLAMMABLE GAS

Section 15 - Regulatory Information

A: International Regulations

Components of this product have been checked against the following Chemical Control Inventories.

Components not identified on European Inventory of Existing Commercial Chemical Substances (EINECS) are exempt from the listing (i.e. as polymers whose monomers are listed).

Component Analysis - International Inventory Status

Component	CAS #	US - TSCA	CANADA - DSL	EU - EINECS
Ethylene	74-85-1	Yes	Yes	Yes

B: USA Federal & State Regulations

Site emission monitoring and control programs may be required. Check applicable regulations.

USA OSHA Hazard Communication Class

HCS CLASS: Flammable gas.

USA Right-to-Know - Federal

This material contains one or more of the following chemicals required to be identified under SARA Section 302 (40 CFR 355 Appendix A), SARA Section 313 (40 CFR 372.65) and/or CERCLA (40 CFR 302.4).

Ethylene (74-85-1)

SARA 313: 1.0 % de minimis concentration

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USA Right-to-Know - State

The following components appear on one or more of the following state hazardous substances lists. Some components (including those present only in trace quantities, and therefore not listed in this document) may be included on the Right To Know lists of other U.S. states. The reader is therefore cautioned to contact his or her NOVA Chemicals representative or NOVA Chemicals' Product Integrity group for further U.S. State Right To Know information.

Component	CAS	NJ	PA
Ethylene	74-85-1	Yes	Yes

C: Canadian Regulations - Federal and Provincial

WHMIS Ingredient Disclosure List (IDL)

No components are listed in the WHMIS Ingredient Disclosure List (IDL).

WHMIS Classification

Workplace Hazardous Materials Information Systems (WHMIS): This product has been classified in accordance with Canadian Controlled Product Regulations (CPR) hazard criteria and this MSDS contains complete CPR-required information.

WHMIS CLASS A: Compressed gas

WHMIS CLASS B1: Flammable gas

Provincial Regulations

Site emission monitoring and control programs may be required by provincial regulations. Check applicable regulations.

Section 16 - Other Information

Label Information

PRECAUTIONS: DANGER EXTREMELY FLAMMABLE LIQUEFIED GAS This product is a colourless liquefied gas while under high pressure with a sweet hydrocarbon odor. Ethylene is highly volatile, when released it will disperse as a highly flammable vapor cloud. Consider need for immediate emergency isolation and evacuation. Vapors may travel to some distant source and flash back. DO NOT ATTEMPT TO EXTINGUISH A GAS FIRE UNLESS LEAK SOURCE CAN BE ISOLATED AND SHUT OFF. Contact with liquefied gas may cause frostbite. Excessive inhalation of this material causes headache, dizziness, nausea and loss of coordination and in extreme conditions coma and possibly death.

FIRST AID:

SKIN: Thaw frostbite slowly with lukewarm water. DO NOT RUB affected area. Do not pull off adherent clothing or objects. Seek medical attention at once.

EYES: Remove contact lenses, if worn. Immediately flush eyes with lukewarm water for at least 15 minutes, while holding eyelids open. Seek medical attention at once.

INHALATION: Remove affected individual to fresh air immediately. Loosen tight clothing such as a collar, tie, belt, or waistband to facilitate breathing. Seek immediate medical attention if the individual is not breathing. **INGESTION:** Ingestion of this product is extremely unlikely. DO NOT induce vomiting. Examine the lips and mouth to ascertain whether the tissues are damaged. Thaw frostbite in mouth slowly with lukewarm water if the exposed individual is conscious, ensuring that the individual does not gag or choke. Loosen tight clothing such as a collar, tie, belt or waistband. If the affected individual is not breathing qualified personnel should perform mouth-to-mouth resuscitation. Seek immediate medical attention.

IN CASE OF A LARGE SPILL: Consider initial downwind evacuation for at least 800 meters (1/2 mile). Eliminate all potential ignition sources. Stop leak remotely or if safe to do so. Alert stand-by emergency and fire fighting personnel. Monitor surrounding area for build-up of flammable air concentrations. Ground all equipment used. Evacuate personnel. Prevent flammable vapors or liquids from entering drains and sewers. Foam cover may help suppress evolution of flammable gas. Accumulations of gas may persist in low areas. Keep area isolated until any detectable flammable gas has been dispersed.

References

Available on request.

Special Considerations

For additional information on properties, hazards, spill response, transportation equipment maintenance, inspection and repair procedures, please refer to "Handling and Transportation Guide for Ethylene, Refrigerated Liquid (Cryogenic Ethylene)", published April 2004, by the Cryogenic Ethylene Transportation Safety Panel and the American Chemistry Council. This Guide is posted on the American Chemistry Council's Website www.americanchemistry.com under "Affiliate Links."

For additional information on equipment bonding and grounding, refer to the American Petroleum Institute (API) Recommended Practice 2003, "Protection Against Ignitions Arising out of Static, Lightning, and Stray Currents" or National Fire Protection Association (NFPA) 77, "Recommended Practice on Static Electricity".

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Key/Legend

ACGIH = American Conference of Governmental Industrial Hygienists; BOD = Biochemical Oxygen Demand; CAS = Chemical Abstracts Service; CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act; CPR = Controlled Products Regulations; DOT = Department of Transportation; DSL = Domestic Substances List; EINECS = European Inventory of Existing Commercial Substances; EPA = Environmental Protection Agency; EU = European Union; FDA = Food and Drug Administration; IARC = International Agency for Research on Cancer; IDL = Ingredient Disclosure List; Kow = Octanol/water partition coefficient; LEL = Lower Explosive Limit; NIOSH = National Institute for Occupational Safety and Health; NJTSR = New Jersey Trade Secret Registry; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration; RCRA = Resource Conservation and Recovery Act; SARA = Superfund Amendments and Reauthorization Act; TDG = Transportation of Dangerous Goods; TSCA = Toxic Substances Control Act. BLEVE= boiling liquid expanding vapour explosion.

MSDS Prepared by: NOVA Chemicals

MSDS Information Phone Number: 1-412-490-4063

Other Information

Notice to Reader

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This is the end of MSDS # NOVA-0017