SAFETY DATA SHEET

Classified in accordance with 29 CFR 1910.1200

1. Identification

Product identifier: Ethylene

Other means of identification

Common name(s), synonym(s): Ethylene, Ethene

SDS number: NOVA-0017

Recommended use and restriction on use

Recommended use: Feedstock for chemical and polymer synthesis.

Restrictions on use: All uses other than the identified.

Manufacturer/Importer/Supplier/Distributor Information

Manufacturer

Company Name:	NOVA Chemicals Olefins LLC
Address:	P.O. Box 470 Geismar, Louisiana, USA 70734
Telephone:	Product Information: 1-412-490-4063
SDS Information Email:	msdsemail@novachem.com

Emergency telephone number:

1-800-561-6682, 1-403-314-8767 (NOVA Chemicals) (24 hours)
1-800-424-9300 (CHEMTREC-USA) (24 hours)

2. Hazard(s) identification

Hazard Classification

Physical Hazards

Flammable gas	Category 1
Gases under pressure	Liquefied gas

Health Hazards

Specific Target Organ Toxicity - Single Exposure	Category 3

OSHA hazard(s)

Simple asphyxiant

Label Elements

Hazard Symbol:

Signal Word: Danger

Hazard Statement: Extremely flammable gas.
Contains gas under pressure; may explode if heated.
May displace oxygen and cause rapid suffocation.

May cause drowsiness or dizziness.

Precautionary Statements:

Prevention: Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Keep container tightly closed. Avoid breathing dust/fume/gas/mist/vapors/spray. Use only outdoors or in a well-ventilated area.

Response: IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/doctor if you feel unwell. Leaking gas fire: Do not extinguish, unless leak can be stopped safely. In case of leakage, eliminate all ignition sources.

Storage: Store in a well-ventilated place. Keep container tightly closed. Store locked up. Protect from sunlight.

Disposal: Dispose of contents/ container to an approved facility in accordance with local, regional, national and international regulations.

Other hazards which do not result in GHS classification: Contact with liquefied gas may cause irritation and/or frostbite.

3. Composition/information on ingredients

Mixtures

Chemical Identity	Common name and synonyms	CAS number	Content in percent (%)*
Ethene	Ethylene	74-85-1	>99.9%

* All concentrations are percent by weight.

Additional Information: This product is considered hazardous by the OSHA Hazard Communication Standard, (29 CFR 1910.1200).

4. First-aid measures

Inhalation: IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/doctor if you feel unwell.

Ingestion: Ingestion of this product is not a likely route of exposure. Do NOT induce vomiting. Seek medical attention.

Skin Contact: Contact with liquefied gas may cause irritation and/or frostbite. Seek medical attention immediately in the event of frostbite. IF ON SKIN: Gently wash with plenty of soap and water. Thaw frosted parts with lukewarm water. Do not rub affected area. Remove non-adhering contaminated clothing. Do not remove adherent material or clothing.

Eye contact: Contact with liquefied gas may cause irritation and/or frostbite. Seek medical attention immediately in the event of frostbite. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Call a physician or poison control center immediately.

Most important symptoms/effects, acute and delayed

Symptoms: Frostbite, headache, dizziness, nausea, confusion, loss of appetite, loss of consciousness, heartbeat irregularities, possible cardiac sensitization. Suffocation (asphyxiant) hazard - if allowed to accumulate to concentrations that reduce oxygen below safe

breathing levels.

Indication of immediate medical attention and special treatment needed

Treatment:	Administer oxygen by mask if there is respiratory distress, any change in level of consciousness, or cardiac rhythm disturbance. Treat unconsciousness, hypotension, seizures, cardiac dysrhythmias, and frostbite in the conventional manner. Adrenergic (epinephrine, norepinephrine) and dopaminergic agonists should be avoided during treatment or used with caution (lowest effective dose) because of possible cardiac sensitization by this product mixture.

5. Fire-fighting measures

General Fire Hazards:	Extremely flammable liquefied gas. Vapors may travel considerable distance to a 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 reignition. Vapors may form explosive mixture with air. Consider need for immediate emergency isolation and evacuation. When pressure in a container needs to be controlled consider setting up emergency flaring. If a pipeline or a storage vessel is involved in a fire, ISOLATE for 1600 meters (1 mile) in all directions. Keep containers away from source of heat or fire. Containers may explode when heated and rocket away.

Suitable (and unsuitable) extinguishing media

Suitable extinguishing media:	Dry chemical, foam, carbon dioxide, and water fog. Foam cover may help suppress evolution of flammable gas. Use water to cool fire-exposed containers and to protect personnel.
Unsuitable extinguishing media:	Do not use water jet as an extinguisher, as this will spread the fire. Adding water directly to pooled liquid will heat liquid and increase evolution of extremely flammable gas.
Specific hazards arising from the chemical:	Upon combustion, this product emits carbon monoxide, carbon dioxide, low molecular weight hydrocarbons.

Special protective equipment and precautions for fire-fighters

Special fire-fighting procedures:	Keep upwind. Keep unauthorized personnel away. Move containers from fire area if you can do so without risk. Fight fire from maximum distance or use unmanned holders or monitor nozzles. Immediately withdraw in case of fire and container venting or heat discoloration of a container. Let uncontrolled fires burn off. Avoid inhaling any smoke and combustion materials. Remove and isolate contaminated clothing and shoes. Cool containers with flooding quantities of water until well after the fire is out. Do not direct water at source of leak or safety devices as icing may occur. Prevent runoff from fire control or dilution from entering streams, sewers, or drinking water supply. Reference Emergency Response Guidebook No. 116P for additional details and instructions.
Special protective equipment for fire-fighters:	Wear positive pressure self-contained breathing apparatus (SCBA).

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures:	Wear appropriate personal protective equipment. Isolate area. Keep unauthorized personnel away. Alert stand-by emergency and fire-fighting personnel. Monitor surrounding area for buildup of flammable concentrations in air.

Methods and material for containment and cleaning up:

Do not touch or walk through spilled material. In case of leakage, eliminate all ignition sources. Keep upwind. Keep out of low areas. Stop leak if safe to do so. All equipment used when handling the product must be grounded. Prevent runoff from fire control or dilution from entering streams, sewers, or drinking water supply. Keep area isolated until any detectable flammable gas has been fully dispersed.

Small Spills: Isolate spill or leak area for at least 100 meters (330 feet) in all directions.

Large Spills: Consider initial downwind evacuation for at least 800 meters (1/2 mile). Evacuate personnel to upwind of the spill area, and position at a safe distance. Use water spray to reduce vapors or divert vapor cloud drift. A vapor-suppressing foam may be used to reduce vapors. Accumulations of gas may persist in low areas.

7. Handling and storage

Precautions for safe handling:

Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Keep container tightly closed. Ground and bond container and receiving equipment. Use explosion-proof [electrical/ventilating/lighting] equipment. Use non-sparking tools. Take action to prevent static discharges. These alone may be insufficient to remove static electricity. 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". Avoid breathing dust/fume/gas/mist/vapors/spray. Use only outdoors or in a well-ventilated area. Wear protective gloves/ protective clothing/ eye protection/ face protection. In case of inadequate ventilation, use respiratory protection. Where possible, collect and flare vents. Check for accumulation of liquids when breaking into pipelines. Liquid ethylene must first be drained and/or flared then the system depressured before opening pipes/equipment containing ethylene. If liquid ethylene is present when breaking flanges, the liquid will boil into a vapor cloud and will create severe cold temperatures (see Section 9). If used in refrigeration, check that drains are not plugged and valves are working and not plugged by ice formed from the vaporizing liquid.

Conditions for safe storage, including any incompatibilities:

This product can be stored as a flammable gas or liquid depending on the temperature and pressure. Store in a well-ventilated place. Keep container tightly closed. Store locked up. Protect from sunlight. Only allow access to authorized persons. Store and handle in properly designed pressure vessels and equipment. Store and use away from heat, sparks, open flame, or any other ignition source. Have appropriate extinguishing capability in storage area (e.g. sprinkler system, portable fire extinguishers) and flammable gas detectors. Storage pressure vessels should be above ground and diked. Store away from incompatible materials. Store according to applicable regulations and standards for flammable materials. Keep cylinders secure while in storage or in transportation.

8. Exposure controls/personal protection

Control Parameters

Occupational Exposure Limits

Chemical Identity	Type	Exposure Limit Values	Source
Ethene	TWA	200 ppm	US. ACGIH Threshold Limit Values, as amended

Appropriate Engineering

Engineering methods to reduce hazardous exposure are preferred controls.

Controls	Methods include mechanical ventilation (dilution and local exhaust) process or personal enclosure, remote and automated operation, control of process conditions, leak detection and repair systems, and other process modifications. Ensure all exhaust ventilation systems are discharged to outdoors, away from air intakes and ignition sources. Supply sufficient replacement air to make up for air removed by exhaust systems. Administrative (procedure) controls and use of personal protective equipment may also be required.

Individual protection measures, such as personal protective equipment

General information:	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.
Eye/face protection:	Safety glasses. Chemical goggles under a full-face shield are recommended if contact with liquefied gas is possible.
Skin Protection	
Hand Protection:	Wear protective gloves. Wear cold insulating gloves.
Skin and Body Protection:	Wear appropriate clothing to prevent any possibility of skin contact. Wear work clothes with long sleeves and pants. Fire resistant (i.e., Nomex) or natural fiber clothing (i.e., cotton or wool) is recommended. Synthetic clothing can generate static electricity and is not recommended where a flammable vapor release may occur. Wear chemical-resistant safety footwear with good traction to prevent slipping. Static Dissipative (SD) rated footwear is also recommended.
Respiratory Protection:	Supplied air breathing apparatus must be used when oxygen concentrations are low or if airborne concentrations exceed OEL.
Hygiene measures:	Use effective control measures and PPE to maintain worker exposure to concentrations that are below these limits. Ensure that eyewash stations and safety showers are in close proximity to work locations.

9. Physical and chemical properties

Appearance	
Physical state:	Gas
Form:	Liquefied gas
Color:	Colorless
Odor:	Sweet odor
Odor Threshold:	270 - 420 ppm (detectable)
pH:	not applicable
Melting point/freezing point:	-169 °C (-272 °F)
Initial boiling point and boiling range:	-102.4 °C (-152.3 °F) (933.1 hPa)
Flash Point:	-136 °C (-213 °F)
Evaporation rate:	Immediate at 20 °C (68 °F).
Flammability (solid, gas):	Extremely flammable.
Upper/lower limit on flammability or explosive limits	
Flammability Limit - Upper (%):	36 %(V)
Flammability Limit - Lower (%):	2.7 %(V)
Vapor pressure:	609 psia (0 °C (32 °F)) 735 psia (10 °C (50 °F)) (critical point)

Vapor density:	0.974 (0 °C (32 °F)) 14 psia (Air=1)
Density:	568 kg/m3
Relative density:	0.568 (-103.8 °C (-154.8 °F))
Solubility(ies)	
Solubility in water:	0.131 g/l (20 °C (68 °F))
Solubility (other):	No data available.
Partition coefficient (n-octanol/water):	1.13
Auto-ignition temperature:	425 °C (797 °F)
Decomposition temperature:	No data available.
Viscosity:	not applicable

Other information

Minimum ignition energy:	0.07 mJ
Molecular weight:	28.05 g/mol (C2H4)

10. Stability and reactivity

Reactivity:	This product is moderately reactive and may polymerize, decompose or become self-reactive under certain conditions of high temperatures, high pressures or contamination. Rapid pressurization can lead to exothermic decomposition of the product; pressure shocks should be avoided.
Chemical Stability:	Stable under normal storage conditions.
Possibility of hazardous reactions:	Hazardous polymerization can occur at elevated temperatures and pressures in the presence of a catalyst. May polymerize explosively when heated or involved in a fire. Liquefied gas may explode on contact with hot water (45 °C to 75 °C) (113 °F to 167 °F).
Conditions to avoid:	Keep away from heat, sparks and open flame.
Incompatible Materials:	Acids, oxidizing agents, chlorine, halogens, organic peroxides, ozone and nitrogen dioxide. Product can react with water to form hydrates. **Caution:** Evaluate the compatibility of the molecular sieve with the vendor if it is to be in ethylene service. There is a risk of runaway polymerization under certain conditions. 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 Decomposition Products:	Upon decomposition, this product emits carbon monoxide, carbon dioxide, low molecular weight hydrocarbons.

11. Toxicological information

Information on likely routes of exposure

Inhalation:	May cause drowsiness or dizziness. May displace oxygen and cause rapid suffocation.
Ingestion:	Ingestion of this product is not a likely route of exposure.
Skin Contact:	Ethylene gas is not irritating to the skin. The liquefied form will cause freezing burns (frostbite).
Eye contact:	Ethylene gas is not irritating to the eyes. The liquefied form will cause freezing burns (frostbite).

Symptoms related to the physical, chemical and toxicological characteristics

Inhalation: Headache, dizziness, nausea, confusion. Suffocation (asphyxiant) hazard - if allowed to accumulate to concentrations that reduce oxygen below safe breathing levels.

Ingestion: No adverse effects due to ingestion are expected.

Skin Contact: Frostbite.

Eye contact: Frostbite.

Information on toxicological effects

Acute toxicity (list all possible routes of exposure)

Oral
Product: Not classified for acute toxicity based on available data.

Dermal
Product: Not classified for acute toxicity based on available data.

Inhalation
Product: LC 50 (Rat, 4 h): > 57000 ppm Inhalation

Repeated dose toxicity
Product: Ethylene has low chronic toxicity and no risk to human health has been identified from occupational exposure below the OEL. In rodents, exposure to ethylene produces nasal lesions but no similar lesions are observed in lungs. It is not known whether the effects seen in rodents are relevant to humans.

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

Skin Corrosion/Irritation
Product: Ethylene gas is not irritating to the skin. The liquefied form will cause freezing burns (frostbite).

Serious Eye Damage/Eye Irritation
Product: No data available.

Respiratory or Skin Sensitization
Product: No data available.

Carcinogenicity
Product: All tests on ethylene for genotoxicity and carcinogenicity were negative indicating that ethylene should not be considered a risk for cancer in humans.

IARC Monographs on the Evaluation of Carcinogenic Risks to Humans:
No carcinogenic components identified

US. National Toxicology Program (NTP) Report on Carcinogens:
No carcinogenic components identified

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1053), as amended:
No carcinogenic components identified

Germ Cell Mutagenicity

In vitro
Product: There are no known or reported genetic effects.

In vivo
Product: There are no known or reported genetic effects.

Reproductive toxicity
Product: There are no known or reported reproductive effects.

Specific Target Organ Toxicity - Single Exposure
Product: May cause drowsiness or dizziness.

Specific Target Organ Toxicity - Repeated Exposure
Product: Not classified.

Aspiration Hazard
Product: not applicable

Other effects: asphyxia

12. Ecological information

Ecotoxicity:

Acute hazards to the aquatic environment:

Fish
Product: LC 50 (Various, 4 d): 50 - 119.5 mg/l QSAR
Ethene is not considered harmful to aquatic life.

Aquatic Invertebrates
Product: EC 50 (Daphnia magna, 48 h): 53 - 152.9 mg/l QSAR
Ethene is not considered harmful to aquatic life.

Toxicity to Aquatic Plants
Product: EC 50 (Green algae (Selenastrum capricornutum), 72 h): 40 mg/l
Ethene is not considered harmful to aquatic life.

Chronic hazards to the aquatic environment:

Fish
Product: NOEC (Fathead Minnow, 28 d): 13 mg/l QSAR
Ethene is not considered harmful to aquatic life.

Aquatic Invertebrates
Product: NOEC (16 d): 37.4 mg/l
Ethene is not considered harmful to aquatic life.

Toxicity to Aquatic Plants
Product: NOEC (72 h): 13.9 mg/l (growth inhibition)
Ethene is not considered harmful to aquatic life.

Persistence and Degradability

Biodegradation
Product: Expected to be readily biodegradable. The lifetime of ethylene in the atmosphere ranges from 0.4 to 4 days, with an average of 1.5 days, and is strongly dependent on the amount of sunlight.

BOD/COD Ratio
Product: No data available.

Bioaccumulative potential
Bioconcentration Factor (BCF)
Product: Bioconcentration potential is low.

Partition Coefficient n-octanol / water (log Kow)
Product: 1.13

Mobility in soil: Low potential.

Other adverse effects: Several species of flowers (orchids, carnations, etc.), and vegetables such as tomatoes, potatoes, peppers, beans and peas are sensitive to ethylene exposure.

13. Disposal considerations

Disposal instructions: Dispose of contents/container to an appropriate treatment and disposal facility in accordance with applicable laws and regulations, and product characteristics at time of disposal. Waste generator is advised to carefully consider hazardous properties and control measures needed for other materials that may be found in the waste.

Contaminated Packaging: Check local, federal and state environmental regulations prior to disposal.

14. Transport information

DOT

UN number or ID number:	UN 1962
UN Proper Shipping Name:	Ethylene
Transport Hazard Class(es)	
Class:	2.1
Label(s):	2.1
Packing Group:	–
Marine Pollutant:	No
Special precautions for user:	Emergency Response Guidebook No. 116P, latest revision.

15. Regulatory information

US Federal Regulations

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)
None present or none present in regulated quantities.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1053), as amended
None present or none present in regulated quantities.

CERCLA Hazardous Substance List (40 CFR 302.4):
None present or none present in regulated quantities.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories
Flammable (gases, aerosols, liquids, or solids), Gas under pressure, Specific target organ toxicity (single or repeated exposure), Simple asphyxiant

US. EPCRA (SARA Title III) Section 304 Extremely Hazardous Substances Reporting Quantities and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Hazardous Substances
None present or none present in regulated quantities.

US. EPCRA (SARA Title III Section 313 Toxic Chemical Release Inventory (TRI) Reporting

Chemical Identity	Reporting threshold for other users	Reporting threshold for manufacturing and processing
Ethene	10000 lbs	25000 lbs.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130):

Chemical Identity	Reportable quantity
Ethene	10000 lbs

Clean Water Act Section 311 Hazardous Substances (40 CFR 117.3)

None present or none present in regulated quantities.

US State Regulations

US. California Proposition 65

No ingredient requiring a warning under CA Prop 65.

Inventory Status

Canada DSL Inventory List:	On or in compliance with the inventory
US TSCA Inventory:	On or in compliance with the inventory

16. Other information, including date of preparation or last revision

Issue Date: 11/20/2023

Revision Information: 11/20/2023: SDS Update – Section 9 edits, section 15 updates, phrase edits
01/15/2020: SDS Update

Version #: 2.1

Abbreviations and acronyms: ACC = American Chemistry Council; ACGIH = American Conference of Governmental Industrial Hygienists; BOD = Biochemical Oxygen Demand; C = Ceiling; CAS = Chemical Abstracts Service; CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act; CFR = Code of Federal Regulations; COD = Chemical Oxygen Demand; DOT = Department of Transportation; DSL = Domestic Substances List; EC50 = Effective Concentration 50%; EPA = Environmental Protection Agency; GHS = Globally Harmonized System for the Classification and Labelling of Chemicals; HPV = High Production Volume; IARC = International Agency for Research on Cancer; LC50 = Lethal Concentration 50%; LD50 = Lethal Dose 50%; NFPA = National Fire Protection Association; NIOSH = National Institute for Occupational Safety and Health; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration; PEL = Permissible Exposure Limit; PMCC = Pensky-Martens Closed Cup; PPE = Personal Protective Equipment; RCRA = Resource Conservation and Recovery Act; REL = Recommended Exposure Limit; SARA = Superfund Amendments and Reauthorization Act; SCBA = Self Contained Breathing Apparatus; SDS = Safety Data Sheet; STEL = Short Term Exposure Limit; TLV = Threshold Limit Value; TSCA = Toxic Substances Control Act; TWA = Time Weighted Average

Further Information: 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, type in "Handling and Transportation Guide for Ethylene" in the "Search" field.

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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