

Material Safety Data Sheet

Material Name: **Butene-2 (SCRS)**

MSDS ID: NOVA-0027

Section 1 - Product and Company Identification

Synonyms: Liquefied Petroleum Gas (butylenes); Raffinate III (Butene-2); Spent butene-SCRS; St. Clair Raffinate III Butene Stream

Chemical Name: Butene Mixture

Chemical Family: Liquefied Petroleum Gas

Material Use: Petrochemical industry; Raw Material

Chemical Formula: Not applicable, mixture

NOVA Chemicals

P.O. Box 2518, Station M

Calgary, Alberta, Canada T2P 5C6

Product Information: 1-412-490-4063

MSDS Information Email:

msdsemail@novachem.com

EMERGENCY Telephone Numbers:

North America (Canada and US):

1-800-561-6682, 1-403-314-8767 (NOVA Chemicals) (24 hours)

1-800-424-9300 (CHEMTREC-USA) (24 hours)

1-613-996-6666 (Canutec-Canada) (24 hours)

Section 2 - Hazards Identification

HMIS Ratings: Health: 2* Fire: 4 Physical Hazard: 1 Personal Protection: chemical goggles, gloves, SCBA (see Section 8)

*Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe * = Chronic hazard*

NFPA Ratings: Health: 2 Fire: 4 Reactivity: 1

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 with a faint hydrocarbon odour. Material is highly volatile. When released it will immediately disperse as a highly flammable vapour cloud. Consider need for immediate emergency isolation and evacuation. Fire and container explosion hazards are extremely high when this product is exposed to heat or flame. Vapours are heavier than air and may travel along the ground 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.** 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: Eye

Contact of the eye 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 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 product may result in serious injury or frostbite.

Potential Health Effects: Inhalation

This product is a narcotic, asphyxiant gas that can cause unconsciousness/death if OXYGEN levels are sufficiently reduced. Excessive inhalation of gas irritates the respiratory tract causing coughing and wheezing, and causes headache, dizziness, nausea and loss of coordination, and in extreme conditions coma and possibly death. High concentrations may trigger heartbeat irregularities, and possible cardiac sensitization.

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Section 3 - Composition/Information on Ingredients

CAS #	Component	Percent by Wt.
107-01-7	2-Butene	60-96
106-98-9	1-Butene	1-5
106-98-9	1-Butene	5-10
106-98-9	1-Butene	10-30
106-98-9	1-Butene	30-32
106-97-8	Butane	1-5
106-97-8	Butane	5-10
110-82-7	Cyclohexane	0.1-1
110-82-7	Cyclohexane	1-5
Not Available	C3 and Lighter *	<0.1-1
Not Available	C3 and Lighter *	1-5
106-99-0	1,3-butadiene	< 0.1-0.2

Additional Information

* Includes methane (CAS # 74-82-8), ethane (CAS # 74-84-0) and propane (CAS # 74-98-6).
The actual components and weight % concentrations vary based on operating conditions.

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

This material is a controlled product under Canadian WHMIS regulations.

This material is regulated as a hazardous material/dangerous goods for transportation.

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

Section 4 - First Aid Measures

First Aid: Eyes

Remove contact lenses, if it can be done safely. Immediately flush eyes with water for at least 15 minutes, while holding eyelids open. Seek medical attention if symptoms develop or persist.

First Aid: Skin

Wash immediately with soap and water. Seek medical attention if symptoms develop or persist. 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

Move affected individual to non-contaminated air. Loosen tight clothing such as a collar, tie, belt or waistband to facilitate breathing. Seek immediate medical attention if the individual is not breathing, is unconscious or if any other symptoms persist. WARNING: Contact through mouth-to-mouth resuscitation may pose a secondary risk to the rescuer. Avoid mouth-to-mouth contact by using a mouth shield or guard to perform artificial respiration.

First Aid: Ingestion

DO NOT INDUCE VOMITING. Loosen tight clothing such as a collar, tie, belt or waistband. Seek immediate medical attention. Examine the lips and mouth to ascertain whether the tissues are damaged. Thaw frostbite in mouth slowly with lukewarm water, ensuring that the conscious affected individual does not gag or choke. If the individual is not breathing, qualified personnel should perform mouth-to-mouth resuscitation. WARNING: Contact through mouth-to-mouth resuscitation may pose a secondary risk to the rescuer. Avoid mouth-to-mouth contact by using a mouth shield or guard to perform artificial respiration.

First Aid: Notes to Physician

For more detailed medical emergency support information call 1-800-561-6682 or 1-403-314-8767 (24 hours, NOVA Chemicals Emergency Response). 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.

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Section 5 - Fire Fighting Measures

See Section 9: Physical Properties for flammability limits, flash point and auto-ignition information.

General Fire Hazards

Fire and container explosion hazards are extremely high when this product is exposed to heat or flame. Use massive quantities of water to cool fire-exposed containers. Direct addition of water (or any other room temperature liquid) to the liquefied gas will cause a BLEVE. Immediately withdraw in case of fire and container venting or heat discoloration of a container. Vapours are heavier than air and may travel along the ground to some distant source of ignition and flash back. Consider need for immediate emergency isolation and evacuation. **DO NOT ATTEMPT TO EXTINGUISH A GAS FIRE UNLESS LEAK SOURCE CAN BE ISOLATED AND SHUT OFF.** Be aware of possibility of re-ignition. If a storage vessel, rail car or tank truck is possibly ruptured or involved in a fire, ISOLATE for 1600 metres (1 mile) in all directions; also, consider initial evacuation for 1600 metres (1 mile) in all directions.

Explosion Hazards

Vapours will form an explosive mixture with air. Keep containers away from source of heat or fire. Highly explosive in the presence of sparks, fire, heat and oxidizing agents.

Hazardous Combustion Products

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

Extinguishing Media

Dry chemical, foam, carbon dioxide, and water fog. Use massive quantities of water to cool fire-exposed containers and to protect personnel. **DO NOT ATTEMPT TO EXTINGUISH A LEAKING GAS FIRE UNLESS LEAK SOURCE CAN BE ISOLATED AND SHUT OFF.** Monitor water run-off for flammability, and prevent from entering sewers, drains, ditches, underground or confined spaces and waterways.

Fire Fighting Equipment/Instructions

Reference 2008 Emergency Response Guidebook, Guide No. 115 for additional details and instructions. Position upwind. Keep unnecessary 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. Fire fighters should wear full-face, self-contained breathing apparatus and thermal protective clothing. Avoid inhaling any smoke and combustion materials. Remove and clean or destroy any contaminated clothing. Cool containers with flooding quantities of water until well after the fire is out. Control runoff waters to prevent entry into sewers, drains, ditches, underground or confined spaces and waterways.

Section 6 - Accidental Release Measures

Evacuation Procedures

Isolate area. Keep unnecessary personnel away. Alert stand-by emergency and fire fighting personnel. Monitor surrounding area for buildup of flammable concentrations in air.

Small Spills

Isolate spill or leak area for 50 to 100 metres (164 to 328 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 metres (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 buildup of flammable concentrations in air. Ground all approved equipment used in area. Evacuate personnel to upwind of the spill area, and positioned at a safe distance. Consider use of water spray to knock down vapours or divert vapour cloud drift. Prevent flammable vapours or liquids from entering sewers, drains, ditches or other confined or underground structures. 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. Wear appropriate protective equipment and clothing during cleanup. Individuals without appropriate protective

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equipment should be excluded from area of spill until cleanup has been completed.

See Section 8 for recommended Personal Protective Equipment and see Section 13 for waste disposal considerations.

Section 7 - Handling and Storage

Handling Procedures

Keep locked up or secured. Handle in fully enclosed, grounded, properly designed and approved liquefied pressurized gas systems. Use with adequate ventilation. Avoid inhalation. Keep away from uncontrolled heat and incompatible materials. Ground all material handling and transfer equipment to dissipate buildup of static electricity. Wear suitable protective equipment including thermally protective gloves. No smoking or open flames permitted in storage, use or handling areas. Where possible, collect and flare vents.

Storage Procedures

Storage area should be clearly identified, well illuminated, clear of obstruction, well secured 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. Inspect vents during winter conditions for vapour ice buildup. Storage pressure vessels should be above ground and diked to hold entire contents. A refrigerated room is generally recommended for warehouse storage of materials with a flash point lower than 37.8°C (100°F).

See Section 8: Exposure Controls/Personal Protection for appropriate Personal Protective Equipment. See Section 10 for information on Incompatibilities.

Section 8 - Exposure Controls / Personal Protection

Exposure Guidelines

A: General Product Information

Refer to published exposure limits - 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 within close proximity to work locations.

B: Component Exposure Limits

ACGIH, OSHA, NIOSH, EPA, 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.

*Note: The Vacated OSHA Permissible Exposure Limits (PELs) are those provided in the 1989 update to OSHA's Air Contaminants Standard 29 CFR 1910.1000. These limits were vacated by the U.S. Court of Appeals, Eleventh Circuit but may be enforceable in some states.

2-Butene (107-01-7)

ACGIH: 250 ppm TWA (listed under Butenes, all isomers)

1-Butene (106-98-9)

ACGIH: 250 ppm TWA (listed under Butenes, all isomers)

Butane (106-97-8)

ACGIH: 1000 ppm TWA (listed under Aliphatic hydrocarbon gases alkane C1-C4)
OSHA (Vacated)*: 800 ppm TWA; 1900 mg/m³ TWA
NIOSH: 800 ppm TWA; 1900 mg/m³ TWA
Alberta: 1000 ppm TWA
Ontario: 800 ppm TWA

Cyclohexane (110-82-7)

ACGIH: 100 ppm TWA; 344 mg/m³ TWA
OSHA (Vacated)*: 300 ppm TWA; 1050 mg/m³ TWA
OSHA (Final): 300 ppm TWA; 1050 mg/m³ TWA
NIOSH: 300 ppm TWA; 1050 mg/m³ TWA
1300 ppm IDLH (10% LEL)
Alberta: 100 ppm TWA; 344 mg/m³ TWA
Ontario: 100 ppm TWA

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Methane (74-82-8)

ACGIH: 1000 ppm TWA (listed under Aliphatic hydrocarbon gases alkane C1-C4)

Alberta: Simple asphyxiant

Ontario: 1000 ppm TWA (listed under Aliphatic hydrocarbon gases alkane C1-C4)

Ethane (74-84-0)

ACGIH: 1000 ppm TWA (listed under Aliphatic hydrocarbon gases alkane C1-C4)

Alberta: 1000 ppm TWA

Ontario: 1000 ppm TWA (listed under Aliphatic hydrocarbon gases alkane C1-C4)

Propane (74-98-6)

ACGIH: 1000 ppm TWA (listed under Aliphatic hydrocarbon gases alkane C1-C4)

OSHA (Vacated)*: 1000 ppm TWA; 1800 mg/m³ TWA

OSHA (Final): 1000 ppm TWA; 1800 mg/m³ TWA

NIOSH: 1000 ppm TWA; 1800 mg/m³ TWA

2100 ppm IDLH (10% LEL)

Alberta: 1000 ppm TWA

Ontario: 1000 ppm TWA (listed under Aliphatic hydrocarbon gases alkane C1-C4)

1,3-Butadiene (106-99-0)

ACGIH: 2 ppm TWA; 4.4 mg/m³ TWA, BEI

OSHA (Vacated)*: 0.5 ppm Action Level; 1 ppm TWA; 5 ppm STEL (15 min. See 29 CFR 1910.1051)

OSHA (Final): 1 ppm TWA; 5 ppm STEL (see 29 CFR 1910.1051)

NIOSH: 2000 ppm IDLH (10% LEL)

Alberta: 2 ppm TWA; 4.4 mg/m³ TWA

Ontario: 2 ppm TWA

ENGINEERING CONTROLS

Engineering methods to reduce hazardous exposure are preferred 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.

PERSONAL PROTECTIVE EQUIPMENT

Personal Protective Equipment: Eyes/Face

Use safety glasses. Use of a full-face shield is recommended if contact with liquefied product is possible.

Personal Protective Equipment: Skin/Hands/Feet

Use impervious gloves designed to prevent freezing of body tissues if contact with liquefied gas is possible. Wear chemical-resistant safety footwear with good traction to prevent slipping. Work clothing that sufficiently prevents skin contact and prevents freezing of body tissues if contact with liquefied gas is possible should be worn, such as coveralls and/or long sleeves and pants. Fire resistant (i.e., Nomex) or natural fibre clothing (i.e., cotton or wool) is recommended. Synthetic clothing can generate static electricity and is not recommended where a flammable vapour release may occur. Static Dissipative (SD) rated footwear is recommended.

Personal Protective Equipment: Respiratory

If engineering controls and ventilation are not sufficient to prevent buildup of aerosols or vapours, self-contained breathing apparatus (SCBA) appropriate for exposure potential should be used. Air-supplied breathing apparatus must be used when oxygen concentrations are low.

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.

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Section 9 - Physical & Chemical Properties

Physical State and Appearance:	Gas at room temperature, liquid under pressure	Colour:	Colourless
Odour:	Odourless to faint hydrocarbon	Odour Threshold:	Not available
pH:	Not applicable	Vapour Pressure:	28 psia at 21°C (70°F)
Vapour Density at 0°C (Air=1):	1.9 (estimate)	Boiling Point:	3.7°C (39°F) (butene-2)
Melting Point:	-139°C (-218°F) (butene-2)	Solubility (H2O):	Practically insoluble (0.042 g/100 ml) (butene-2)
Specific Gravity (Water=1):	0.6	Evaporation Rate (n-Butyl Acetate=1):	Not applicable, gas
Percent Volatile:	100%	Octanol/H2O Coeff.:	Log P(oct) = 2.3 (butene-2)
Auto Ignition:	324°C (615°F) (butene-2)	Flash Point:	-73°C (-100°F) (butene-2)
Flash Point Method:	ASTM D56	Upper Flammable Limit (UFL):	10% (based on butenes)
Lower Flammable Limit (LFL):	1.6% (based on butenes)	Flammability Classification:	Highly Flammable

Section 10 - Stability & Reactivity Information

Chemical Stability

This is a stable product.

Chemical Stability: Conditions to Avoid

Keep away from heat, sparks, or open flame. Containers may rupture or explode if exposed to high heat conditions.

Incompatibility

May react with strong acids or oxidizing agents. 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.

Possibility of Hazardous Reactions or Hazardous Polymerization

Hazardous polymerization not likely to occur except under favourable conditions requiring heat and catalyst.

Corrosivity

Not corrosive to the common metals.

Hazardous Decomposition

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

Special Remarks

Vapours will form an explosive mixture with air. May react vigorously with oxidizing agents. Liquefied gas may explode on contact with hot water (45°C to 75°C) (113°F to 167°F).

Section 11 - Toxicological Information

A: Acute Toxicity - General Product Information

Butene-2 has low acute toxicity at the levels found in the workplace. Exposure to high levels of butanes and butenes can lead to dizziness. Vapour or aerosol concentrations above 800 ppm in the air can cause eye irritation in humans. Should skin or eye contact occur with butenes in their liquid state, tissue freezing, severe cold burns, and/or frostbite may result. Very high levels of vapours in an enclosed space will decrease the amount of available oxygen and may cause suffocation. The following additional information has been found for its components:

Cyclohexane - Contact can irritate and may burn the eyes and skin. Inhalation can irritate the nose, mouth, and throat causing coughing and wheezing. Inhalation of high concentrations may result in central nervous system (CNS) depression, causing headache, nausea, vomiting, dizziness, loss of coordination, unconsciousness, and in extreme conditions respiratory failure and coma. Exposure to very high levels may cause an irregular heartbeat, which may be fatal. Ingestion and subsequent aspiration into the lungs may cause chemical pneumonitis.

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1,3-Butadiene - May cause irritation of the eyes, nose and throat. Contact can irritate the skin and may cause frostbite. Inhalation irritates the respiratory tract causing coughing and wheezing. Inhalation may cause drowsiness, lightheadedness, unconsciousness, and at very high exposures death.

B: Component Analysis - LD50/LC50

2-Butene (107-01-7)

Inhalation LC50 Rat: >10,057 ppm/4H

Butane (106-97-8)

Inhalation LC50 Rat: 658 mg/L/4H

Cyclohexane (110-82-7)

Inhalation LC50 Rat: 13.9 mg/L/4H; Oral LD50 Rat: >5000 mg/kg; Dermal LD50 Rabbit: >2000 mg/kg

Methane (74-82-8)

Inhalation LC50 Mouse: 326 g/m³/2H

Ethane (74-84-0)

Inhalation LC50 Rat: 658 mg/L/4H

Propane (74-98-6)

Inhalation LC50 Rat: 658 mg/L/4H

1,3-Butadiene (106-99-0)

Inhalation LC50 Rat: 285 mg/L/4H; Oral LD50 Rat: 5480 mg/kg

C: Chronic Toxicity - General Product Information

Minimal long-term toxic effects reported in repeat dose toxicity tests in animals. 2-Butene was found to be not mutagenic with or without metabolic activation. No reproductive or developmental toxicity was observed in rats exposed to 2-butene or 1-butene. The following additional information has been found for its components:

Cyclohexane - Prolonged and repeated skin contact can cause irritation, defatting dermatitis with dryness and cracking, and can lead to a rash. Long-term exposure to these solvent mixtures may result in possible lung, liver, kidney, spleen, blood, thymus, and adrenal gland damage; and has resulted in neurotoxic effects including peripheral neuropathy (n-hexane) causing numbness, tingling, and/or muscle weakness in the arms and legs.

1,3-Butadiene - Prolonged and repeated exposure may cause irritation effects and haematological changes. Elevated incidence of lymphomas, leukemias, and other neoplastic diseases of the blood system are found in studies of Butadiene (BD) monomer production workers. The Environmental Protection Agency (EPA) and the International Agency for Research on Cancer (IARC) have classified 1,3-butadiene as a known human carcinogen. There is limited evidence that 1,3-butadiene is a teratogen in animals and may cause damage to the testes and ovaries.

D: Chronic Toxicity - Carcinogenic Effects

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

1,3-Butadiene (106-99-0)

ACGIH: A2 - Suspected Human Carcinogen

OSHA: 0.5 ppm Action Level; 1 ppm TWA; 5 ppm STEL (15 min. See 29 CFR 1910.1051)

EPA: Classification: under EPA's 1999 Guidelines for Carcinogen Risk Assessment (U.S. EPA, 1999), 1,3-butadiene is characterized as carcinogenic to humans by inhalation.

NTP: Known Carcinogen

IARC: Monograph 100F [in prep]; Monograph 97 [2008]; Monograph 71 [1999]; Supplement 7 [1987] (Group 1 (carcinogenic to humans))

Section 12 - Ecological Information

Ecotoxicity

A: General Product Information

Product is insoluble in water, and is a gas at ambient conditions. This product is not considered harmful to aquatic life, and has likely limited absorption into soil and sediment.

B: Component Analysis - Ecotoxicity - Aquatic Toxicity

2-Butene (107-01-7)

LC50 (96 hr) fathead minnow: 58 mg/L; EC50 (48 hr) Daphnia magna: 63 mg/L (SIDS QSAR Estimates)

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Cyclohexane (110-82-7)

Test and Species

24 Hr EC50 Daphnia magna
96 Hr LC50 Pimephales promelas
96 Hr LC50 Pimephales promelas
96 Hr LC50 Lepomis macrochirus
96 Hr LC50 Poecilia reticulata
72 Hr EC50 Desmodemus subspicatus

Results and Conditions

>400 mg/L
3.96-5.18 mg/L [flow-through]
23.03-42.07 mg/L [static]
24.99-44.69 mg/L [static]
48.87-68.76 mg/L [static]
>500 mg/L

1,3-Butadiene (106-99-0)

Test and Species

24 Hr LC50 Lagodon rhomboides
96 Hr EC50 Daphnia magna

Results and Conditions

71.5 mg/L
24.8 mg/L

Environmental Fate/Mobility

Product is highly volatile and will partition primarily to air. This product is largely insoluble in water, and evaporates rapidly from surface soil and water. In air, C4 hydrocarbons are expected to be rapidly degraded through indirect photolytic processes mediated by hydroxyl radicals. Potential for mobility in soil and ground waters is considered to be low.

Persistence/Degradability

Components are likely to degrade in air within minutes to hours. C4 hydrocarbon mixtures can be degraded by bacteria in soils and surface waters.

Bioaccumulation/Accumulation

Bioconcentration potential is considered very low.

Section 13 - Disposal Considerations

U.S./Canadian Waste Information

A: General Product Information

This product as sold, is ignitable and, if disposed of, would be considered a hazardous waste according to US and Canadian regulations. The use, mixing or processing of this product may alter its properties or hazards. 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. DO NOT ATTEMPT TO DISPOSE OF BY UNCONTROLLED IGNITION. Since emptied containers retain product residue, follow safe handling/label warnings even after container is emptied.

See Section 7: Handling and Storage and Section 8: Exposure Controls/Personal Protection for additional handling information that may be applicable for safe handling and the protection of employees.

Waste generator is advised to carefully consider hazardous properties and control measures needed for other materials that may be found in the waste.

B: Component Waste Numbers

Cyclohexane (110-82-7)

RCRA: waste number U056 (Ignitable waste)

Section 14 - Transportation Information

US DOT Information

Shipping Name: Petroleum gases, liquefied or Liquefied petroleum gas (Butylenes)

UN/NA #: UN1075 **Hazard Class:** 2.1

Required Label(s): FLAMMABLE GAS

Additional Info.: NOTE: The Reportable Quantity for cyclohexane is 1000 lbs. (454 kg). The Reportable Quantity for 1,3-butadiene is 10 lbs. (4.54 kg).

2008 Emergency Response Guidebook, Guide No. 115.

Canadian TDG Information

Shipping Name: PETROLEUM GASES, LIQUEFIED or LIQUEFIED PETROLEUM GAS (Butylenes)

UN #: UN1075 **Hazard Class:** 2.1

Required Label(s): FLAMMABLE GAS

Additional Info.: 2008 Emergency Response Guidebook, Guide No. 115.

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International Air Transport Association (IATA) and International Civil Aviation Organization (ICAO) Information

Shipping Name: Petroleum Gases, Liquefied

UN #: UN1075 **Hazard Class:** 2.1

Required Label(s): FLAMMABLE GAS

International Maritime Dangerous Goods (IMDG) Code

Shipping Name: Petroleum Gas, Liquefied

UN #: UN1075 **Hazard Class:** 2.1

Required Label(s): FLAMMABLE GAS

Additional Info.: EmS No.: F-D, S-U

Marine Pollutant: No

Section 15 - Regulatory Information

A: International Regulations

Component Analysis - Inventory

Component	CAS #	US - TSCA	CANADA - DSL	EU - EINECS
2-Butene	107-01-7	Yes	Yes	Yes
1-Butene	106-98-9	Yes	Yes	Yes
Butane	106-97-8	Yes	Yes	Yes
Cyclohexane	110-82-7	Yes	Yes	Yes
Methane	74-82-8	Yes	Yes	Yes
Ethane	74-84-0	Yes	Yes	Yes
Propane	74-98-6	Yes	Yes	Yes
1,3-Butadiene	106-99-0	Yes	Yes	Yes

B: USA Federal & State Regulations

Ongoing occupational hygiene, medical surveillance programs, site emission or spill reporting may be required by Federal or State regulations. Check for applicable regulations.

USA OSHA Hazard Communication Class

This product is considered hazardous under 29 CFR 1910.1200 (Hazard Communication). HCS Classes:

HCS CLASS: Flammable gas.

HCS CLASS: Compressed gas.

HCS CLASS: DANGEROUS MAY CAUSE CANCER

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).

Cyclohexane (110-82-7)

SARA 313: 1.0% de minimis concentration

CERCLA: final RQ = 1000 pounds (454 kg)

1,3-Butadiene (106-99-0)

SARA 313: 0.1% de minimis concentration

CERCLA: 10 lb final RQ; 4.54 kg final RQ

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.

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Component	CAS #	NJ	PA
2-Butene	107-01-7	Yes	Yes
1-Butene	106-98-9	Yes	Yes
Butane	106-97-8	Yes	Yes
Cyclohexane	110-82-7	Yes	Yes
1,3-Butadiene	106-99-0	Yes	Yes
Ethane	74-84-0	Yes	Yes
Propane	74-98-6	Yes	Yes
Methane	74-82-8	Yes	Yes

The following statement(s) are provided under the California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65):

WARNING! This product contains a chemical known to the state of California to cause cancer.

WARNING! This product contains a chemical known to the state of California to cause reproductive/developmental effects.

C: Canadian Regulations - Federal and Provincial

WHMIS Ingredient Disclosure List (IDL)

The following components are identified under the Canadian Hazardous Products Act - Ingredient Disclosure List (IDL):

Component	CAS #	Minimum Concentration
Butane	106-97-8	1 %
Cyclohexane	110-82-7	1 %
1,3-Butadiene	106-99-0	0.1 %

WHMIS Classification

Workplace Hazardous Materials Information System (WHMIS): This product has been classified in accordance with the hazard criteria of the CPR (Controlled Products Regulations) and the MSDS contains all the information required by the CPR.

WHMIS CLASS A: Compressed gas

WHMIS CLASS B1: Flammable gas

WHMIS CLASS D2A: Carcinogen (1,3-Butadiene), Mutagen (1,3-Butadiene)

WHMIS CLASS D2B: Toxic

Other Regulations

Ongoing occupational hygiene, medical surveillance programs, site emission or spill reporting may be required by Federal or Provincial regulations. Check for applicable regulations.

Section 16 - Other Information

Label Information

DANGER! EXTREMELY FLAMMABLE LIQUEFIED GAS. This product is a colourless liquefied gas with a faint hydrocarbon odour. Material is highly volatile. When released it will immediately disperse as a highly flammable vapour cloud. Consider need for immediate emergency isolation and evacuation. Fire and container explosion hazards are extremely high when this product is exposed to heat or flame. Vapours are heavier than air and may travel along the ground 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.** 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: Wash immediately with soap and water. Seek medical attention if symptoms develop or persist. 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 it can be done safely. Immediately flush eyes with water for at least 15 minutes, while holding eyelids open. Seek medical attention if symptoms develop or persist.

INHALATION: Move affected individual to non-contaminated air. Loosen tight clothing such as a collar, tie, belt or waistband to facilitate breathing. Seek immediate medical attention if the individual is not breathing, is unconscious or if any other symptoms persist. **WARNING:** Contact through mouth-to-mouth resuscitation may pose a secondary risk to the rescuer. Avoid mouth-to-mouth contact by using a mouth shield or guard to perform artificial respiration.

INGESTION: **DO NOT INDUCE VOMITING.** Loosen tight clothing such as a collar, tie, belt or waistband. Seek immediate medical attention. Examine the lips and mouth to ascertain whether the tissues are damaged. Thaw frostbite in mouth slowly with lukewarm water, ensuring that the conscious affected individual does not gag or choke. If the individual is not breathing,

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Material Name: **Butene-2 (SCRS)**

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qualified personnel should perform mouth-to-mouth resuscitation. WARNING: Contact through mouth-to-mouth resuscitation may pose a secondary risk to the rescuer. Avoid mouth-to-mouth contact by using a mouth shield or guard to perform artificial respiration.

IN CASE OF A LARGE SPILL: Consider initial downwind evacuation for at least 800 metres (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 buildup of flammable concentrations in air. Ground all approved equipment used in area. Evacuate personnel to upwind of the spill area, and positioned at a safe distance. Consider use of water spray to knock down vapours or divert vapour cloud drift. Prevent flammable vapours or liquids from entering sewers, drains, ditches or other confined or underground structures. 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 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".

Key/Legend

ACGIH = American Conference of Governmental Industrial Hygienists; ADR = Transport of Dangerous Goods by Road; ADR/RID = European Agreement of Dangerous Goods by Road/Rail; BOD = Biochemical Oxygen Demand; CAS = Chemical Abstracts Service; CEPA = Canadian Environmental Protection Act; CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act; CFR = Code of Federal Regulations; CPR = Controlled Products Regulations; DFG = Deutsche Forschungsgemeinschaft; DOT = Department of Transportation; DSL = Domestic Substances List; EC50 = Effective Concentration 50%; EEC = European Economic Community; EINECS = European Inventory of Existing Commercial Chemical Substances; ELINCS = European List of Notified Chemical Substances; EPA = Environmental Protection Agency; EU = European Union; FDA = Food and Drug Administration; GHS = Globally Harmonized System for the Classification and Labelling of Chemicals; HCS = Hazard Communication Standard; HMIS = Hazardous Materials Identification System; IARC = International Agency for Research on Cancer; IATA = International Air Transport Association; ICAO = International Civil Aviation Organization; IDL = Ingredient Disclosure List; IDLH = Immediately Dangerous to Life or Health; IMDG = International Maritime Dangerous Goods; IMO = International Maritime Organization; ISHL = Industrial Safety and Health Law; Kow = Octanol/water partition coefficient; LC50 = Lethal Concentration 50%; LD50 = Lethal Dose 50%; LEL = Lower Explosive Limit; LFL = Lower Flammable Limit; LLV = Level Limit Ceiling Limit (Sweden dust); MAK = Maximum Concentration Value in the Workplace; MITI = Ministry of International Trade and Industry; MSDS = Material Safety Data Sheet; NAB = Threshold Values (Indonesia); NCEC = National Chemical Emergency Centre; NDSL = Non-Domestic Substances List; NFPA = National Fire Protection Association; NIOSH = National Institute for Occupational Safety and Health; NJTSR = New Jersey Trade Secret Registry; NTP = National Toxicology Program; OEL = Occupational Exposure Limit; OSHA = Occupational Safety and Health Administration; PEL = Permissible Exposure Limit; PNOC = Particulates Not Otherwise Classified; PPE = Personal Protective Equipment; PRTR = Designated Chemical Substance Law (Japan); PSD = Short Term Exposure Limit (Indonesia); RCRA = Resource Conservation and Recovery Act; REACH = Registration, Evaluation, Authorisation and Restriction of Chemical Substances; REL = Recommended Exposure Limit; RID = Transport of Dangerous Goods by Rail; SARA = Superfund Amendments and Reauthorization Act; SCBA = Self Contained Breathing Apparatus; SDS = Safety Data Sheet; SEPA = State Environmental Protection Administration; STEL = Short Term Exposure Limit; TDG = Transportation of Dangerous Goods; TLV = Threshold Limit Value; TSCA = Toxic Substances Control Act; TWA = Time Weighted Average; UEL = Upper Explosive Limit; UFL = Upper Flammable Limit; VLA-ED = Valor límite Ambiental de Exposición Diaria (Environmental Exposure Daily Limit Value); VME = valeur limite d'exposition (Occupational Exposure Limits); WHMIS = Workplace Hazardous Materials Information Systems

MSDS Prepared by: NOVA Chemicals

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

Other Information

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This is the end of MSDS # NOVA-0027.