

Material Safety Data Sheet

Material Name: **Crude Propylene**

MSDS ID: NOVA-0013

Section 1 - Product and Company Identification

Synonyms: Joffre C3 Intermediate Product

Chemical Name: Propylene mixture

Chemical Family: Hydrocarbons, alkenes

Material Use: Raw material for manufacture of chemicals and polymers

Chemical Formula: C₃H₆ (propylene)

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)

Mexico and South America: +44 (0) 1235 239 670 (NCEC) (24 hours)

General Comments

This product has been assigned a CAS # of 115-07-1.

Section 2 - Hazards Identification

HMIS Ratings: Health: 2 Fire: 4 Physical Hazard: 1 Personal Protection: chemical goggles, gloves, respirator, coveralls

*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 sweet hydrocarbon odour. Propylene is highly volatile, when released it will disperse as a highly flammable vapour cloud. Consider need for immediate emergency isolation and evacuation. Vapours are heavier than air and may travel along ground 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. Contains a component that may cause cancer.

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 and blistering. 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 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.
115-07-1	Propylene	65-89
74-98-6	Propane	8-10
74-98-6	Propane	10-30
74-98-6	Propane	30-32
Mixture	Methyl acetylene-propadiene mixture (MAPD)	1-5
Mixture	Methyl acetylene-propadiene mixture (MAPD)	5-6
106-99-0	1,3-Butadiene	0.1-1

Additional Information

This product may contain very low levels of Naturally Occurring Radioactive Materials (NORM), which have been identified as Radon 222 and its main radioactive decay product, Lead 210. See Section 16 - Special Considerations.

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 product 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. If the individual is conscious, thaw frostbite in mouth slowly with lukewarm water, ensuring that the 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 arrhythmia 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. Treatment for overexposure should be directed at controlling the symptoms and clinical condition of the patient. After adequate first aid, no further treatment is necessary, unless symptoms reappear.

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. Immediately withdraw in case of fire and container

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venting or heat discoloration of a container. Vapours may travel 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 pipeline, 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 may 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 drains and sewers, or other confined or underground spaces.

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, 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 50-100 metres (164-328 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 reduce vapours or divert vapour cloud drift. Prevent flammable vapours or liquids from entering drains and sewers, 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 equipment should be excluded from area of spill until cleanup has been completed.

See Section 8 for recommended Personal Protective Equipment and 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 flammable gas systems. Use with adequate ventilation. Avoid inhalation and skin and eye contact. Keep away from uncontrolled

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heat, ignition sources 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. Check for accumulation of liquids when breaking into pipelines. Radioactive decay products may accumulate over time in scale or deposits in processing equipment (e.g. pumps, filters, piping, etc.). Equipment and piping should be checked for possible treatment (decontamination) prior to maintenance or disposal/salvage.

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.

See Section 8 for recommended Personal Protective Equipment and 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 in 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.

Propylene (115-07-1)

ACGIH: 500 ppm TWA; 860 mg/m³ TWA
Alberta: 500 ppm TWA; 860 mg/m³ TWA
Ontario: 500 ppm TWA

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)

Methyl Acetylene-Propadiene Mixture (MAPD) (CAS # Not Available)//

ACGIH: 1000 ppm TWA; 1640 mg/m³ TWA (related to Methyl acetylene)
OSHA (Vacated)*: 1000 ppm TWA; 1650 mg/m³ TWA (related to Methyl acetylene (Propyne))
OSHA (Final): 1000 ppm TWA; 1650 mg/m³ TWA (related to Methyl acetylene (Propyne))
NIOSH: 1000 ppm TWA; 1650 mg/m³ TWA (related to Methyl acetylene)
1700 ppm IDLH (10% LEL) (related to Methyl acetylene)
Alberta: 1000 ppm TWA; 1640 mg/m³ TWA; 1250 ppm STEL; 2050 mg/m³ STEL (related to Methyl acetylene-propadiene mixture (MAPP))
Ontario: 1000 ppm TWA; 1250 ppm STEL (related to Methyl acetylene)

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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 (15 min. 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 or respirator is recommended if contact with liquefied gas is possible.

Personal Protective Equipment: Skin/Hands/Feet

Use impervious gloves when handling product. Wear chemical-resistant safety footwear with good traction to prevent slipping. Work clothing that sufficiently prevents skin contact 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, appropriate NIOSH approved air-purifying respirators or self-contained breathing apparatus (SCBA) appropriate for exposure potential should be used. Air-supplied breathing apparatus must be used when oxygen concentrations are low or if airborne concentrations exceed the limits of the air-purifying respirators.

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, liquid under pressure	Colour:	Colourless
Odour:	Faint hydrocarbon	Odour Threshold:	20 ppm, but not reliable as a warning property
pH:	Not applicable	Vapour Pressure:	10 atm at 21°C to 24°C (69.8°F to 75.2°F)
Vapour Density at 0°C (Air=1):	1.5	Boiling Point:	Range: -46°C to -48°C (-50.8°F to -54.4°F)
Freezing Point:	Range: -185°C to -190°C (-301°F to -310°F)	Solubility (H₂O):	Slight (0.1% at 21°C (69.8°F))
Evaporation Rate (n-Butyl Acetate=1):	Not applicable	Specific Gravity (Water=1):	0.53 at 0°C (32°F) and ~580 kPa (propylene, liquefied)
Percent Volatile:	100%	Octanol/H₂O Coeff.:	1.77
Auto Ignition:	455°C (851°F)	Flash Point:	-108°C (-162°F) minimum
Flash Point Method:	Pensky Martens closed cup	Upper Flammable Limit (UFL):	11% (propylene)
Lower Flammable Limit (LFL):	2% (propylene)	Flammability Classification:	Extremely Flammable

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Section 10 - Stability & Reactivity Information

Chemical Stability

This product is stable under normal use conditions for shock, vibration, pressure or temperature.

Chemical Stability: Conditions to Avoid

Keep away from heat, sparks, or open flame.

Incompatibility

Nitrates, perchlorates, nitrogen oxides including nitrogen dioxide, nitrous oxide and nitrogen tetroxide. 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

Under specific conditions, such as high temperature and pressure, and when product is in liquid state, product may polymerize with metal coordination complexes or mixtures of lithium nitrate and sulphur dioxide.

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 may 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

Similar hydrocarbon mixtures were tested under the EPA's High Production Volume (HPV) Chemical Challenge program. Propylene has been tested under the HPV test plan for the Olefins Panel of the ACC Propylene Streams Category. Based on testing, propylene has a low order of acute toxicity. Inhalation of propylene can produce narcosis and anaesthesia; however, these effects are only seen at very high concentrations (reports indicate >46,000 ppm to induce narcosis in humans). Excessive exposures may cause headache, dizziness, nausea, loss of coordination, and in extreme conditions coma and possibly death. High concentrations may trigger heartbeat irregularities and possible cardiac sensitization. In the gaseous state propylene is NOT expected to be irritating to the skin or eyes. However, should skin or eye contact occur with this product in its liquid state, tissue freezing, severe cold burn, and/or frostbite may result. The following additional information has been found for its components:

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: Acute Toxicity - LD50/LC50

Propylene (115-07-1)

Inhalation LC50 Rat: >65,000 ppm/4H

Propane (74-98-6)

Dermal LD50 Rat: >800,000 ppm/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

Similar hydrocarbon mixtures were tested under the EPA's High Production Volume (HPV) Chemical Challenge program. Propylene has been tested under the HPV test plan for the Olefins Panel of the ACC Propylene Streams Category. Repeated exposure to propylene produces no clinical effects in animals exposed to concentrations up to 10,000 ppm, one half of the lower flammability limit, for 103 weeks. In the nasal cavity, propylene induced nasal lesions of relatively mild nature and relatively few animals were affected. Results indicated no carcinogenic effects found. A weak mutagenic response was observed with *Salmonella typhimurium* strains TA1535 exposed to propylene in the presence of S9 mix but not in the absence of S9. It was not mutagenic in the other *Salmonella* strains (TA100, TA98 and TA1537) or in *E.coli* WP2uvrA (pKM101). Propane was negative for mutagenicity when

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tested in the *in vitro* Ames assay in five strains of *Salmonella typhimurium*. The following additional information has been found for its components:

Methyl Acetylene - A single study has indicated mutagenicity in *E.coli*.

Methyl Acetylene-Propadiene Mixture (MAPD) - Tests of rabbits, dogs, and guinea pigs exposed to an average concentration of 5000 ppm for seven hours/day, five days/week for four months resulted in no adverse health effects except decreased lung weights. No changes were observed in animals exposed to 1000 ppm for four months. Based on this data, MAPD is considered a low toxicity chemical mixture.

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.

Propylene (115-07-1)

ACGIH: A4 - Not Classifiable as a Human Carcinogen

IARC: Monograph 60 [1994], Supplement 7 [1987] (Group 3 (not classifiable))

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))

Lead 210 (14255-04-0)

IARC: Monograph 43 [1988] (Group 1 (carcinogenic to humans))

Radon 222 (14859-67-7)

IARC: Monograph 78 [2001] (listed under Some internally deposited radionuclides), Monograph 43 [1988] (Group 1 (carcinogenic to humans))

Special Remarks on Other Toxic Effects on Humans

Propylene that is inhaled is largely exhaled unchanged. A small fraction may be metabolized and transported in blood as propylene oxide. There is no known health effect found to be associated with this metabolism in 2-year cancer studies or in studies of potential adverse genetic effects.

Section 12 - Ecological Information

Ecotoxicity

A: General Product Information

Similar hydrocarbon mixtures were tested under the EPA's High Production Volume (HPV) Chemical Challenge program. Propylene has been tested under the HPV test plan for the Olefins Panel of the ACC Propylene Streams Category. Aquatic toxicity was assessed with a model that is based on an equation developed for neutral organic chemicals, a reliable estimation method for the class of chemicals in streams from this category. Calculated toxicity values for two to four day exposures suggest that category members have the potential to produce moderate toxicity, based on an effect range of 10.5 to 100.8 mg/L for selected stream constituents.

B: Component Analysis - Ecotoxicity - Aquatic/Terrestrial Toxicity

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

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Environmental Fate/Mobility

Results of distribution modeling show that chemical constituents of streams in the Propylene Streams Category will partition primarily to the air compartment, with a negligible amount partitioning to water. In the air, these constituents have the potential to rapidly degrade through indirect photolytic processes mediated primarily by hydroxyl radicals. This is expected to be the dominant route of loss and degradation process for constituents of these streams. Aqueous photolysis and hydrolysis will not contribute to the transformation of category constituents in aquatic environments because they are either poorly or not susceptible to these reactions.

Persistence/Degradability

Although the biodegradability of streams in this category has not been evaluated with standard testing procedures because of their high volatility, studies have demonstrated that the predominant category constituents can be degraded by bacteria isolated from soil and surface water samples. The results from these studies show that selected stream constituents are subject to microbial degradation. However, biodegradation is unlikely to contribute to the overall degradation of constituents from these streams because they tend to partition to the air compartment. Propylene will degrade rapidly in air; with a calculated atmospheric half-life range of 4.9 to 101.2 hours.

Bioaccumulation/Accumulation

Product is not expected to bioaccumulate.

Section 13 - Disposal Considerations

U.S./Canadian Waste Information

A: General Product Information

This product may generate 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/material 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 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

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

Section 14 - Transportation Information

US DOT Information

Shipping Name: Liquefied petroleum gas *or* Petroleum gases, liquefied

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

Required Label(s): FLAMMABLE GAS

Additional Info.: NOTE: The Reportable Quantity for butadiene is 10 lbs. (4.54 kg). For shipments, in a single container, exceeding the RQ for butadiene the letters RQ must appear in the proper shipping name.

These hazardous materials may be handled, offered for transport or transported under the UN number, UN1077, with the corresponding shipping name.

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Canadian TDG Information

Shipping Name: Liquefied petroleum gases *or* Petroleum gases, liquefied

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

Required Label(s): FLAMMABLE GAS

Additional Info.: These dangerous goods may be handled, offered for transport or transported under the UN number, UN1077, with the corresponding shipping name.

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

Shipping Name: Petroleum gases, liquefied **or** Liquefied petroleum gases

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

Required Label(s): FLAMMABLE GAS

Additional Info.: These hazardous materials may be handled, offered for transport or transported under the UN number, UN1077, with the corresponding shipping name.

International Maritime Dangerous Goods (IMDG) Code

Shipping Name: Petroleum gases, liquefied

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

Required Label(s): FLAMMABLE GAS

Additional Info.: These hazardous materials may be handled, offered for transport or transported under the UN number, UN1077, with the corresponding shipping name.

EmS No.: F-D, S-U

Marine Pollutant: No

Section 15 - Regulatory Information

A: International Regulations

Component Analysis - International Inventory Status

Component	CAS #	US - TSCA	CANADA - DSL	EU - EINECS
Propylene	115-07-1	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 hazardous under 29 CFR 1910.1200 (Hazard Communication). HCS Classes:

HCS CLASS: Flammable gas

HCS CLASS: Carcinogen (1,3 butadiene)

HCS CLASS: Toxic (1,3 butadiene)

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).

Propylene (115-07-1)

SARA 313: 1.0 % de minimis concentration

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.

Component	CAS #	NJ	PA
Propylene	115-07-1	Yes	Yes
Propane	74-98-6	Yes	Yes
MAPD (methyl acetylene & propadiene) (1related to Methyl acetylene) (2related to 1-Propyne)	Mixture	Yes ¹	Yes ²
1,3-Butadiene	106-99-0	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.

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

C: Canadian Regulations - Federal and Provincial

Canadian Environmental Protection Act (CEPA): All components of this product are on the Domestic Substances List (DSL), and are acceptable for use under the provisions of CEPA.

WHMIS Ingredient Disclosure List (IDL)

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

Component	CAS #	Minimum Concentration
MAPD (methyl acetylene & propadiene)	Not Available	1 % (related to Methyl acetylene)
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, Mutagen (1,3-Butadiene)

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 sweet hydrocarbon odour. Propylene is highly volatile, when released it will disperse as a highly flammable vapour cloud. Consider need for immediate emergency isolation and evacuation. Vapours are heavier than air and may travel along ground 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. Contains a component that may cause cancer.

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. If the individual is conscious, thaw frostbite in mouth slowly with lukewarm water, ensuring that the 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.

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 reduce vapours or divert vapour cloud drift. Prevent flammable vapours or liquids from entering drains and sewers, 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.

Material Safety Data Sheet

Material Name: **Crude Propylene**

MSDS ID: NOVA-0013

Special Considerations

For additional information on properties, health information, regulatory overview, handling, transport, storage, emergency response and general considerations to aid in fire prevention, please refer to the, "Propylene Product Stewardship Guidance Manual", published January 2007, by the American Chemistry Council (www.americanchemistry.com).

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".

Naturally Occurring Radioactive Material (NORM)

This information is given to call attention to the issue of Naturally Occurring Radioactive Material (NORM) contamination. Industry experience has shown that this product may contain small amounts of Radon-222 (Rn-222) and its radioactive decay products.

Radon-222 is a naturally occurring radioactive gas that has been found to be a contaminant in natural gas. During processing, Rn-222 tends to be concentrated in the liquefied petroleum gas stream and in product streams having a similar boiling point range. Although Rn-222 levels in this product do not present any direct radon exposure, customers should be aware of the potential for buildup of Rn-222 decay products within their processing streams. The concentration of Rn-222 decay products in processing equipment (e.g. pumps, filters, piping, etc.) may accumulate to a point where gamma radiation is detected outside of this equipment during normal operations.

Field studies quoted in the literature, and those conducted by company personnel, have not shown any conditions, which subject workers to cumulative exposures that may exceed regulated limits. Equipment emitting gamma radiation should be presumed to be internally contaminated with alpha-emitting decay products (i.e. Lead-210, Polonium-210). These decay products may be a health hazard if inhaled or ingested. Equipment and piping should be checked for possible treatment (decontamination) prior to maintenance or disposal/salvage.

Protective equipment (e.g. coveralls, gloves, and a respirator with HEPA filters, or supplied air) should be worn by personnel entering a vessel or working on contaminated process equipment to prevent skin contamination, ingestion, or inhalation of any NORM contaminated residue. Airborne contamination may be minimized by handling contaminated materials in a wet state.

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

Material Safety Data Sheet

Material Name: **Crude Propylene**

MSDS ID: NOVA-0013

MSDS Prepared by: NOVA Chemicals

MSDS Information Phone Number: 412-490-4063

Other Information

Notice to Reader:

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This is the end of MSDS # NOVA-0013.