

## Material Safety Data Sheet

Material Name: **Hydrocarbons C5 Rich (Isoprene)**

MSDS ID: NOVA-0007

### Section 1 - Product and Company Identification

**Synonyms:** Crude Isoprene, Isoprene/Piperylene Concentrate, C<sub>5</sub> Mixture, Isoprene Product

**Chemical Name:** Hydrocarbons, C<sub>5</sub>-rich

**Chemical Family:** Hydrocarbons

**Material Use:** Industrial Feedstock

**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](mailto: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:** +44 208 762 8322 (NCEC) (24 hours)

**General Comments**

This product has been assigned a CAS # of 68476-55-1.

### Section 2 - Hazards Identification

**HMIS Ratings: Health: 2\* Fire: 4 Physical Hazard: 2 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: 2**

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

**Emergency Overview**

**DANGER! EXTREMELY FLAMMABLE!** This product is a clear, volatile liquid with a slight hydrocarbon odor. Vapor is heavier than air and may spread long distances. Distant ignition and flashback are possible. Flammable liquid and vapor can accumulate static charge. Liquid can float on water and may travel to distant locations and/or spread fire. This product is harmful by inhalation and if it is swallowed. This product is irritating to the eyes and skin. Ingestion of this product may result in central nervous system effects including headache, sleepiness, dizziness, slurred speech and blurred vision. Ingestion may cause kidney and liver damage. 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**

This product is irritating to the eyes.

**Potential Health Effects: Skin**

Prolonged and/or repeated skin contact with this product may cause irritation/dermatitis. Prolonged contact with this product may cause allergic skin sensitization reactions.

**Potential Health Effects: Ingestion**

This product is harmful if swallowed. Ingestion of this product may result in central nervous system effects including headache, sleepiness, dizziness, slurred speech and blurred vision. Ingestion may cause liver and kidney damage. Small amounts of this product, if aspirated into the lungs, may cause mild to severe pulmonary injury.

**Potential Health Effects: Inhalation**

This product may be harmful by inhalation. Excessive inhalation of this material causes headache, dizziness, nausea and loss of coordination, and in extreme conditions coma and possibly death. Repeated excessive inhalation may result in bronchitis or other breathing problems, as well as possible liver or kidney damage, and possible cardiac sensitization. Liquid aspirated into the lungs may cause chemical pneumonitis.

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## Section 3 - Composition/Information on Ingredients

CAS #	Component	Percent by Wt.
68476-55-1	Hydrocarbons, C5-rich	100
	The above listed material is comprised of the following components:	
109-66-0	Pentane	22-32
78-79-5	Isoprene	14-25
504-60-9	1-Methylbutadiene (1,3-pentadiene)	10-25
78-78-4	Isopentane	1-5
78-78-4	Isopentane	5-10
78-78-4	Isopentane	10-15
563-46-2	2-Methyl-1-butene	4-7
142-29-0	Cyclopentene	4-7
109-67-1	1-Pentene	2-5
109-67-1	1-Pentene	5-7
513-35-9	2-Methyl-2-butene	2-4
287-92-3	Cyclopentane	1-3
109-68-2	2-Pentene	1-3
542-92-7	Cyclopentadiene	0.5-1.5
542-92-7	Cyclopentadiene	1.5-3

### Additional Information

The actual components and weight % concentrations vary based on operating conditions.

This product is inhibited with BHT (butylated hydroxytoluene) (50-100 ppm) for storage and transportation, however the cyclopentadiene component may dimerize forming a maximum of 1% dicyclopentadiene (CAS # 77-73-6).

This product is considered to be 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 if symptoms develop or persist.

### First Aid: Skin

Remove contaminated clothing and shoes. For skin contact, wash immediately with soap and water. Seek medical attention if symptoms develop or persist. Completely decontaminate clothing, shoes and other protective equipment before reuse or discard.

### 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.

### 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). Ensure thorough eye and skin decontamination. Treat unconsciousness, nausea, hypotension, seizures and cardiac arrhythmias in the conventional manner. Aspiration of this product during induced emesis can result in lung injury. If evacuation of stomach contents is considered necessary, use the method least likely to cause aspiration, such as gastric lavage after protecting the airway. Observe hospitalized patients for delayed chemical pneumonia, acute tubular necrosis, encephalopathy and

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dysrhythmias. Monitor for urinary phenol within 72 hours of acute exposure.

## Section 5 - Fire Fighting Measures

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

### General Fire Hazards

Fire and explosion hazards are serious when this product is exposed to heat or flame. Vapors are heavier than air and may travel along the ground to some distant source of ignition and flash back. Product will float and can be reignited on surface of water. Consider need for immediate emergency isolation and evacuation. If large tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also consider initial evacuation for 800 meters (1/2 mile) in all directions.

### Explosion Hazards

Vapors may form explosive mixture with air. Keep containers away from source of heat or fire. Containers may explode when involved in a fire. Evacuate personnel to a distance of at least 0.8 to 1.6 kilometers (1/2 to 1 mile) if a fire or rail car, tank car, or major vessel rupture is possible. This product may be a static accumulator which can form an ignitable vapor-air mixture in a storage tank.

### 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 spray or fog. Use water to cool fire-exposed containers and to protect personnel. Water may be an ineffective extinguishing medium. Monitor water run-off for flammability, and prevent from entering drains, ditches and sewers, or other confined or underground spaces.

### Fire Fighting Equipment/Instructions

Reference 2008 Emergency Response Guidebook, Guide No. 128 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 products. 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 build-up of flammable concentrations in air.

### Small Spills

Eliminate ignition sources. Spill or leak area should be isolated immediately for 25 to 50 meters (82 to 164 feet) in all directions. Keep upwind and out of low areas. Stop discharge if safe to do so. Contain discharge by booming on water or diking on ground. Spills on water will volatilize rapidly, making containment or recovery difficult. Remove liquid material with non-sparking approved pumps, skimmers or vacuum equipment. Absorb/adsorb residual materials with an inert, non-combustible material and clean up with non-sparking tools. Product may react (exothermic, ignite, polymerize) with some absorbents. Test with small quantity prior to using larger amounts. Prevent entry into sewers, drains, ditches, underground or confined spaces, water intakes and waterways. Shovel material with non-sparking tools into appropriate container for disposal.

### Large Spills

Consider downwind evacuation for 300 meters (984 feet). Eliminate ignition sources. Keep upwind and out of low areas. Stop discharge if safe to do so. Contain liquids by booming on water or by diking on land to prevent entry into sewers, drains or waterways. Spills on water will volatilize rapidly, making containment or recovery difficult. Absorb with DRY earth, sand or other inert, non-combustible material. Product may react (exothermic, ignite, polymerize) with some absorbents. Test with small quantity prior to using larger amounts. Remove material with non-sparking approved pumps, skimmers or vacuum equipment. Prevent entry into sewers, drains, ditches, underground or confined spaces, water intakes and waterways. Soil remediation may be required.

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## 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 clean up. 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 see Section 13 for waste disposal considerations.*

## Section 7 - Handling and Storage

### Handling Procedures

Keep locked up or secured. Handle in fully grounded, properly designed and approved equipment systems that are suitable for flammable liquids. Use with adequate ventilation. Do not ingest or inhale. Keep away from heat and ignition sources. No smoking or open flames permitted in storage, use or handling areas. Dissipate static electricity during transfer by grounding and bonding containers and equipment. Bonding and grounding may be insufficient to eliminate the hazard from static-accumulating flammable liquids. 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". Maintain adequate inhibitor concentrations, and nitrogen pad bulk shipping containers to keep oxygen in headspace below 100 ppm. Deposits of organic build-up in lines or process equipment may react spontaneously with air, causing smoking and possibly a fire. Take special precautions when cold cutting or breaking into lines, or when cleaning and disposing of empty containers. Do not breathe gas, fumes, vapor or spray. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately. Avoid contact with skin and eyes. Keep away from incompatible materials such as oxidizing agents and acids. After handling, always wash hands thoroughly with soap and water.

### Storage Procedures

Storage area should be clearly identified, well-illuminated, clear of obstruction and accessible only to trained and authorized personnel. Adequate security must be provided so that unauthorized personnel do not have access to product. Maintain adequate inhibitor concentrations, and nitrogen pad bulk shipping containers to keep oxygen in headspace below 100 ppm. Store in grounded, properly designed and approved vessels and away from incompatible materials. Store and use away from heat, sparks, open flame, or any other ignition source. Avoid halogen lighting. Store according to applicable regulations for flammable materials for storage tanks, containers, piping, buildings, rooms, cabinets, allowable quantities and minimum storage distances. Use non-sparking ventilation systems, approved explosion-proof equipment, and intrinsically safe electrical systems. Have appropriate extinguishing capability in storage area (e.g. sprinkler system, portable fire extinguishers (dry chemical, foam or carbon dioxide)) and flammable gas detectors. Keep absorbents for leaks and spills readily available. Inspect vents during winter conditions for vapor ice build-up. Storage tanks 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 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 authorities.

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\*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.

## **Pentane (109-66-0)**

ACGIH: 600 ppm TWA; 1770 mg/m<sup>3</sup> TWA  
OSHA (Vacated)\*: 600 ppm TWA; 1800 mg/m<sup>3</sup> TWA; 750 ppm STEL; 2250 mg/m<sup>3</sup> STEL  
OSHA Final: 1000 ppm TWA; 2950 mg/m<sup>3</sup> TWA  
NIOSH: 120 ppm TWA; 350 mg/m<sup>3</sup> TWA; 610 ppm Ceiling (15 min); 1800 mg/m<sup>3</sup> Ceiling (15 min)  
1500 ppm IDLH (10% LEL)  
Alberta: 600 ppm TWA; 1770 mg/m<sup>3</sup> TWA  
Ontario: 600 ppm TWAEV; 1770 mg/m<sup>3</sup> TWAEV; 750 ppm STEV; 2210 mg/m<sup>3</sup> STEV

## **Isoprene (78-79-5)**

While no peer-reviewed workplace exposure limit has been established for isoprene, based on current literature, adoption of an internal Isoprene 8 hr. TWA exposure limit of 10 ppm or 28 mg/m<sup>3</sup> is recommended.

## **Isopentane (78-78-4)**

ACGIH: 600 ppm TWA; 1770 mg/m<sup>3</sup> (listed under Pentane, all isomers)  
OSHA (Vacated)\*: 600 ppm TWA; 1800 mg/m<sup>3</sup> TWA (related to Pentane)  
750 ppm STEL; 2250 mg/m<sup>3</sup> STEL (related to Pentane)  
OSHA (Final): 1000 ppm TWA; 2950 mg/m<sup>3</sup> TWA (related to Pentane)  
NIOSH: 120 ppm TWA; 350 mg/m<sup>3</sup> TWA;  
610 ppm Ceiling (15 min); 1800 mg/m<sup>3</sup> Ceiling (15 min)  
1500 ppm IDLH (10% LEL)(related to n-Pentane)  
Alberta: 600 ppm TWA; 1770 mg/m<sup>3</sup> TWA  
Ontario: 600 ppm TWAEV; 1770 mg/m<sup>3</sup> TWAEV; 750 ppm STEV; 2210 mg/m<sup>3</sup> STEV (related to Pentane)

## **Cyclopentadiene (542-92-7)**

ACGIH: 75 ppm TWA; 203 mg/m<sup>3</sup> TWA  
OSHA (Vacated)\*: 75 ppm TWA; 200 mg/m<sup>3</sup> TWA  
OSHA Final: 75 ppm TWA; 200 mg/m<sup>3</sup> TWA  
NIOSH: 75 ppm TWA; 200 mg/m<sup>3</sup> TWA; 750 ppm IDLH  
Alberta: 75 ppm TWA; 203 mg/m<sup>3</sup> TWA  
Ontario: 75 ppm TWAEV; 200 mg/m<sup>3</sup> TWAEV

## **Cyclopentane (287-92-3)**

ACGIH: 600 ppm TWA; 1720 mg/m<sup>3</sup> TWA  
OSHA (Vacated)\*: 600 ppm TWA; 1720 mg/m<sup>3</sup> TWA  
NIOSH: 600 ppm TWA; 1720 mg/m<sup>3</sup> TWA  
Alberta: 600 ppm TWA; 1720 mg/m<sup>3</sup> TWA  
Ontario: 600 ppm TWAEV; 1720 mg/m<sup>3</sup> TWAEV

## **C: Exposure Limits for Chemicals which may be generated during processing**

### **Dicyclopentadiene (77-73-6)**

ACGIH: 5 ppm TWA; 27 mg/m<sup>3</sup> TWA  
OSHA: 5 ppm TWA; 30 mg/m<sup>3</sup> TWA  
OSHA (Vacated): 5 ppm TWA; 30 mg/m<sup>3</sup> TWA  
NIOSH: 5 ppm TWA; 30 mg/m<sup>3</sup> TWA  
Alberta: 5 ppm TWA; 27 mg/m<sup>3</sup> TWA  
Ontario: 5 ppm TWAEV; 27 mg/m<sup>3</sup> TWAEV

## **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.

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## PERSONAL PROTECTIVE EQUIPMENT

### Personal Protective Equipment: Eyes/Face

Wear safety glasses; chemical goggles are recommended if splashing is possible, or to prevent eye irritation from vapors.

### 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. If splashing or contact with liquid material is possible, consider the need for an impervious overcoat. 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 flammable vapor releases 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 vapors, 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

<b>Physical State and Appearance:</b>	Liquid, highly volatile	<b>Color:</b>	Clear
<b>Odor:</b>	Hydrocarbon (Slight)	<b>Odor Threshold:</b>	Not available
<b>pH:</b>	Not applicable	<b>Vapor Pressure:</b>	53.3 kPa at 25°C (77°F) (1,3-PD) Mixture has been calculated as 874 mm Hg at 20°C (68°F)
<b>Vapor Density @ 0°C (Air=1):</b>	2.5	<b>Boiling Point:</b>	30°C to 40°C (86°F to 104°F)
<b>Melting Point:</b>	Not available	<b>Solubility (H2O):</b>	690 mg/L (1,3-PD, estimated)
<b>Specific Gravity (Water=1):</b>	0.68	<b>Evaporation Rate (n-Butyl Acetate=1):</b>	28.6 (n-pentane)
<b>Percent Volatile:</b>	100% (v/v)	<b>Octanol/H2O Coeff.:</b>	1.5 (1,3-PD, estimated)
<b>Auto Ignition:</b>	220°C (428°F)	<b>Flash Point:</b>	-51°C (-59.8°F)
<b>Flash Point Method:</b>	TAG Closed Cup	<b>Upper Flammable Limit (UFL):</b>	10% (isoprene)
<b>Lower Flammable Limit (LFL):</b>	1.4 % (pentane)	<b>Flammability Classification:</b>	Flammable

## Section 10 - Stability & Reactivity Information

### Chemical Stability

This is considered a stable material when inhibited and handled and stored properly.

### Chemical Stability: Conditions to Avoid

Keep away from heat, sparks, or open flame.

### Incompatibility

Incompatible with oxidizing agents, reducing agents, and acids. May attack some rubbers, gasket coatings (amine epoxies) and some plastics. Residues (hydrocarbons in polymer build-up) will react with air and may be a serious fire hazard. Product may react (exothermic, ignite, polymerize) with some absorbents. Test with small quantity prior to using larger amounts.

### Possibility of Hazardous Reactions or Hazardous Polymerization

Hazardous reactions can occur if product is in contact with oxygen.

### Corrosivity

Not corrosive to steel, aluminum, zinc, copper, stainless steels.

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## Hazardous Decomposition

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

## Special Remarks

Maintain adequate inhibitor concentrations. In the presence of air, explosive peroxides may be produced. Residues (hydrocarbons in polymer build-up) will react with air and may be a serious fire hazard. Strong oxidizers can increase fire and explosion hazard.

## 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. Hydrocarbons, C5 Rich have been tested under the HPV test plan for ACC HPV C5 Noncyclics Category. Based on testing of its components, this product is believed to be mildly irritating to the eyes and skin. Product is irritating to the respiratory tract, and may possibly cause acute bronchitis or breathing problems. Inhalation of vapors may cause headaches, dizziness, nausea, loss of coordination. Ingestion of liquids may cause damage to the liver and kidney. Aspiration of liquids into lungs may cause pulmonary edema and chemical pneumonia. The following additional information has been found for its components:

Pentanes and Pentenes, mixed - Contact can irritate the eyes and skin causing a rash and a burning sensation. Inhalation can irritate the nose, throat, and lungs causing coughing, wheezing, and/or shortness of breath. Inhalation of high concentrations may result in central nervous system (CNS) depression, causing headache, dizziness, nausea, loss of coordination, unconsciousness, and in extreme conditions coma and possibly death. Very high levels of vapors in an enclosed space will decrease the amount of available oxygen and may cause suffocation. Ingestion and subsequent aspiration into the lungs may cause chemical pneumonitis.

Isoprene / 1,3-Pentadiene - Contact can irritate the skin and eyes. Inhalation can irritate the mucous membranes 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 possible coma.

1,3-Cyclopentadiene - Can irritate the eyes and mucous membranes. Can irritate the skin causing a rash or burning feeling on contact. Inhalation may cause central nervous system (CNS) depression, causing headache, dizziness, nausea, loss of coordination, unconsciousness, and in extreme conditions coma and possibly death. CNS depression with terminal seizures has been noted in animal tests; however, seizures have not been reported in exposed humans.

Dicyclopentadiene (DCPD) - Contact can irritate the eyes and skin. Inhalation can irritate the nose, throat, and lungs, causing coughing, wheezing, and/or shortness of breath. DCPD is toxic to the central nervous system (CNS) and exposure may cause CNS depression, causing headache, dizziness, nausea, vomiting, loss of coordination and unconsciousness.

### B: Acute Toxicity - LD50/LC50

#### **Pentane (109-66-0)**

Inhalation LC50 Rat 364 g/m<sup>3</sup>/4H; Dermal LD50 Rabbit 3000 mg/kg; Oral LD50 Rat >2000 mg/kg

#### **Isoprene (78-79-5)**

Inhalation LC50 Rat 180 mg/m<sup>3</sup>/4H; Oral LD50 Rat 2043 mg/kg; Dermal LD50 Rat >1 mL/kg

#### **1-Methylbutadiene (1,3-pentadiene) (504-60-9)**

Inhalation LC50 Rat >17.8 mg/L/4H; Inhalation LC50 Rat 97,200 mg/m<sup>3</sup>/4H

#### **Isopentane (78-78-4)**

Inhalation LC50 Rat 280,000 mg/m<sup>3</sup>/4H

#### **Cyclopentene (142-29-0)**

Oral LD50 Rat 2.14 mL/kg; Dermal LD50 Rabbit 1.59 mL/kg

#### **1-Pentene (109-67-1)**

Inhalation LC50 Rat 175,000 mg/m<sup>3</sup>/4H

#### **2-Methyl-2-butene (513-35-9)**

Inhalation LC50 Rat >61,000 ppm/4H; Oral LD50 Rat 700 mg/kg; Dermal LD50 Rat >2000 mg/kg

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**Cyclopentane (287-92-3)**

Oral LD50 Mouse 12,800 mg/kg; Oral LD50 Rat 11,400 mg/kg

**Cyclopentadiene (542-92-7)**

Oral LD50 Rat 113 mg/kg; Dermal LD50 Rabbit 430 mg/kg

**Dicyclopentadiene (77-73-6) (Dimerization)**

Inhalation LC50 Rat: 500 ppm/4H; Oral LD50 Rat: 346.5 mg/kg; Dermal LD50 Rat: >2000 mg/kg; Dermal LD50 Rabbit: 4380 mg/kg

**C: Chronic Toxicity - General Product Information**

Similar hydrocarbon mixtures were tested under the EPA's High Production Volume (HPV) Chemical Challenge Program. Hydrocarbons, C5 Rich have been tested under the HPV test plan for ACC HPV C5 Noncyclics Category. This product may act as an irritant and skin defatting agent, and repeated or prolonged contact may cause excessive skin dryness or dermatitis. Tested product has low chronic toxicity. The following additional information has been found for its components:

Pentanes and Pentenes, mixed - Prolonged and repeated skin contact can cause defatting dermatitis with dryness and cracking, redness, and blisters. Chronic exposure to high concentrations of pentane may damage the nervous system causing numbness, "pins and needles", and weakness in the arms and legs.

Isoprene / 1,3-Pentadiene - Prolonged and repeated exposure can irritate the lungs and may cause bronchitis to develop with cough, phlegm, and/or shortness of breath. Repeated exposure to high concentrations may affect the blood cells. Isoprene has been classified by IARC as Group 2B (possibly carcinogenic to humans).

1,3-Cyclopentadiene - Prolonged and repeated contact may cause a skin sensitization (allergy) to develop. If an allergy develops, very low future exposure can cause itching and a skin rash. Chronic exposure may cause headache, abdominal pain, jaundice, and anemia. Cyclopentadiene has been shown to cause mild liver and kidney injury in repeat exposure animal tests.

Dicyclopentadiene (DCPD) - Moderately toxic in repeated dose toxicity study. Prolonged and repeated exposure may damage the liver and adrenal glands. Signs of intoxication in animals include excessive salivation, anorexia, and loss of coordination. At higher doses, effects include convulsions, gastrointestinal disturbance, and hemorrhage of the lungs and intestines. Testing indicates that DCPD is not a skin sensitizer.

**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.

**Isoprene (78-79-5)**

NTP: Reasonably Anticipated To Be A Human Carcinogen (Possible Select Carcinogen)

IARC: Monograph 71 [1999]; Monograph 60 [1994] (Group 2B (possibly carcinogenic to humans))

## 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. Hydrocarbons, C5 Rich have been tested under the HPV test plan for ACC HPV C5 Noncyclics Category.

Product is largely insoluble in water, and evaporates rapidly. This product is considered harmful to aquatic life, and has likely limited absorption into soil and sediment.

**B: Component Analysis - Ecotoxicity - Aquatic Toxicity**

**Pentane (109-66-0)**

**Test & Species**

	Conditions
96 Hr LC50 Oncorhynchus mykiss	9.87 mg/L
96 Hr LC50 Pimephales promelas	11.59 mg/L
96 Hr LC50 Lepomis macrochirus	9.99 mg/L
48 Hr EC50 Daphnia magna	9.74 mg/L

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## Isoprene (78-79-5)

Test & Species		Conditions
96 Hr LC50 Lepomis macrochirus	32.5-50.15 mg/L	[static]
96 Hr LC50 Pimephales promelas	58.75-95.32 mg/L	[static]
96 Hr LC50 Poecilia reticulata	188.77-305.14 mg/L	[static]
96 Hr EC50 Scenedesmus quadricauda	>1000 mg/L	
48 Hr EC50 Daphnia magna	140 mg/L	

## 1-Methylbutadiene (1,3-pentadiene) (504-60-9)

Test & Species		Conditions
96 Hr LC50 Pimephales promelas	19 mg/L	
96 Hr EC50 Chaetogammarus marinus	18 - 35 mg/L	

## Isopentane (78-78-4)

Test & Species		Conditions
48 Hr EC50 Daphnia magna	2.3 mg/L	

## 2-Methyl-2-butene (513-35-9)

Test & Species		Conditions
48 Hr EC50 Daphnia magna	3 mg/L	

## Cyclopentane (287-92-3)

Test & Species		Conditions
48 Hr EC50 Daphnia magna	10.5 mg/L	

## Dicyclopentadiene (77-73-6) (Dimerization)

Test & Species		Conditions
96 Hr LC50 fish (carp)	62.2 mg/L	
96 Hr LC50 fish (bluegill)	95.2 mg/L	
96 Hr LC50 fish (rainbow trout)	23 mg/L	
48 Hr LC50 fish (red killfish)	25 mg/L	
96 Hr LC50 fish (fathead minnow, 30 days post-hatching)	86 mg/L	
48 Hr LC50 daphnid	6.9 mg/L	

## Environmental Fate/Mobility

Material is highly volatile. Will readily vaporize from soil, water and readily undergo photo oxidation. In the environment, direct photolysis will not significantly contribute to the degradation of constituent chemicals in the C5 Non-Cyclics Category. Atmospheric oxidation via hydroxyl radicals can be a significant route of degradation for products in this category. Based on calculated values, products in this category can have an atmospheric half-life range of 1.2 to 31.8 hours as a result of indirect photolysis by hydroxyl radical attack.

When released into air, isopentane is expected to be readily degraded by reaction with photochemically produced hydroxyl radicals, with half-life between 1 and 10 days. When released into water, isopentane may biodegrade to a moderate extent and is expected to quickly evaporate. In water, isopentane is expected to have a half-life of less than 1 day.

## Persistence/Degradability

The average percent biodegradation of the test substance was determined to be 61% on day 28. The test substance can be considered readily biodegradable.

Components are likely to degrade in air and over time in soils or ground water into less toxic materials. Not expected to persist in the environment.

## Bioaccumulation/Accumulation

No other information is available for the product as a tested mixture. Components are not likely to accumulate in plant or animal tissue.

Isopentane has an estimated bioconcentration factor (BCF) of less than 100. Isopentane has a log octanol-water partition coefficient greater than 3.0. Isopentane is not expected to significantly bioaccumulate.

# Material Safety Data Sheet

Material Name: **Hydrocarbons C5 Rich (Isoprene)**

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## Section 13 - Disposal Considerations

### U.S./Canadian Waste Information

#### A: General Product Information

This product is known to be a hazardous waste according to US and Canadian regulations. The use, mixing or processing of this material may alter this product. Contact federal, provincial/state and local authorities in order to generate or ship a waste material associated with this product to ensure materials are handled appropriately and meet all criteria for disposal of hazardous waste. **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

**1-Methylbutadiene (1,3-pentadiene) (504-60-9)**

RCRA: waste number U186 (Ignitable waste)

## Section 14 - Transportation Information

### US DOT Information

**Shipping Name:** Flammable liquids, n.o.s. (Pentanes, Isoprene)

**UN/NA #:** UN1993 **Hazard Class:** 3 **Packing Group:** I

**Required Label(s):** FLAMMABLE LIQUID

**Additional Info.:** NOTE: The Reportable Quantity for isoprene & 1,3-pentadiene is 100 lbs. (45.4 kg) each. 2008 Emergency Response Guidebook, Guide # 128.

### Canadian TDG Information

**Shipping Name:** FLAMMABLE LIQUIDS, N.O.S. (Pentanes, Isoprene)

**UN #:** UN1993 **Hazard Class:** 3 **Packing Group:** I

**Required Label(s):** FLAMMABLE LIQUID

**Additional Info.:** 2008 Emergency Guidebook, Guide #128

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

**Shipping Name:** Flammable liquids, n.o.s. (Pentanes, Isoprene)

**UN #:** UN1993 **Hazard Class:** 3 **Packing Group:** I

**Required Label(s):** FLAMMABLE LIQUID

### International Maritime Dangerous Goods (IMDG) Code

**Shipping Name:** Flammable liquids, n.o.s. (Pentanes, Isoprene)

**UN #:** UN1993 **Hazard Class:** 3 **Packing Group:** I

**Additional Info.:** EmS No.: F-E, S-E

**Marine Pollutant:** No

# Material Safety Data Sheet

Material Name: **Hydrocarbons C5 Rich (Isoprene)**

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## Section 15 - Regulatory Information

### A: International Regulations

#### Component Analysis - Inventory

Component	CAS #	US-TSCA	CANADA-DSL	EU-EINECS
Hydrocarbons, C5-rich	68476-55-1	Yes	Yes	Yes
Pentane	109-66-0	Yes	Yes	Yes
Isoprene	78-79-5	Yes	Yes	Yes
1-Methylbutadiene (1,3-pentadiene)	504-60-9	Yes	Yes	Yes
Isopentane	78-78-4	Yes	Yes	Yes
2-Methyl-1-butene	563-46-2	Yes	Yes	Yes
Cyclopentene	142-29-0	Yes	Yes	Yes
1-Pentene	109-67-1	Yes	Yes	Yes
2-Methyl-2-butene	513-35-9	Yes	Yes	Yes
2-Pentene	109-68-2	Yes	Yes	Yes
Cyclopentane	287-92-3	Yes	Yes	Yes
Cyclopentadiene	542-92-7	Yes	Yes	Yes

### B: USA Federal & State Regulations

Ongoing occupational hygiene, medical surveillance programs, or 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: Toxic

HCS CLASS: MAY CAUSE CANCER

HCS CLASS: Flammable liquid IA having a flashpoint lower than 22.8°C (73°F) and a boiling point lower than 37.8°C (100°F).

HCS CLASS: Irritating substance.

HCS CLASS: Sensitizing substance

HCS CLASS: Target organ effects.

#### 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).

##### Isoprene (78-79-5)

CERCLA: 100 lb final RQ; 45.4 kg final RQ

##### 1-Methylbutadiene (1,3-pentadiene) (504-60-9)

CERCLA: 100 lb final RQ; 45.4 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
Pentane	109-66-0	Yes	Yes
Isoprene	78-79-5	Yes	Yes
1-Methylbutadiene (1,3-pentadiene)	504-60-9	Yes	Yes
Isopentane	78-78-4	Yes	Yes
2-Methyl-1-butene	563-46-2	Yes	Yes
Cyclopentene	142-29-0	Yes	Yes
1-Pentene	109-67-1	Yes	Yes
2-Methyl-2-butene	513-35-9	Yes	Yes
Cyclopentane	287-92-3	Yes	Yes
Cyclopentadiene	542-92-7	Yes	Yes

# Material Safety Data Sheet

Material Name: **Hydrocarbons C5 Rich (Isoprene)**

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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.

## 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
Pentane	109-66-0	1 %
Isoprene	78-79-5	1%
Cyclopentadiene	542-92-7	1%
Cyclopentane	287-92-3	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 B2: Flammable liquid with a flashpoint lower than 37.8°C (100°F).

WHMIS CLASS D1A: Very Toxic (isoprene, dicyclopentadiene)

WHMIS CLASS D1B: Toxic (cyclopentadiene)

WHMIS CLASS D2A: Carcinogen (isoprene)

WHMIS CLASS D2B: Skin sensitization (cyclopentadiene)

## Other Regulations

Ongoing occupational hygiene, medical surveillance programs, or 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!** This product is a clear, volatile liquid with a slight hydrocarbon odor. Vapor is heavier than air and may spread long distances. Distant ignition and flashback are possible. Flammable liquid and vapor can accumulate static charge. Liquid can float on water and may travel to distant locations and/or spread fire. This product is harmful by inhalation and if it is swallowed. This product is irritating to the eyes and skin. Ingestion of this product may result in central nervous system effects including headache, sleepiness, dizziness, slurred speech and blurred vision. Ingestion may cause kidney and liver damage. 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:** Remove contaminated clothing and shoes. For skin contact, wash immediately with soap and water. Seek medical attention if symptoms develop or persist. Completely decontaminate clothing, shoes and other protective equipment before reuse or discard.

**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 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.

**IN CASE OF A LARGE SPILL:** Consider downwind evacuation for 300 meters (984 feet). Eliminate ignition sources. Keep upwind and out of low areas. Stop discharge if safe to do so. Contain liquids by booming on water or by diking on land to prevent entry into sewers, drains or waterways. Spills on water will volatilize rapidly, making containment difficult. Absorb with DRY earth, sand or other inert, non-combustible material. Product may react (exothermic, ignite polymerize) with some absorbents. Test with small quantity prior to using larger amounts. Remove material with non-sparking approved pumps, skimmers or vacuum equipment. Prevent entry into sewers, drains, ditches, underground or confined spaces, water intakes and waterways. Soil remediation may be required.

# Material Safety Data Sheet

Material Name: **Hydrocarbons C5 Rich (Isoprene)**

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## References

Available on request.

## Special Considerations

Bonding and grounding may be insufficient to eliminate the hazard from static-accumulating flammable liquids. 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; BLEVE = Boiling Liquid Expanding Vapor Explosion; BOD = Biochemical Oxygen Demand; CAS = Chemical Abstracts Service; CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act; CPR = Controlled Products Regulations; DOT = Department of Transportation; DSL = Domestic Substances List; EINECS = European Inventory of Existing Commercial Substances; EPA = Environmental Protection Agency; EU = European Union; FDA = Food and Drug Administration; IARC = International Agency for Research on Cancer; IDL = Ingredient Disclosure List; Kow = Octanol/water partition coefficient; LEL = Lower Explosive Limit; NIOSH = National Institute for Occupational Safety and Health; NJTSR = New Jersey Trade Secret Registry; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration; RCRA = Resource Conservation and Recovery Act; SARA = Superfund Amendments and Reauthorization Act; TDG = Transportation of Dangerous Goods; TSCA = Toxic Substances Control Act.

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-0007.