

PROPYLENE

Product Summary

Propylene is an industrial hydrocarbon product made at NOVA Chemicals' ethylene manufacturing facilities in Joffre, Alberta and Corunna, Ontario. Propylene is also produced in nature by germinating plants and occurs naturally in fruits.

Propylene is considered to pose a low risk for potential adverse impacts in the workplace and to the public when risk management controls are in place to minimize an accidental release from closed equipment systems designed for the safe handling, processing, storage and transport of this product. However, propylene is flammable and explosive when in contact with direct heat, flames or sparks. Propylene is shipped as liquefied petroleum gas by pipeline, rail car and may be shipped by marine vessel to other industrial processors that produce polypropylene, acrylonitrile and other polymers. Potential exposure to propylene in the workplace or releases to the environment are strictly controlled to well below applicable regulatory limits. There are no identified consumer product uses for propylene sold by NOVA Chemicals.

Product Use Information

Propylene is used primarily in the manufacture of polypropylene resins and other industrial chemicals e.g. acrylonitrile, propylene oxide, cumene, isopropyl alcohol, and oxo process alcohols. Propylene is also used in the preparation of specialty gases.

Human Exposure

There is very limited routine industrial workplace exposure to propylene as it is handled in closed product systems meeting stringent industry design and operating standards. Any potential occupational exposure is restricted to accidental releases, emissions from process flares, storage and handling operations and fugitive emissions from process equipment (such as pumps or valves). Industry has adopted an occupational exposure limit for propylene of less than 500 parts per million (ppm) averaged over 8-hours of work or a 40-hour workweek. Workplace air quality measurements taken by NOVA Chemicals indicate that good facility design, maintenance and good operating practices and procedures minimize general workplace exposures to levels well below the threshold limit values for propylene adopted by the American Conference for Governmental Industrial Hygienists (ACGIH). There is no established workplace biological exposure index for propylene.

General population exposure to propylene from industrial facilities is limited since industrial air emissions are subject to federal and state/provincial environmental regulations for volatile organic compounds. Measurements of emissions around industrial facilities during normal operations find levels ranging from not detectable to low parts per billion (ppb). In the United States, reported air emissions of propylene to the Toxics Release Inventory (TRI) decreased by 56% since 1988. In Canada, propylene emissions to air reported to the National Pollutant Release Inventory (NPRI) decreased by 16% between 1994 and 2007.

Health Information

Propylene is a gas or vapour that in a confined space can reduce the percent oxygen in air. Inhalation exposures to high concentrations of propylene can cause headache, dizziness, nausea, heartbeat irregularities, unconsciousness, and/or suffocation by asphyxiation. Based on published studies, the toxicity from a single (acute) exposure to propylene is considered low. Because propylene is a gas at room temperature and pressure, toxic ingestion (swallowing) and skin absorption is very unlikely. Propylene as a gas is not irritating to the skin or eyes. However should skin or eye contact occur with propylene as a liquid, tissue freezing, severe cold burns, and/or frostbite may result.

Propylene from the Joffre, Alberta facility may contain very small amounts of Radon-222, a naturally occurring radioactive material (NORM). Potential for buildup of Radon-222 decay products, (Lead-210, Polonium-210) in processing equipment may accumulate to a point where gamma radiation is detected outside of this equipment during normal operations. These decay products may be a health hazard if inhaled or ingested.

In repeated exposure (chronic) toxicity testing of propylene, no ill effects were observed in rodents exposed to concentrations up to 10,000 ppm. The only indication of toxicity was inflammation of the nasal cavity following exposure of male rats to 5,000 ppm and 10,000 ppm and female rats exposed to 10,000 ppm for 103 weeks. A recent inhalation study indicated no propylene-specific nasal lesions were microscopically detected in any of the male or female rats exposed to 200, 2000 or 10,000 ppm for 3 to 20 days. However, because the first study was longer (103 weeks) and it showed inflammation of the nasal cavities at a longer exposure, the no observable adverse effect level (NOAEL) in rats is < 5,000 ppm. Test data also demonstrates that propylene will not affect genetic material in mice. Neither reproductive toxicity nor developmental toxicity (birth defects) was observed in rats exposed to propylene. The International Agency for Research on Cancer (IARC), in its evaluation of propylene in 1994, concluded that there is inadequate evidence for the carcinogenicity of propylene in humans.

Environmental Exposure

Environmental exposure to propylene is limited since it is only processed in closed systems in industrial facilities. Propylene is very volatile and is not expected to remain in water or on the soil surface. If released to the environment, propylene is expected to partition primarily to air. The calculated half-life of propylene in the atmosphere ranges from 4.9 to 101.2 hours. Industrial volatile organic compound emissions and spills are regulated in Canada and in the United States and must be reported to regulatory agencies. Air emissions from these products can contribute to photochemical formation of ground level

PROPYLENE

ozone and possible smog formation. These products contain no sulphur and no halogens and therefore are not associated with acid rain, stratospheric ozone depletion or with climate change.

Ecological Information

Due to its physical and chemical properties, propylene released from industrial processes distributes mainly into the atmosphere. Propylene is also released to the environment from natural sources, including many trees, germinating beans, corn, cotton and pea seeds. Propylene occurs naturally in fruit. Calculated component toxicity values indicate moderate toxicity to aquatic organisms but exposure to aquatic life for any component is expected to be minimal.

Physical Hazards

Propylene is a colourless, extremely flammable gas with a faintly sweet odour that can be detected at 20 ppm. The major hazard is due to its flammable and explosive character. Propylene is easily ignited and on release can quickly form a flammable mixture in air. Containers may explode when heated or exposed to direct flames. Industrially produced propylene is kept within closed systems as pressurized or liquefied gas during production, storage, transportation and use.

Industry experience has shown that the propylene product from the Joffre, Alberta facility 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.

Risk Management at NOVA Chemicals

Risk management priorities focus efforts on controls and improvements in process design, operation and maintenance of our industrial facilities and transportation equipment to prevent accidental releases and minimize the potential for fires or explosions. Use of suitable packing materials and sealing technology minimizes propylene releases from pump seals, valve packings, pipe connections or gaskets. Ongoing preventative Leak Detection and Repair (LDAR) programs are in place at both the Joffre and Corunna production and storage facilities. Emergency response teams are prepared and equipped to rapidly respond to on-site and off-site incidents. Processes are designed to eliminate possible ignition sources and undergo periodic detailed Process Hazard and Risk Assessment reviews (HAZOPs).

All processing, storage, and transport are conducted in closed systems designed to minimize the potential for exposure or releases to the environment. Industrial Hygiene programs periodically review all workplace potential exposures to ensure controls are in place and effective. Personal protective equipment is used to prevent exposure in those situations where exposure cannot be controlled using engineering controls or other methods.

NOVA Chemicals continues to carefully review all relevant information on the safety and suitability of propylene and other petrochemical products for their known and intended end uses. In addition, NOVA Chemicals is committed to sharing information on the safe handling and end use of our products with customers and other interested parties. Material Safety Data Sheets (MSDS) are provided to our customers and can be accessed by interested members of the public electronically at the NOVA Chemicals' website at www.novachemicals.com.

NOVA Chemicals is a member of the American Chemistry Council (ACC) and the Chemistry Industry Association of Canada (CIAC). Through these and other industry associations, we actively monitor and participate in public regulatory processes impacting propylene. We also seek to better understand health and environmental challenges related to all of our products. We actively support industry-sponsored product testing initiatives and other industry initiatives supporting responsible actions, sound science and life cycle stewardship of our products.

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For detailed information on this product, please review the product Material Safety Data Sheet (MSDS). In the case of an emergency involving this product, please call our 24-hour hotline at 1-800-561-6682 or 1-403-314-8767.

For more information on this product risk profile, please contact us at 1-412-490-4063 or email us at stewardp@novachem.com.

For more information on any NOVA Chemicals' product, please contact us at the nearest location below during business hours or visit our website at www.novachemicals.com.

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