

Global Product Strategy (GPS) Safety Summary

Raffinates (Raffinate 1, Raffinate 2)

This GPS Safety Summary is a high-level summary intended to provide the general public with an overview of product safety information on this chemical substance. It is not intended to provide emergency response, medical or treatment information, nor to provide an overview of all safety and health information. This summary is not intended to replace the Safety Data Sheet. For detailed guidance on the use or regulatory status of this substance, please consult the Safety Data Sheet.

Chemical Identity

Name: Raffinates

Brand names: Raffinates, crude C4 low butadiene, butenes, isobutylenes mixture, butylenes mix (C4 raffinate I)

Chemical name (IUPAC): Hydrocarbons, C4, steam cracker distillate

CAS number: 92045-23-3, 68477-42-9, 25167-67-3

EC number: 295-405-4, 270-732-5, 246-689-3

Uses and Applications

Raffinates (commonly called Raffinate 1) is a by-product obtained after extraction of butadiene from a crude C4 stream. It is a mixture of 2-methylpropene (isobutylene), butenes, and butanes. Traces of butadiene might also be present.

Depending on the level of extraction, the product may be called either Raffinate 1 or Raffinate 2.

A wide range of chemical products can be obtained from Raffinates such as:

- Diisobutylene (DIB)
- Methyl tertiary butyl ether (MTBE)
- Poly isobutylene (PIB)
- Butene-1
- Isononanol
- Methyl ethyl ketone (MEK or butanone).

Fuel blending is another possible application of Raffinates.

Physical / Chemical Properties

At ambient temperature and pressure, Raffinates is a colorless gas with a pungent, gasoline-like odor.

Raffinates is extremely flammable. It is stable under recommended storage conditions and no decomposition may occur if stored and applied as directed.

Raffinates is incompatible with halides, hydrogen, halogens (bromine, chlorine, fluorine), strong oxidizing agents and aluminum chloride.

The boiling range of Raffinates is [-11.7 - 3.7 °C] - (11°F – 39°F).

Raffinates has been classified as hazardous under the Globally Harmonized System (GHS) on classification and labeling for its extreme flammability.

Health Effects

The most likely route of exposure is inhalation as Raffinates is a gas at standard temperature and pressure. Raffinates has been classified as hazardous under GHS for its potential to produce cardiac sensitization (HNOC).

The table below gives an overview of the health effects assessment results for raffinates stream.

Effect Assessment	Result
Acute Toxicity Oral / inhalation / dermal	Low acute inhalation toxicity. High vapor concentrations may produce narcosis or cause asphyxia by reducing the available concentration of oxygen. May increase the sensitivity of the heart to endogenous catecholamines leading to potentially fatal cardiac sensitization.
Irritation / corrosion Skin / eye/ respiratory tract	No known irritation from exposure to gas. Contact with evaporating liquid may cause frostbite.
Sensitization	No known sensitization from exposure to gas
Toxicity after repeated exposure Oral / inhalation / dermal	Low concern for repeated exposure toxicity. High exposures may produce nasal effects.
Genotoxicity / Mutagenicity	Not mutagenic/genotoxic (*)
Carcinogenicity	Low concern for cancer (*)
Toxicity for reproduction	Not toxic to reproduction or development.

(*) In case of butadiene content above 0.1% weight, Raffinates is classified as H340 (May cause genetic defects) and H350 (May cause cancer).

Environmental Effects

When released into the environment, Raffinates will volatilize rapidly. Therefore, water contamination and aquatic toxicity are not expected.

The table below gives an overview of the environmental assessment results for Raffinates.

Effect Assessment	Result
Aquatic Toxicity	Toxic to aquatic life (although volatility is expected to limit the presence of the product in surface waters).

Fate and behaviour	Result
Biodegradation	Expected to be readily biodegradable
Bioaccumulation potential	Not expected to bioaccumulate
PBT / vPvB conclusion	Not considered to be either PBT nor vPvB.

PBT = Persistent, Bio-accumulative and Toxic in the environment.
vPvB = very Persistent and very Bio-accumulative in the environment.

Exposure

Human health

Exposure to Raffinates of personnel in manufacturing facilities is considered very low because the process, storage and handling operations are usually enclosed. However, worker exposure can potentially happen during operations like product transfer operations, product sampling, or maintenance / repair activities on product containing systems. The risk of accidental exposure should be controlled and mitigated by selecting and applying the appropriate Risk Management Measures.

Environment

Raffinates is manufactured in a closed and automated process. Transfer operations such as loading and transportation are realized with dedicated equipment and under recommended Safe Use guidance to reduce the risk of release to the environment.

Risk Management Measures

For detailed guidance on the use of Raffinates, the [Safety Data Sheet](#) should be consulted.

Raffinates should only be handled by knowledgeable and trained personnel.

Flammability

Because of its flammability potential, Raffinates should not be handled or stored near heat, sparks or flame. Metal containers involved in the handling and storage of this material should be grounded and bonded.

Human health

When using chemicals make sure that there is adequate ventilation. Always use appropriate chemical-resistant gloves to protect your hands and skin, always wear eye protection such as chemical goggles and always wear flame-retardant clothing. Do not eat, drink, or smoke where chemicals are handled, processed, or stored. Wash hands and skin following contact. If the substance gets into your eyes, rinse eyes thoroughly for at least 15 minutes with tap water and seek medical attention.

In the case of transfer or maintenance operations, always clear transfer lines prior to decoupling, and flush/drain to a closed system for recycle prior to opening equipment.

In cases where engineering controls cannot maintain airborne substance concentrations below exposure limits, or in cases with a risk of accidental exposure, additional risk management

measures may be necessary for safe use, such as the use of a complete suit protecting against chemicals and supplied air, a self-contained breathing apparatus or respirator.

Environmental

In case of accidental release or spill, do not allow the product to enter sewers, surface or ground water.

Regulatory Information / Classification and Labeling

This substance has been registered under REACH by relevant companies of LyondellBasell in the European Union.

Under GHS (Globally Harmonized System on Classification and Labeling) substances are classified according to their physical, health and environmental hazards. The hazards are communicated via specific labels on the product packaging and the Safety Data Sheet. GHS attempts to standardize hazard communication so that the intended audience (workers, consumers, transport workers, and emergency responders) can better understand the hazards of the chemicals in use.

For a detailed overview of the classification and labeling of this substance, please refer to the regional [Safety Data Sheet](#), which can be found on the LyondellBasell corporate website.

Conclusion Statements

- Raffinates is used to produce a wide range of chemical products.
- Raffinates has been classified as hazardous under GHS. It is extremely flammable and can cause cardiac sensitization.
- Exposure risk to humans and the environment is considered low as the manufacturing process, storage and handling operations are enclosed.

Contact Information within Company

For further information on this product in general, please consult the [LyondellBasell corporate website](#).

Date of issue

23 March 2016.

Disclaimer

Before using a product sold by a company of the LyondellBasell family of companies, users should make their own independent determination that the product is suitable for the intended use and can be used safely and legally.

SELLER MAKES NO WARRANTY; EXPRESS OR IMPLIED (INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR ANY WARRANTY) OTHER THAN AS SEPARATELY AGREED TO BY THE PARTIES IN A CONTRACT.

Users should review the applicable Safety Data Sheet before handling the product.

This product(s) may not be used in the manufacture of any of the following, without prior written approval by Seller for each specific product and application:

- (i) U.S. FDA Class I or II Medical Devices; Health Canada Class I, II or III Medical Devices; European Union Class I or II Medical Devices;
- (ii) film, overwrap and/or product packaging that is considered a part or component of one of the aforementioned medical devices;
- (iii) packaging in direct contact with a pharmaceutical active ingredient and/or dosage form that is intended for inhalation, injection, intravenous, nasal, ophthalmic (eye), digestive, or topical (skin) administration;
- (iv) tobacco related products and applications, electronic cigarettes and similar devices.

The product(s) may not be used in:

- (i) U.S. FDA Class III Medical Devices; Health Canada Class IV Medical Devices; European Class III Medical Devices;
- (ii) applications involving permanent implantation into the body;
- (iii) life-sustaining medical applications.

All references to U.S. FDA, Health Canada, and European Union regulations include another country's equivalent regulatory classification.

In addition to the above, LyondellBasell may further prohibit or restrict the use of its products in certain applications. For further information, please contact a LyondellBasell representative.

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