

Global Product Strategy (GPS) Safety Summary

Benzene

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, or 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: Benzene

Brand names: Benzene

Chemical name (IUPAC): Benzene, Benzol, Cyclohexatriene

CAS number: 71-43-2

EC number: 200-753-7

Molecular formula: C₆H₆

Uses and Applications

Benzene is an aromatic hydrocarbon and one of the most important and versatile building blocks in the petrochemical industry.

Benzene is converted into intermediate chemical products such as ethylbenzene, cumene, cyclohexane, nitrobenzene and alkylbenzenes, which are in turn converted to other chemicals, plastics, resins, elastomers, fibers or surfactants.

The benzene derivatives are converted into products such as: styrene, polystyrene and synthetic rubber; phenol, a component in phenolic resins and adhesives; and cyclohexane, a precursor of caprolactam and adipic acid, both used in nylon production.

Physical / Chemical Properties

At ambient temperature and pressure, benzene is a colorless liquid with a distinctive aromatic odor.

Benzene is highly flammable with a flash point of -11°C (12.2°F). It is typically handled in industrial facilities where ignition sources and ventilation are controlled. The boiling point and freezing point of Benzene are 80°C (176°F) and 5.5°C (41.9°F), respectively.

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

Health Effects

Benzene is of slight acute toxicity although inhalation exposure to high concentrations may cause dizziness and CNS depression. Liquid benzene is irritating to the skin and severely irritating to the eyes. Repeated exposure is linked to bone marrow toxicity, reduced red and white blood cell counts, and decreased immunological function irrespective of the route of contact. Benzene may cause cancer and genetic defects. Benzene is classified as hazardous under GHS for its health effects.

The table below gives an overview of the health effects assessment for benzene.

Effect Assessment	Result
Acute Toxicity Oral / inhalation / dermal	Benzene is of slight acute toxicity, although inhalation exposure to high concentrations may cause dizziness and CNS depression.
Irritation / corrosion Skin / eye/ respiratory tract	Irritating to the skin and severely irritating to the eyes.
Sensitization	Not expected to cause skin or respiratory sensitization.
Toxicity after repeated exposure Oral / inhalation / dermal	The hematopoietic system is the primary target for benzene. Effects include bone marrow toxicity and reduced red and white blood cell counts.
Genotoxicity / Mutagenicity	Classified as a mutagen.
Carcinogenicity	Classified as a carcinogen.
Toxicity for reproduction	Not teratogenic or toxic to reproduction (fertility). Minor fetotoxic effects reported at concentrations that generally caused maternal toxicity.

Environmental Effects

When released to water, volatilization results in substantial losses to the atmosphere with a calculated half-life of approximately 13 days.

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

Effect Assessment	Result
Aquatic Toxicity	Toxic to fish, daphnia and other aquatic invertebrates, and toxic to aquatic plants.
Fate and behaviour	Result
Biodegradation	Readily biodegradable in aerobic conditions.
Bioaccumulation potential	Not expected to bio-accumulate.
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 benzene of personnel in manufacturing facilities is considered very low because the process, storage and handling operations are enclosed and continuous. It is not used in a widespread or dispersive manner. However, worker exposure can potentially happen during operations such as product transfer, 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.

Exposure of consumers to commercially produced benzene is unlikely as benzene is intended for industrial applications. There are no supported uses in direct consumer products.

Environment

Benzene is manufactured in a closed and automated process. Transfer operations such as loading/unloading and transportation are conducted according to industrial best practices to reduce the risk of release to the environment.

Risk Management Measures

For detailed guidance on the use of benzene, the Safety Data Sheet should be consulted.

Benzene should only be handled by knowledgeable and trained personnel.

Flammability and stability

Flammable materials should be stored in a separate safety storage cabinet or room. Vapors may form explosive mixtures with air. Check atmosphere for explosiveness and oxygen deficiencies. Vapor space above stored liquid may be flammable/explosive unless blanketed with inert gas.

Bonding and grounding measures may not be enough if nonconductive flammable liquids are involved. This liquid may accumulate static electricity even when transferred into properly grounded containers. Static electricity accumulation may be significantly increased by the presence of small quantities of water.

Store in tightly closed/properly vented containers away from heat/sparks/open flame and strong oxidizing agents like nitric acid or halogens (bromine, chlorine, fluorine).

Human health

When using chemicals make sure there is adequate ventilation. Always use appropriate chemical-resistant gloves to protect your hands and skin, wear eye protection such as chemical goggles, and 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, 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 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, prevent entry into waterways, sewers, basements or confined areas.

Regulatory Information / Classification and Labeling

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

For a detailed overview of the regulatory status of this substance, please refer to the Safety Data Sheet available on lyondellbasell.com

Under the Globally Harmonized System (GHS) 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 lyondellbasell.com.

Conclusion Statements

- Benzene is a versatile aromatic chemical intermediate used in the production of a wide range of products such as other chemicals, plastics, styrene, resins, elastomers, fibers or surfactants.
- Benzene is hazardous for its high flammability, skin and eye irritancy, carcinogenicity, mutagenicity, and damaging to hematopoietic (blood organs and cells) from prolonged or repeated exposure.
- Exposure to human health and environment is considered very low as benzene manufacturing process, storage and handling operations are enclosed. There are no supported uses in consumer products.

Contact Information within Company

For further information on this product in general, please consult the LyondellBasell corporate website (www.lyb.com).

Date of issue

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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.

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This product(s) may not be used in:

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(ii) the manufacture of any of the following, without prior written approval by Seller for each specific product and application: U.S. FDA Class II Medical Devices; Health Canada Class II or Class III Medical Devices; European Union Class II Medical Devices; film, overwrap and/or product packaging that is considered a part or component of one of the aforementioned medical devices; 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; tobacco related products and applications, electronic cigarettes and similar devices, and pressure pipe or fittings that are considered a part or component of a nuclear reactor. Additionally, 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; and (iv) lead, asbestos or MTBE related applications. All references to U.S. FDA, Health Canada, and European Union regulations include another country's equivalent regulatory classification.

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

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