

## Global Product Strategy (GPS) Safety Summary

### 1,4-Butanediol

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 and the Product Stewardship Bulletin (PSB).

#### Chemical Identity

**Name:** 1,4-Butanediol

**Brand names:** BDO

**Chemical name (IUPAC):** Butane-1,4-diol

**CAS number:** 110-63-4

**EC number:** 203-786-5

**Molecular formula:** C<sub>4</sub>H<sub>10</sub>O<sub>2</sub>

#### Uses and Applications

1,4-Butanediol (BDO) is used as a monomer, chain extender, cross-linking agent, or other reactant to produce polymers and as an additive in textile sizing and finishing baths.

It is a versatile chemical intermediate because of its terminal, primary hydroxyl groups and its hydrophobic and chemical resistant nature. Polymers produced upon reaction with diacids or diisocyanates are the basis for many commercial polyurethane and polyester applications, such as:

- Thermoplastic Polyesters. BDO is used to manufacture polybutylene terephthalate (PBT). PBT's high strength, excellent thermal stability and good durability lead to its many uses in the automotive, electrical and appliances industries;
- Polyesters. In polyurethane applications, BDO is primarily used as a component of polyesters or as a chain extender; For example, polyesters such as poly (butylene adipate) diols are formulated into urethane elastomers with excellent oil, chemical and UV resistance. In addition, these materials have good mechanical properties over a broad temperature range, as well as good flex and abrasion resistance. As a chain extender with MDI systems, 1,4-BDO provides a good balance between hardness and low temperature flexibility.
- Polyester Plasticizers. BDO based polyester plasticizers impart superior compatibility with vinyl polymers while providing non-migrating characteristics. In addition, polyesters based upon BDO have excellent oxidation resistance and good low temperature flexibility.

There are no supported uses of BDO in direct consumer products or applications.

## **Physical / Chemical Properties**

BDO is a colorless liquid with little or no odor at temperatures above 20°C (68°F). At lower temperatures, BDO will be a white solid.

The substance is considered not flammable with a flashpoint of 115°C (239°F). The boiling and freezing points of BDO are 230°C (446°F) and 20°C (68°F) respectively.

## **Health Effects**

BDO has low to moderate acute toxicity by the oral route, and it can cause drowsiness and dizziness when ingested or inhaled. BDO is readily absorbed through the skin and via oral exposure or respiration. Based on these health effects, BDO has been classified as hazardous under GHS (Globally Harmonized System for Classification and Labeling).

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

<b>Effect Assessment</b>	<b>Result</b>
Acute Toxicity Oral / inhalation / dermal	Low to moderate toxicity via the oral route of exposure. Can cause drowsiness or dizziness when inhaled. BDO is rapidly absorbed and metabolized to Gamma-Hydroxybutyrate (GHB) which is thought to produce the neurotoxic effects of BDO.
Irritation / corrosion Skin / eye/ respiratory tract	Slightly irritating to the skin, eyes and respiratory tract.
Sensitisation	Not sensitizing.
Toxicity after repeated exposure Oral / dermal	Acute, transient nervous system effects and drowsiness may occur with repeat exposure to high concentrations.
Genotoxicity / Mutagenicity	Not mutagenic.
Carcinogenicity	Not considered as carcinogenic.
Toxicity for reproduction	Not toxic to reproduction or development.

## **Environmental Effects**

BDO is a low ecotoxicity hazard based on short and long term test results in fish, aquatic invertebrates and plants.

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

<b>Effect Assessment</b>	<b>Result</b>
Aquatic Toxicity	Low ecotoxicity hazard to aquatic organisms

  

<b>Fate and behaviour</b>	<b>Result</b>
Biodegradation	Readily biodegradable.
Bioaccumulation potential	Not bio-accumulative.
PBT / vPvB conclusion	Not considered to be either PBT or vPvB.

## **Exposure**

### **Human health**

Workers may be exposed to BDO during activities such as product transfer, packing and repacking, formulation, laboratory activities, or during use as a component in professional or industrial products. For such activities exposure should be controlled by selecting and applying the appropriate Risk Management Measures.

Exposure to BDO in manufacturing facilities where BDO is used as a chemical intermediate or process chemical is considered low because the process, storage and handling operations are usually enclosed. However, worker exposure can potentially occur during operations such as product transfer, product sampling, or maintenance / repair activities on product containing systems. The risk of accidental exposure should be controlled by selecting and applying the appropriate Risk Management Measures.

### **Environment**

Due to its industrial and professional uses, BDO has various indoor and outdoor environmental release possibilities, although the volumes released are expected to be small. As BDO is readily biodegradable and not bio-accumulative, it is not expected to be found in the environment

## **Risk Management Measures**

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

BDO should only be handled by knowledgeable and trained personnel.

### **Flammability**

Equipment should be grounded to prevent build-up of static electricity.

### **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 a 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.

In the United States, the sale and distribution of BDO may be regulated by federal and/or state authorities. In Europe, BDO may be similarly regulated following Country specific requirements. Other Countries outside of the United States and Europe have also begun to implement specific requirements. Requests for BDO will be reviewed and approved by LyondellBasell as appropriate. LyondellBasell will report questionable requests for BDO, including samples, as applicable to the Drug Enforcement Agency, to the European Country Authorities and other relevant agencies.

For a detailed overview of the regulatory status of this substance, please refer to the Product Stewardship Bulletin, which is available from the LyondellBasell corporate website.

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

- BDO is a versatile substance used as a monomer, chain extender, cross-linking agent, or other reactant to produce polymers and as an additive in textile sizing and finishing baths.
- BDO is of low to moderate acute toxicity by the oral route and it can cause drowsiness and dizziness when ingested or inhaled, on basis of which it has been classified as hazardous.
- BDO possesses narcotic properties and, to prevent abusive use, its sale and use are strictly controlled and documented.
- By applying the appropriate risk management measures, exposure to BDO is expected to be below the recommended exposure limits.

### Contact Information within Company

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

## **Date of issue**

Date of issue: 4 June 2015.

## **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.

This product(s) may not be used in:

(i) any U.S. FDA Class I, Health Canada Class I, and/or European Union Class I medical devices, without prior notification to Seller for each specific product and application; or  
(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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1,4 Butanediol is a product of Lyondell Chemical Company and Lyondell Chemie Nederland B.V.