

# BDO

1,4-Butanediol  
CAS No. 110-63-4

**Description** 1,4-Butanediol (BDO) is a non-corrosive, colorless, high boiling liquid with a low order of toxicity. BDO is completely soluble in water, most alcohols, esters, ketones, glycol ethers and acetates, but may be immiscible or partially miscible in common aliphatic and aromatic/chlorinated hydrocarbons. BDO is produced by Lyondell Chemical Company in a proprietary, multi-step reaction from propylene oxide. BDO 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.

<b>Typical Properties</b>	Boiling point @ 760 TORR	228°C/442°F
	Freezing Point	19-20°C
	Molecular Weight	90.12
	Specific Gravity (20°/20°C)	1.015
	Hydroxyl Value	1245
	Flash Point (Closed Cup)	115°C/239°F

**Applications** **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 appliance industries. PBT is also compatible with several other thermoplastics which enables a compounder to tailor a polymer alloy to an end user's specifications. BDO is a key component of thermoplastic copolyester elastomers. These elastomers rely upon BDO to provide crystallinity which in turn provides elasticity and resilience to these terephthalate-based polyesters.

**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, BDO provides a good balance between hardness and low temperature flexibility. On comparison to other diols, BDO combines the best attributes of hydroxyl reactivity, linearity and overall system compatibility to build in the proper crystallinity required in the polyurethane hard segment. Also, the BDO/MDI systems provide a lower exposure hazard than MOCA/TDI systems.

BDO is used as a chain extender for thermoplastic urethane elastomers. BDO yields crystalline urethane domains which readily melt and flow at elevated temperatures but phase separate at ambient temperatures in order to yield tough elastomeric networks.

Cast urethane elastomers continue to be a major end use of BDO because of overall consistency and reliability.

Current applications of BDO-based urethane elastomers include automotive front and rear end fascia, bumpers, fenders and spoilers. Non-automotive applications include footwear, electrical enclosures, recreation equipment, appliances and furniture.

Urethane RIM elastomers using BDO allow design freedom and parts consolidation with large, complex shapes.

**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.

## Copolyester Hot Melt and Solvent borne Adhesives

BDO is a key component of copolyesters of isophthalic acid and terephthalic acid used in hot melt adhesive applications. BDO yields polyesters with excellent adhesives and cohesive strength.

### Derivatives

BDO is the key raw material of several industrially important derivatives, particularly tetrahydrofuran, gammabutyrolactone, and N-methyl pyrrolidone. Each of these derivatives will also be produced at Lyondell Chemical's butanediol facility.

BDO is not intended for human consumption or in a direct consumer product or application as either a pure substance nor as a component of a mixture.

### Storage and Handling

In the presence of strong acids, BDO is dehydrated to tetrahydrofuran.

Keep away from heat, sparks and flame.

Since BDO solidifies at temperatures below 19°C, appropriate storage temperatures are required; however, reliquefaction does not alter its properties.

BDO can be shipped and stored in mild steel; however, coated tanks or stainless steel will prolong product consistency. Upon longer storage, water and iron should be avoided. It is also advisable to store under a pad of dry nitrogen. Keep container tightly closed.

### Safety and Health

Not listed as a carcinogen by IARC, NTP, OSHA or ACGIH. Exposure limits for BDO have not been established by OSHA and ACGIH.

<b>Toxicological Evaluation (BDO)</b>	
Inhalation-4 hour ALC	15 mg/L in rats
Oral LD 50	1,780 mg/kg in rats
Aquatic Toxicity-LC50	33000 mg/L (96 hrs-fathead minnow)

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.

Alkylate, Duopac, Duoprime, Filmex, MPDIOL, Polymeg, SAA-100, SAA-101, TBAC, Tebol, T-Hydro, and Tufflo are trademarks owned or used by the LyondellBasell family of companies.

Duopac, Duoprime, Filmex, MPDIOL, Polymeg, Tebol, T-Hydro and Tufflo are registered in the U.S. Patent and Trademark Office.

Houston, Texas, USA | Tel: +1 713 309 7200 or toll-free within USA +1 888 777 0232  
Rotterdam, The Netherlands | Tel: +31 10 275 5500  
Hong Kong, China | Tel: +852 2882 2668