

Global Product Strategy (GPS) Safety Summary

Tertiary-Butyl Alcohol

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: Tertiary-Butyl Alcohol (TBA)

Brand names: Tertiary-Butyl Alcohol (TBA); Gasoline Grade TBA (GTBA); Chemical Grade TBA (CTBA); *Tebol-99*; *Tebol-93*.

Chemical name (IUPAC): 2-methyl-2-propanol or 2-methylpropan-2-ol

CAS number: 75-65-0

EC number: 200-889-7

Molecular formula: C₄H₁₀O

Uses and Applications

TBA is mainly used as an intermediate for, or a by-product within, the production of other high-volume chemicals. Its intermediate uses include:

- A starting material for the production of tert-butyl peroxides used as polymerization initiators;
- An alkylating agent;
- Production of various tert-butyl esters as precursors for antioxidants, phenolic resins, pharmaceutical products and perfumes.

Because TBA has good solubility for both polar and non-polar substances, TBA is useful as a solvent and as a solubilizer in water-based paints, for dewaxing of oils and as a denaturing agent for Ethanol.

Physical / Chemical Properties

TBA is a low molecular weight, highly flammable liquid of moderate volatility with a flash point of 15°C (59°F). It freezes/melts around 26°C (79°F) and will either be present as a colorless liquid with a camphor-like odor, or an off-white solid block depending on ambient temperature.

The liquid is lighter than water and miscible with water, while vapors are heavier than air.

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

Health Effects

The human health toxicological hazards of TBA indicate low acute toxicity by the oral, dermal and inhalation routes of exposure. Transient signs of altered nervous system function (commonly observed with short-chain alcohol exposure) are observed with exposure to high levels. Slight skin and moderate eye irritation have been observed from contact to liquid but there is no evidence of allergic skin reactions. High air concentrations are reported to cause respiratory irritation. TBA has been classified as hazardous under GHS for its health effects.

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

| Effect Assessment | Result |
|--|--|
| Acute Toxicity Oral / inhalation / dermal | Low acute toxicity, but narcotic effects and respiratory irritation at very high concentrations possible (see note 1). |
| Irritation / corrosion Skin / eye/ respiratory tract | Slight skin and moderate eye irritation. |
| Sensitisation | Not considered to be sensitizing. |
| Toxicity after repeated exposure Oral / inhalation / dermal | Target organ effects specific to rodents are not relevant to human health. |
| Genotoxicity / Mutagenicity | Not mutagenic / genotoxic. |
| Carcinogenicity | Not considered to be a human cancer concern. |
| Toxicity for reproduction | No adverse effects on fertility and not selectively toxic to the fetus. |

Note 1: In Europe a harmonized classification exists for TBA, under which TBA is classified as harmful by inhalation (acute toxicity category 4).

Environmental Effects

TBA is a low-ecotoxicity hazard based on the results of acute and chronic studies.

The table below provides an overview of the environmental assessment results for TBA.

| Effect Assessment | Result |
|--------------------------|---------------------------------|
| Aquatic Toxicity | Low toxicity to water organisms |

| Fate and behaviour | Result |
|---------------------------|--|
| Biodegradation | Inherently biodegradable |
| Bioaccumulation potential | Not bio-accumulative |
| PBT / vPvB conclusion | Not considered to be either PBT or vPvB. |

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

Exposure

Human health

Consumers may be exposed to small amounts of TBA during the use of consumer products containing TBA, such as coatings and cleaning products. However, for supported uses these potential exposures are expected to be below the allowable and recommended exposure limits.

Professionals and industrial workers may come into contact with TBA as a component of cleaning agents, coatings and other TBA containing products. For uses as a solubilizer, the amount used in the products, e.g. coatings and cleaning products, is very low. Exposure should be controlled by selecting and applying the appropriate Risk Management Measures.

Personnel exposure to TBA in manufacturing facilities where TBA is used as an intermediate is considered very low because the process, storage and handling operations are 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

Exposure to the environment may take place during production, formulation, intermediate preparation, use as an industrial processing aid and during use of professional and consumer TBA-containing products.

Risk Management Measures

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

TBA should only be handled by knowledgeable and trained personnel.

Consumer use

When using a TBA-containing consumer product at home, all instructions and precautions should be read, understood and followed. Adequate ventilation should be present and it should never be used near open flames or other ignition sources.

Flammability

The vapor space above a stored liquid may be flammable/explosive unless blanketed with inert gas. 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 at 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.

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

Under the Globally Harmonized System on classification and labeling (GHS) 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

- TBA is mainly used as an intermediate for, or a by-product within, the production of high-volume chemicals. Due to its good solvent properties and solubility, TBA is suitable as a solvent and as a solubilizer, for water-based paints, the dewaxing of oils and as a denaturing agent for Ethanol.
- TBA is highly flammable, is of low acute toxicity by the oral route, can cause slight skin and moderate eye irritation and respiratory irritation at high air concentrations. Appropriate Risk Management Measures should be selected and applied to control risk of exposure.
- Consumer exposure to small amounts of TBA during supported uses in consumer products containing TBA are expected to be below the allowable and recommended exposure limits.

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:

(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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