

MATERIAL SAFETY DATA SHEET (M.S.D.S)

1,4 BUTANEDIOL

1. PRODUCT AND COMPANY IDENTIFICATION

Product name: 1,4 BUTANEDIOL

Chemical characterization: Glycols

CAS-No.: 110-63-4

Chemical Name: 1,4-Butanediol

Synonyms: Tetra Methylene Glycol, BDO

2. HAZARDS IDENTIFICATION

Emergency Overview

This material is HAZARDOUS by OSHA Hazard Communication definition.

Signal Word

CAUTION.

Physical state

liquid

Color

White in solid form <20 C; clear, colorless in liquid form.

Odor

Little or no odor.

Odor Threshold

No value available.

Hazards

Ingestion hazard. Inhalation hazard. Slight eye irritant. Slight skin irritant.

Potential health effects

Routes of exposure

Eye. Inhalation. Skin.

Acute effects

See component summary.

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Slight eye irritant. Slight skin irritant. Not expected to be a sensitizer. This material may be absorbed through the skin. Ingestion hazard. Inhalation hazard. Overexposure may cause coughing, shortness of breath, dizziness, central nervous system depression, intoxication and collapse.

Skin

May cause minimal irritation. Not expected to be a skin absorption hazard. Not expected to be a sensitizer.

Inhalation

May produce symptoms of central nervous system depression including headache, dizziness, nausea, euphoria, loss of equilibrium, drowsiness, visual disturbances, fatigue, unconsciousness and respiratory arrest.

Eyes

May cause minimal irritation, seen as excess redness of the conjunctiva.

Ingestion

Ingestion of high doses may cause behavioral changes, nervous system stimulation (increased activity, shaking, tremors) and/or depression (fatigue, dizziness, and possibly loss of concentration, with collapse, coma and death in cases of severe over-exposure), respiratory depression, and gastrointestinal effects (vomiting). Some nervous system symptoms may have a delayed onset and prolonged course.

Chronic effects

See component summary.

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Prolonged or repeated breathing of high concentrations may cause symptoms of central nervous system depression.

Aggravated Medical Condition

This material or its emissions may affect the central nervous system (CNS) and/or aggravate pre-existing CNS disorders.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS-No.	EC-No.	Weight %
1,4-Butanediol	110-63-4	203-786-5	>= 99.5

Typical composition

4. FIRST AID MEASURES

General advice

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General advice

Harmful by ingestion. Ingestion may cause CNS depression (drowsiness and dizziness) and respiratory failure.

Vapors may cause drowsiness and dizziness. Always observe self-protection methods Move out of dangerous area. If you feel unwell, seek medical advice (show the label where possible). Show this material safety data sheet to the doctor in attendance.

Skin

Wash off immediately with soap and plenty of water. Remove contaminated clothing and wash skin with plenty of soap and water. Flush with lukewarm water for 15 minutes. Seek medical attention if ill effect or irritation develops.

Inhalation

If symptoms are experienced, move victim to fresh air. Give oxygen or artificial respiration as needed. Obtain emergency medical attention. Prompt action is essential.

Eyes

Flush with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. If eye irritation persists: Get medical advice/ attention.

Ingestion

If victim is drowsy or unconscious, place on the left side with head down. If victim is conscious and able to swallow, have victim drink water to dilute. Never give anything by mouth if victim is unconscious or having convulsions. Induce vomiting only if advised by a physician or Poison Control Center. CALL A PHYSICIAN OR POISON CONTROL CENTER IMMEDIATELY! If vomiting does occur, have victim lean forward to reduce risk of aspiration. Prompt action is essential.

Notes to physician

Treat symptomatically. Treatment of overexposure should be directed at the control of symptoms and the clinical condition of the patient.

5. FIRE-FIGHTING MEASURES

Flammable properties

Classification

OSHA/NFPA Class IIIB combustible liquid.

Flash point

> 115 °C (239 °F) closed cup

Autoignition temperature

385 °C (725 °F)

Lower explosion limit

1.9 vol%

Upper explosion limit

13.2 vol%

Extinguishing Media

Suitable extinguishing media

SMALL FIRE: Use dry chemicals, CO₂, water spray or alcohol-resistant foam LARGE FIRE: Use water spray, water fog or alcohol-resistant foam

Unsuitable extinguishing media

Do not use solid water stream/may spread fire.

Protective equipment and precautions for firefighters

Protective equipment and precautions for firefighters

Wear an approved positive pressure self-contained breathing apparatus and firefighter turnout gear. Structural firefighters

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protective clothing will only provide limited protection.

Precautions for fire-fighting

Heat from fire can generate flammable vapor. When mixed with air and exposed to ignition source, vapors can burn in open or explode if confined. Vapors may be heavier than air. May travel long distances along the ground before igniting and flashing back to vapor source. Fine sprays/mists may be combustible at temperatures below normal flash point. Fight fire from a safe distance/protected location. Heat may build enough pressure to rupture closed containers/spreading fire/increasing risk of burns/injuries. Use water spray/fog for cooling. Avoid frothing/steam explosion. Burning liquid may float on water. Although water soluble, may not be practical to extinguish fire by water dilution. Notify authorities immediately if liquid enters sewer/public waters. Fire residues and contaminated fire extinguishing water must be disposed of in accordance with local regulations.

Hazardous combustion products

Thermal decomposition may produce carbon monoxide and other toxic vapors.

6. ACCIDENTAL RELEASE MEASURES

Spills and leaks

May contaminate water supplies/pollute public waters. Soak up small spills with inert solids. Do not touch or walk through spilled material. Slippery walking/spread granular cover or soak up. Evacuate/limit access. Equip responders with proper protection. Prevent flow to sewer/public waters. Stop release. Notify fire and environmental authorities. Restrict water use for cleanup. Impound and recover large land spill. Soak up small spill with inert solids; use suitable disposal containers. May biodegrade. Contain/collect rapidly to minimize dispersion. Disperse residue to reduce aquatic harm. Report per regulatory requirements.

An authoritative evaluation of environmental exposure and risk indicates that no special risk management practices are needed to control environmental release.

7. HANDLING AND STORAGE

Handling

Wear recommended personal protective equipment. Use in a well-ventilated area. Keep container tightly closed when not in use. Store in a warm location (25° -30°C)/(77-86°F) to assist in emptying containers. If direct heat is applied to improve material flow, use care to avoid localized overheating and possible product degradation and container overpressure. Keep floor around container free of spilled product to prevent highly viscous material from sticking to and contaminating shoes.

Storage

Store in a warm location (25° -30°C)/(77-86°F) to assist in emptying containers. Store in stainless steel or lined carbon steel containers.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls

General room or local exhaust ventilation is usually required to meet exposure limit(s).

Personal protective equipment

Inhalation

When workers are facing concentrations above the exposure limit they must use appropriate certified respirators. No occupational exposure limits have been developed for this material. Where exposure through inhalation may occur from use, approved respiratory protection equipment is recommended.

Skin

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Skin

Wear chemical resistant gloves such as: Butyl rubber. Gloves should be discarded and replaced if there is any indication of degradation or chemical breakthrough. Depending on the conditions of use, protective gloves, apron, boots, head and face protection should be worn. The equipment must be cleaned thoroughly after each use.

Eyes

Eye protection such as chemical splash goggles and/or face shield must be worn when possibility exists for eye contact due to splashing or spraying liquid, airborne particles, or vapor. Safety glasses are the minimum requirements.

Remarks

Selection of appropriate personal protective equipment should be based on an evaluation of the performance characteristics of the protective equipment relative to the task(s) to be performed, conditions present, duration of use, and the hazards and/or potential hazards that may be encountered during use. Wash hands before eating, drinking, smoking, or using toilet facilities. Take off contaminated clothing and wash before reuse. Shower after work using plenty of soap and water. Use good personal hygiene practices. Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure.

Occupational Exposure Limits

Consult local authorities for acceptable exposure limits.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance: liquid White in solid form <20 °C; clear, colorless in liquid form.

Odor: Little or no odor.

Odor Threshold: No value available.

pH: ~ 7

Boiling point/boiling range: ~ 230 °C (446 °F) @ 760 mm Hg

Melting/freezing point: 20.4 °C (68.72 °F)

Flash point: > 115 °C (239 °F) closed cup

Autoignition temperature: 385 °C (725 °F)

Flammability: OSHA/NFPA Class IIIB combustible liquid.

Lower explosion limit: 1.9 vol%

Upper explosion limit: 13.2 vol%

Explosive properties: Not explosive

Oxidizing properties: Not considered an oxidizing agent.

Vapor pressure: 1 mm Hg @ 25 °C (77 °F)

Evaporation rate: No Data Available.

Relative density: ~ 1 (Water = 1.0 at 4 °C (39.2 °F))

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Relative vapor density: ~ 3.2 @ 15 - 20 °C (59 - 68 °F)(Air = 1.0)

Viscosity: 71.5 mPa.s @ 25 °C (77 °F)

83.2 mm²/s @ 20 °C (68 °F)

Water solubility: 100 g/l completely miscible

Partition coefficient: n-octanol/water: @ 25 °C (77 °F)

Other physico-chemical properties: Additional properties may be listed in Sections 2 and 5.

10. STABILITY AND REACTIVITY

Conditions to avoid

Heat, sparks, open flame, other ignition sources, and oxidizing conditions.

Materials to avoid

Strong oxidizers such as hydrogen peroxide, nitric acid, sulphuric acid, etc.

Hazardous decomposition products

Carbon oxides (CO, CO₂)

Hazardous polymerization

Not expected to occur.

Reactions with Air and Water

Not expected to occur.

11. TOXICOLOGICAL INFORMATION

Product information

Product Summary

1,4-Butanediol is NOT intended for human consumption and is not approved by the U.S. Food and Drug Administration for such uses. Acute lethal toxicity of 1,4-butanediol (BDO) is low via all routes of exposure. Major toxic signs by oral administration are CNS depression and respiratory failure. In animals and humans, BDO is rapidly absorbed and metabolized to gamma-hydroxybutyrate (GHB) which is thought to produce the neurotoxic effects of BDO. Because there have been a number of human poisonings from accidental or intentional ingestion, BDO is regarded as a hazardous chemical. BDO can competitively inhibit the enzyme that metabolizes alcohol, hence combined exposures may increase the toxic effects of alcohol and delay and prolong the toxicity of BDO. BDO is a slight irritant to the skin, eyes, and respiratory tract but not a skin sensitizer. Repeated exposures of rodents to high doses resulted in sedation, body weight decreases, alterations in blood and clinical chemistry parameters and minimal microscopic structural changes in organs/tissues. BDO is not teratogenic or selectively toxic to the embryo or fetus. A reduction in fetal body weight was observed in rats and mice following high oral doses but this effect was considered secondary to maternal toxicity. BDO is not genotoxic in in vitro assays.

Other information

1,4-Butanediol is rapidly absorbed and metabolized to gamma-hydroxybutyrate (GHB) which is thought to produce the neurotoxic effects of 1,4-Butanediol. 1,4 Butanediol can competitively inhibit the enzyme that metabolizes alcohol, hence combined exposures may increase the toxic effects of alcohol, and delay or prolong the toxicity of 1,4-butanediol.

COMPONENT INFORMATION

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Acute toxicity

LC50 (Inhl) rat > 5.1 MG/L 4 HOURS

LD50 Oral rat 1500 MG/KG BWT

LD50 (Skin) rat > 2000 MG/KG BWT

Acute effects

Skin contact

Not expected to be a skin absorption hazard.

Irritation

Skin

Not a skin irritant.

Eyes

May cause minimal irritation, seen as excess redness of the conjunctiva. Effects of eye irritation are reversible.

Sensitization

Not expected to be a sensitizer.

Target Organs

Central nervous system.

Reproductive effects

No adverse effect on reproductive performance was seen in male and female rats exposed orally to high doses (up to 800 mg/kg bwt/day) of 1-4-butanediol.

Developmental Toxicity

Results from studies in pregnant mice and rats demonstrate that 1,4-butanediol is not teratogenic or selectively toxic to the embryo or fetus. A reduction in fetal body weight was observed at 1,4-butanediol doses of 300 mg/kg bwt and greater but this effect was judged secondary to maternal toxicity.

Genetic Toxicity

In vitro tests show no evidence of mutagenicity or chromosomal damage.

Carcinogenicity

No Data Available. Not listed by IARC, NTP, OSHA or EPA.

Other information

1,4-Butanediol is rapidly absorbed and metabolized to gamma-hydroxybutyrate (GHB) which is thought to produce the neurotoxic effects of 1,4-Butanediol. 1,4 Butanediol can competitively inhibit the enzyme that metabolizes alcohol, hence combined exposures may increase the toxic effects of alcohol, and delay or prolong the toxicity of 1,4-butanediol.

12. ECOLOGICAL INFORMATION

Product information

Ecotoxicity

This material is not harmful or toxic to fish. This material is not harmful or toxic to aquatic invertebrates. This material is not harmful or toxic to algae or higher aquatic plants. See component summary.

Environmental fate and pathways

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This material is expected to be readily biodegradable. Estimated half-life from a model river and model lake is 18,600 and 202,900 days, respectively. Undergoes slow aquatic oxidation to succinic acid and carbon dioxide. Not expected to undergo hydrolysis. Undergoes photooxidation with OH radicals in air with a half-life of 24 hours. Expected to have high mobility in soils. Not expected to volatilize from surface waters. Not likely to adsorb to suspended solids and sediment in water. Volatilization from dry soil surfaces is expected. This material is not expected to bioaccumulate.

Persistence and degradability

Stability in soil: Expected to have high mobility in soils.

Biodegradation: Readily biodegradable.

Bioaccumulation: Bioconcentration factor (BCF) ~ 3.16 (estimated).

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Ecotoxicity

Acute Fish toxicity

LC50 / 96 HOURS *Oryzias latipes* (Orange-red killifish) > 100 mg/l

LC50 / 96 HOURS *Pimephales promelas* (fathead minnow) > 30,000 mg/l

Acute toxicity to aquatic invertebrates

EC50 / 48 HOUR *Daphnia magna* (Water flea) 813 mg/l

Toxicity to aquatic plants

EC50 / 72 HOUR *Desmodesmus subspicatus* (green algae) > 500 mg/l

Toxicity to microorganisms

IC50 / 40 HOURS *Tetrahymena pyriformis* (ciliated protozoa) 15,536 mg/l

Chronic toxicity to fish

Summary: No Data Available.

Chronic toxicity to aquatic invertebrates

EC50 / 21 DAY *Daphnia magna* (Water flea) > 85 mg/l

Environmental fate and pathways

Estimated half-life from a model river and model lake is 18,600 and 202,900 days, respectively. Undergoes slow aquatic oxidation to succinic acid and carbon dioxide. Not expected to undergo hydrolysis. Undergoes photooxidation with OH radicals in air with a half-life of 24 hours. Expected to have high mobility in soils.

Persistence and degradability

Stability in water: Not expected to volatilize from surface waters. Not likely to adsorb to suspended solids and sediment in water.

Stability in soil: Expected to have high mobility in soils. Volatilization from dry soil surfaces is expected.

Biodegradation: This material is expected to be readily biodegradable.

Bioaccumulation: Bioconcentration factor (BCF) 3.2 (estimated) Estimated BCF = 3.2

13. DISPOSAL CONSIDERATIONS

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Contaminated product, soil, water, container residues and spill cleanup materials may be hazardous wastes. Comply with federal, state, or local regulations for disposal.

14. TRANSPORT INFORMATION

Special Provisions

If you reformulate or further process this material, you should consider re-evaluation of the regulatory status of the components listed in the composition section of this sheet, based on final composition of your product.

Proper shipping name BUTANEDIOL, not regulated

15. REGULATORY INFORMATION

Notification status

All ingredients are on the following inventories or are exempted from listing

Country	Notification
Australia	AICS
Canada	DSL
China	IECS
European Union	EINECS
Japan	ENCS/ISHL
Korea	ECL
Philippines	PICCS
United States of America	TSCA
New Zealand	NZIoC

If identified components of this product are listed under the TSCA 12(b) Export Notification rule, they will be listed below.

SARA 302/304

This product contains no known chemicals regulated under SARA 302/304.

SARA 311/312

Based upon available information, this material is classified as the following health and/or physical hazards according to Section 311 & 312:

Immediate (Acute) Health Hazard.

SARA 313

This product contains no known chemicals regulated under SARA 313.

State Reporting

This product contains no known chemicals regulated by California's Proposition 65.

This product contains no known chemicals regulated by New Jersey's Worker and Community Right to Know Act.

No components are subject to the Massachusetts Right to Know Act.

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This product contains no known chemicals regulated by Pennsylvania's Right to Know Act.

16. OTHER INFORMATION

Disclaimer

This document is generated for the purpose of distributing health, safety, and environmental data.

Information is correct to the best of our knowledge at the date of the MSDS publication.

It is not a specification sheet nor should any displayed data be construed as a specification.

The information on this MSDS was obtained from sources which we believe are reliable. However, the information is provided without any warranty, expressed or implied, regarding its correctness. Some information presented and conclusions drawn herein are from sources other than direct test data on the substance itself. The conditions or methods of handling, storage, use and disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage, or expense arising out of or in any way connected with handling, storage, use, or disposal of this product. If the product is used as a component in another product, this MSDS information may not be applicable.

Numerical Data Presentation

The presentation of numerical data, such as that used for physical and chemical properties and toxicological values, is expressed using a comma (,) to separate digits into groups of three and a period (.) as the decimal marker. For example, 1,234.56 mg/kg = 1 234,56 mg/kg.

Language Translations

This document may be available in languages other than English.

End of Material Safety Data Sheet