

Butanol

3.



SIGMA-ALDRICH

Material Safety Data Sheet

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Section 1 - Product and Company Information

Product Name: 1-BUTANOL, ANHYDROUS, 99.8%
Product Number: 281549
Brand: Aldrich Chemical
Company: Sigma-Aldrich
Street Address: 3050 Spruce Street
City, State, Zip, Country: SAINT LOUIS, MO 63103 US
Technical Phone: 314 771 5765
Fax: 800 325 5052
Emergency Phone: 414 273 3850 Ext. 5996

Section 2 - Composition/Information on Ingredient

Substance Name: 1-BUTANOL
CAS #: 71-36-3
SARA 313: Yes
Formula: C4H10O
Synonyms: Alcohol butylique (French), Butanol, n-Butanol (ACGIH), n-Butanol, 1-Butanol, Butan-1-ol, n-Butan-1-ol, Butanolen (Dutch), Butanolo (Italian), n-Butyl alcohol, 1-Butyl alcohol, n-Butyl alcohol (OSHA), Butyl hydroxide, Butylowy alkohol (Polish), Butyric or normal primary butyl alcohol, CCS 203, Hemostyp, 1-Hydroxybutane, Methylolpropane, Propylcarbinol, Propylmethanol, RCRA waste number U031

Section 3 - Hazards Identification

Emergency Overview
Flammable, Harmful.
Harmful if swallowed. Irritating to respiratory system and skin. Risk of serious damage to eyes. Vapors may cause drowsiness and dizziness.
Target organ(s): Central nervous system, Ears.

HMS Rating
Health: 2* Flammability: 3 Reactivity: 1

NFPA Rating
Health: 2 Flammability: 3 Reactivity: 1

*additional chronic hazards present.

Section 4 - First Aid Measures

Oral Exposure
If swallowed, wash out mouth with water provided person is conscious. Call a physician.

Inhalation Exposure
If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

Dermal Exposure

In case of skin contact, flush with copious amounts of water for at least 15 minutes. Remove contaminated clothing and shoes. Call a physician.

Eye Exposure

In case of contact with eyes, flush with copious amounts of water for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers. Call a physician.

Section 5 - Fire Fighting Measures

Flammable Hazards: Yes

Explosion Hazards

Vapor may travel considerable distance to source of ignition and flash back. Container explosion can occur under fire conditions. In advanced or massive fires the area should be evacuated and the fire should be fought from a remote explosion-resistant location.

Flash Point: 95 °F 35 °C

Explosion Limits: Lower: 1.4 % Upper: 11.2 %

Autoignition Temp: 343 °C Flammability: Yes

Extinguishing Media

Suitable
Carbon dioxide, dry chemical powder, or appropriate foam.
Unsuitable
Water may be effective for cooling, but may not effect extinguishment.

Firefighting

Protective Equipment
Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.
Specific Hazard(s)
Flammable liquid.
Specific Method(s) of Fire Fighting
Use water spray to cool fire-exposed containers.

Section 6 - Accidental Release Measures

Procedure to be Followed in Case of Leak or Spill
Evacuate area. Shut off all sources of Ignition.

Procedure(s) of Personal Precaution(s)
Wear self-contained breathing apparatus, rubber boots, and heavy rubber gloves.

Methods for Cleaning Up

Cover with dry-lime, sand, or soda ash. Place in covered containers using non-sparking tools and transport outdoors. Ventilate area and wash spill site after material pickup is complete.

Section 7 - Handling and Storage

Handling

User Exposure
Do not breathe vapor. Avoid contact with eyes, skin, and clothing. Avoid prolonged or repeated exposure.

Storage
Suitable

Keep container closed. Keep away from heat, sparks, and open flame. Handle and store under nitrogen. Store in a cool dry place.

Special Requirements

Hygroscopic. Handle and store under inert gas.

Section 8 - Exposure Controls / PPE**Engineering Controls**

Safety shower and eye bath. Use nonsparking tools. Mechanical exhaust required.

Personal Protective Equipment**Respiratory**

Government approved respirator.

Hand

Compatible chemical-resistant gloves.

Eye

Chemical safety goggles.

General Hygiene Measures

Wash thoroughly after handling. Wash contaminated clothing before reuse.

Exposure Limits

Country	Type	Value
Poland	NDS	50 MG/M3
Poland	NDSch	150 MG/M3
Poland	NDSP	-
USA	OSHA, PEL	150 mg/m3 50 ppm
USA	ACGIH, TLV	152 mg/m3 50 ppm

Exposure Limits, RTECS

Country	Source	Type	Value
USA	ACGIH	Ceiling concentration	50 PPM
USA	MSHA Standard-air	TWA	100 PPM (300 MG/M3)
USA	OSHA,	PEL	8H TWA 100 PPM (300 MG/M3)
New Zealand	OEL		
USA	NIOSH	Ceiling concentration	50 PPM (SK)

Section 9 - Physical/Chemical Properties**Appearance**

Physical State	Color
Clear liquid	Colorless

Molecular Weight: 74.12 AMU

Property	Value	At Temperature or Pressure
pH	N/A	
BP/BP Range	117.7 °C	760 mmHg
MP/MP Range	-90 °C	
Freezing Point	-89 °C	
Vapor Pressure	4 mmHg	20 °C
Vapor Density	2.55 g/l	

Saturated Vapor Conc.	N/A
SG/Density	0.811 g/cm3
Bulk Density	N/A
Odor Threshold	0.83 ppm
Volatile%	N/A
VOC Content	N/A
Water Content	N/A
Solvent Content	N/A
Evaporation Rate	N/A
Viscosity	3 Pas
Partition Coefficient	N/A
Decomposition Temp.	N/A
Flash Point °F	95 °F
Flash Point °C	35 °C
Explosion Limits	Lower: 1.4 % Upper: 11.2 %
Flammability	N/A
Autoignition Temp	343 °C
Refractive Index	1.399
Solubility	
Solubility in Water:	Soluble.

20 °C

Method: closed cup
Method: closed cup

N/A = not available

Section 10 - Stability and Reactivity**Stability****Stable**

Stable.

Conditions to Avoid

Sensitive to moisture.

Materials to Avoid

Oxidizing agents, Copper, Copper alloys, Alkali metals.

Hazardous Decomposition Products**Hazardous Decomposition Products**

Carbon monoxide, Carbon dioxide.

Hazardous Polymerization**Hazardous Polymerization**

Will not occur.

Section 11 - Toxicological Information**Route of Exposure****Skin Contact**

Causes skin irritation.

Skin Absorption

May be harmful if absorbed through the skin.

Eye Contact

Causes severe eye irritation.

Inhalation

May be harmful if inhaled. Vapor or mist is irritating to the mucous membranes and upper respiratory tract.

Ingestion

Harmful if swallowed.

Target Organ(s) or System(s)

Central nervous system. Ears. Liver. Kidneys. Blood.

Signs and Symptoms of Exposure

Can cause CNS depression. Exposure can cause: Gastrointestinal disturbances. Drying, cracking, or irritation of the skin.

RTECS Number: EO1400000

Toxicity Data

Oral - Rat: 2,500 mg/kg(LD50)

Oral - Rabbit: 3,400 mg/kg(LD50)

Inhalation - Rat: 8,000 ppm(LC50)

Skin - Rabbit: 5,300 mg/kg(LD50)

Oral - Rat: 790 mg/kg (LD50)

Remarks: Liver:Fatty liver degeneration.
Kidney, Ureter, Bladder:Other changes.
Blood:Other changes.

Inhalation - Rat: 8,000 ppm (LC50)

Intraperitoneal - Rat: 1122 MG/KG (LD50)

Intravenous - Rat: 310 MG/KG (LD50)

Oral - Mouse: 2,680 mg/kg (LD50)

Intraperitoneal - Mouse: 254 MG/KG (LD50)

Remarks: Liver:Other changes.

Subcutaneous - Mouse: 3200 MG/KG (LD50)

Intravenous - Mouse: 377 MG/KG (LD50)

Oral - Rabbit: 3,484 mg/kg (LD50)

Remarks: Sense Organs and Special Senses (Nose, Eye, Ear, and Taste):Eye:Corneal damage.
Cardiac:Pulse rate.
Lungs, Thorax, or Respiration:Dyspnea.

Skin - Rabbit: 3,400 mg/kg (LD50)

Inhalation - Mammal: 28,400 mg/m3 (LC50)

Oral - Bird (wild): 2,500 mg/kg (LD50)

Irritation Data

Skin - Rabbit:

Remarks: Mild irritation effect

Eyes - Rabbit:

Remarks: Moderate irritation effect

Eyes - Human: 50 ppm

Skin - Rabbit: 405 mg 24H

Remarks: Moderate irritation effect

Skin - Rabbit: 20 mg 24H

Remarks: Moderate irritation effect

Eyes - Rabbit: 2 mg

Remarks: Severe irritation effect

Eyes - Rabbit: 2 mg 24H

Remarks: Severe irritation effect

Chronic Exposure - Teratogen

<u>Species</u>	<u>Dose</u>	<u>Route of Application</u>	<u>Exposure Time</u>
Rat	35295 MG/KG	Oral	(1-15D PREG)
Result:Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus). Effects on Newborn: Biochemical and metabolic.			
Rat	23100 MG/KG	Oral	(8W PRE/0-20D PREG)
Result:Specific Developmental Abnormalities: Craniofacial (including nose and tongue). Specific Developmental Abnormalities: Musculoskeletal system.			
Rat	6000 PPM/7H	Inhalation	(1-19D PREG)
Result:Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus).			

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Rat 8000 PPM/7H Inhalation (1-19D PREG)
Result:Specific Developmental Abnormalities: Musculoskeletal system.

Chronic Exposure - Mutagen

<u>Species</u>	<u>Dose</u>	<u>Cell Type</u>	<u>Mutation test</u>
Hamster	100 MMOL/L	lung	SLN

Chronic Exposure - Reproductive Hazard

<u>Species</u>	<u>Dose</u>	<u>Route of Application</u>	<u>Exposure Time</u>
Rat	35295 MG/KG	Oral	(1-15D PREG)
Result: Effects on Fertility: Female fertility index (e.g., # females pregnant per # sperm positive females; # females pregnant per # females mated). Effects on Fertility: Pre-implantation mortality (e.g., reduction in number of implants per female; total number of implants per corpora lutea). Effects on Fertility: Post-implantation mortality (e.g., dead and/or resorbed implants per total number of implants).			

Section 12 - Ecological Information

No data available.

Acute Ecotoxicity Tests

Test Type	
LC50 Fish	
Species	
Carassius auratus (Goldfish)	
Time:	Value:
24.0 h	1,855 mg/l
Test Type	
LC50 Fish	
Species	
Pimephales promelas (Fathead minnow)	
Time:	Value:
96.0 h	1,840 mg/l
Test Type	
EC50 Daphnia	
Species	
Daphnia	
Time:	Value:
24.0 h	1,855 mg/l

Section 13 - Disposal Considerations

Appropriate Method of Disposal of Substance or Preparation

Contact a licensed professional waste disposal service to dispose of this material.
Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable.
Observe all federal, state, and local environmental regulations.

Section 14 - Transport Information

DOT

Proper Shipping Name: Butanols
UN#: 1120
Class: 3
Packing Group: Packing Group III
Hazard Label: Flammable liquid
PIH: Not PIH

IATA

Proper Shipping Name: Butanols
IATA UN Number: 1120
Hazard Class: 3
Packing Group: III

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Section 15 - Regulatory Information

EU Directives Classification

Symbol of Danger: Xn

Indication of Danger

Harmful.

Risk Statements R: 10 22 37/38 41 67

Flammable. Harmful if swallowed. Irritating to respiratory system and skin. Risk of serious damage to eyes. Vapors may cause drowsiness and dizziness.

Safety Statements S: 7/9 13 26 37/39 46

Keep container tightly closed and in well-ventilated place. Keep away from food, drink, and animal feedingstuffs. In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Wear suitable gloves and eye/face protection. If swallowed, seek medical advice immediately and show this container or label.

US Classification and Label Text

Indication of Danger

Flammable. Harmful.

Risk Statements

Harmful if swallowed. Irritating to respiratory system and skin. Risk of serious damage to eyes. Vapors may cause drowsiness and dizziness.

Safety Statements

Keep away from sources of ignition - no smoking. In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Wear suitable protective clothing and eye/face protection.

US Statements

Target organ(s): Central nervous system. Ears.

United States Regulatory Information

SARA Listed: Yes

De minimis: 1 %

Notes: This product is subject to SARA section 313 reporting requirements.

TSCA Inventory Item: Yes

Canada Regulatory Information

WHMIS Classification

This product has been classified in accordance with the hazard criteria of the CPR, and the MSDS contains all the information required by the CPR.

DSL: Yes

NDSL: No

Section 16 - Other Information

Disclaimer

For R&D use only. Not for drug, household or other uses.

Warranty

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. Sigma-Aldrich Inc., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale. Copyright 2004 Sigma-Aldrich Co. License granted to make unlimited paper copies for internal use only.