

MATERIAL SAFETY DATA SHEET

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Version 1.9

Section 1 - Product and Company Information

Product Name 1-BUTANOL, ANHYDROUS, 99.8%
Product Number 281549
Brand ALDRICH

Company Sigma-Aldrich
Street Address 3050 Spruce Street
City, State, Zip, Country SAINT LOUIS MO 63103 US
Technical Phone: 314 771 5765
Emergency Phone: 414 273 3850 Ext. 5996
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Section 2 - Composition/Information on Ingredient

Substance Name	CAS #	SARA 313
1-BUTANOL	71-36-3	Yes

Formula C4H10O
Synonyms Alcool 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
RTECS Number: E01400000

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.

HMIS RATING

HEALTH: 2*

FLAMMABILITY: 3

REACTIVITY: 1

NFPA RATING

HEALTH: 2

FLAMMABILITY: 3

REACTIVITY: 1

*additional chronic hazards present.

For additional information on toxicity, please refer to Section 11.

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

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 Method: closed cup

EXPLOSION LIMITS

Lower: 1.4 % Upper: 11.2 %

AUTOIGNITION TEMP

343 °C

FLAMMABILITY

N/A

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): Vapor may travel considerable distance to source of ignition and flash back. 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. Store in a cool dry place. Handle and store under nitrogen.

SPECIAL REQUIREMENTS

Handle and store under inert gas. Hygroscopic.

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, RTECS

Country	Source	Type	Value
USA	ACGIH	Ceiling	co50 PPM
Remarks: Skin			
USA	MSHA Standard-air	TWA	100 PPM (300 MG/M3)
USA	OSHA.	PEL	8H TWA 100 PPM (300 MG/M3)
New Zealand OEL			
Remarks: check ACGIH TLV			
USA	NIOSH	Ceiling	co50 PPM (SK)

EXPOSURE LIMITS

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

Section 9 - Physical/Chemical Properties

Appearance Physical State: Clear liquid
Color: Colorless

Property	Value	At Temperature or Pressure
Molecular Weight	74.12 AMU	
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	20 °C
Surface Tension	N/A	
Partition Coefficient	N/A	
Decomposition Temp.	N/A	
Flash Point	95 °F 35 °C	Method: closed cup
Explosion Limits	Lower: 1.4 % Upper: 11.2 %	
Flammability	N/A	
Autoignition Temp	343 °C	
Refractive Index	1.399	
Optical Rotation	N/A	
Miscellaneous Data	N/A	
Solubility	Solubility in Water:Soluble.	

N/A = not available

Section 10 - Stability and Reactivity

STABILITY

Stable: Stable.

Conditions to Avoid: Sensitive to moisture.

Materials to Avoid: Oxidizing agents, Alkali metals, Bases, Strong acids, Halogens.

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.

TOXICITY DATA

Oral

Rat

2,500 mg/kg

LD50

Oral

Rabbit

3,400 mg/kg

LD50

4 HR.

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

2680 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
3484 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
3400 mg/kg
LD50

Inhalation
Mammal
28,400 mg/m3
LC50

Oral
Bird (wild)
2500 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

Species: Rat
Dose: 35295 MG/KG
Route of Application: Oral
Exposure Time: (1-15D PREG)
Result: Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus). Effects on Newborn: Biochemical and metabolic.

Species: Rat
Dose: 23100 MG/KG
Route of Application: Oral
Exposure Time: (8W PRE/0-20D PREG)
Result: Specific Developmental Abnormalities: Craniofacial (including nose and tongue). Specific Developmental Abnormalities: Musculoskeletal system.

Species: Rat
Dose: 6000 PPM/7H
Route of Application: Inhalation
Exposure Time: (1-19D PREG)
Result: Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus).

Species: Rat
Dose: 8000 PPM/7H
Route of Application: Inhalation
Exposure Time: (1-19D PREG)
Result: Specific Developmental Abnormalities: Musculoskeletal system.

CHRONIC EXPOSURE - MUTAGEN

Species: Hamster
Dose: 100 MMOL/L
Cell Type: lung
Mutation test: SLN

CHRONIC EXPOSURE - REPRODUCTIVE HAZARD

Species: Rat
Dose: 35295 MG/KG
Route of Application: Oral
Exposure Time: (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

N/A

ACUTE ECOTOXICITY TESTS

Test Type: LC50 Fish
Species: Carassius auratus (Goldfish)

Time: 24 h
Value: 1,855 mg/l

Test Type: LC50 Fish
Species: Pimephales promelas (Fathead minnow)
Time: 96 h
Value: 1,840 mg/l

Test Type: EC50 Daphnia
Species: Daphnia
Time: 24 h
Value: 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

Section 15 - Regulatory Information

EU DIRECTIVES CLASSIFICATION

Symbol of Danger: Xn
Indication of Danger: Harmful.
R: 10 22 37/38 41 67
Risk Statements: Flammable. Harmful if swallowed. Irritating to respiratory system and skin. Risk of serious damage to eyes. Vapors may cause drowsiness and dizziness.
S: 7/9 13 26 37/39 46
Safety Statements: 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

DEMINIMIS: 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. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. 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.
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