Product Safety Assessment

DOW™ n-Butanol


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Names
- CAS No. 71-36-3
- Butanol
- 1-Hydroxybutane
- n-Butyl alcohol
- Butyric alcohol
- DOW™ n-Butanol
- Propylmethanol
- 1-Butanol
- Butyl alcohol
- Propylcarbinol
- Normal butanol
- Propyl carbinol
- Butyl hydroxide
- Methylpropane

Product Overview
- DOW™ n-butanol is a clear, colorless liquid that is flammable. It has a characteristic banana-like odor.\(^1\) For further details, see Product Description.
- DOW n-butanol is used to make other chemicals, as a solvent, or as an ingredient in formulated products such as cosmetics.\(^2\) For further details, see Product Uses.
- Exposure can occur either in facilities that manufacture n-butanol or in the various facilities that use it. It is produced, transported, stored, and consumed in well-ventilated areas or in completely closed systems. Those working with this material in manufacturing operations could be exposed during maintenance, sampling, testing, or other procedures. For further details, see Exposure Potential.
- Eye contact may cause severe irritation with moderate corneal injury. Vapor may cause eye irritation experienced as mild discomfort and redness. Vapor may cause irritation of the upper respiratory tract (nose and throat). May cause dizziness and drowsiness. Short-term or repeated overexposure to n-butanol can result in depression of the central nervous system. Birth defects have been observed in animals exposed to high concentrations of n-butanol.\(^3,4\) For further details, see Health Information.
- n-Butanol is practically nontoxic to aquatic organisms and microorganisms on an acute basis. The material is considered readily biodegradable and not likely to accumulate or persist in aquatic or terrestrial environments.\(^5\) For further details, see Environmental Information.
- n-Butanol is flammable. It is stable at normal storage conditions, but can decompose at elevated temperatures. Use proper grounding and bonding procedures to minimize the risk of ignition.\(^6\) For further details, see Physical Hazard Information.

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Manufacture of Product

- **Capacity** – DOW™ n-butanol is produced at facilities in Louisiana and Texas, USA. Dow produces 8.3% of the world’s capacity of plasticizer alcohols, such as n-butanol.

- **Process** – Dow first generates n-butyraldehyde using propylene, carbon monoxide (CO), and hydrogen gas (H₂). By using low-pressure technology and a specific catalyst, approximately eight to ten times more n-butyraldehyde is produced than isobutyraldehyde. The n-butyraldehyde is then reacted with H₂ to form n-butanol. Isobutanol is a byproduct in the process used by Dow.

Product Description

DOW™ n-butanol is a colorless, neutral liquid of medium volatility with a characteristic banana-like odor. It is partly soluble (about 7–8%) in water, but mixes easily with nearly all common organic solvents, such as glycols, ketones, alcohols, aldehydes, ethers, and aromatic and aliphatic hydrocarbons.

Product Uses

DOW™ n-butanol is mostly used as an intermediate to make other chemicals, as a solvent, and as an ingredient in formulated products such as cosmetics. A few products for which it serves as an intermediate include:

- Glycol ethers
- Acrylate/methacrylate esters
- n-Butyl acetate
- Amino resins
- n-Butylamines

Applications and products that use DOW n-butanol as an ingredient include:

- Coatings – as a solvent for curable lacquers and cross-linked finishes
- Textiles – as a swelling agent
- Flotation agents
- Cleaners and floor polishes
- Pharmaceuticals – in antibiotics, hormones, and vitamins
- Cosmetics and other personal care products
- Automotive – as a fuel additive and component of brake fluid

U.S. Consumption of n-Butanol

[Chart showing consumption percentages]

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Exposure Potential\textsuperscript{11,12}

DOW™ n-butanol is used in the production of industrial and consumer products, but is not sold directly to consumers. Based on the uses for DOW n-butanol, the public could be exposed through:

- **Workplace exposure** – Exposure can occur either in facilities that manufacture n-butanol or in the various industrial and consumer manufacturing facilities that use it. It is produced, transported, stored, and consumed in well-ventilated areas or in completely closed systems. Those working with this material in manufacturing operations could be exposed during maintenance, sampling, testing, or other procedures. Each manufacturing, industrial, and service facility should have a thorough training program for employees and appropriate work processes, ventilation, and safety equipment in place to limit exposure. Good industrial hygiene practices minimize the risk of exposure.

- **Consumer exposure to products containing DOW n-butanol** – Dow does not sell n-butanol directly to consumers; but it can be a component in some formulated consumer products such as cosmetics. n-Butanol is considered safe as a cosmetic ingredient by the Cosmetic Ingredient Review Expert Panel. n-Butanol demonstrates an overall low order of human toxicity. See Health Information.

- **Environmental releases** – In the event of a spill, the focus is on containing the spill to prevent contamination of soil and surface or ground water. n-Butanol will not persist in the environment. It biodegrades readily in water and soil and photodegrades in the atmosphere. If released, most will eventually partition into the atmosphere. It has a low order of toxicity to environmental organisms at all levels of the food chain. See Environmental, Health, and Physical Hazard Information.

- **Large release** – Industrial spills or releases are infrequent and generally contained. If a large spill does occur, the material should be captured, collected, and reprocessed or disposed of according to applicable governmental requirements. Flammability is the primary concern. Eliminate all sources of ignition immediately. Use only explosion-proof equipment. Ground and bond all containers and handling equipment. The public should be warned of any downwind vapor explosion hazards. Positive-pressure, self-contained breathing apparatus (SCBA) with an approved full-face mask is recommended for emergency work. Emergency personnel should wear proper protective equipment and follow emergency procedures carefully. See Environmental, Health, and Physical Hazard Information.

- **In case of fire** – Deny any unnecessary entry into the area and consider the use of unmanned hose holders. Use of a direct water stream may spread the fire and cause violent steam generation or eruption. The public should be warned of downwind vapor explosion hazards. Vapors are heavier than air and may travel a long distance and accumulate in low-lying areas. Ignition or flashback is possible. Keep vapors out of sewers. Immediately withdraw all personnel from the area in case of rising sounds from venting safety devices or discolorations of the container. Follow emergency procedures carefully. See Environmental, Health, and Physical Hazard Information.

For more information, request the relevant Safety Data Sheet from the Dow Customer Information Group.

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Health Information\textsuperscript{13,14,15,16}

- **Eye contact** – Contact may cause severe eye irritation and moderate corneal injury. Vapor may cause eye irritation experienced as mild discomfort and redness.

- **Skin contact** – Brief contact may cause skin irritation with local redness and also may cause drying and flaking of the skin. Prolonged skin contact is unlikely to result in absorption of harmful amounts. Repeated skin contact may result in absorption of harmful amounts.

- **Inhalation** – Vapor may cause irritation of the upper respiratory tract (nose and throat). Inhalation may cause dizziness and drowsiness.

- **Ingestion** – Low toxicity if swallowed. Small amounts swallowed incidental to normal handling operations are not likely to cause injury. However, swallowing larger amounts may cause injury. Aspiration into the lungs may occur during ingestion or vomiting, causing lung damage or even death due to chemical pneumonia.

- **Repeated Exposure** – n-Butanol has been reported to cause effects on the eye (tearing, blurred vision, sensitivity to light, temporary corneal effects), hearing loss, and vertigo. Symptoms of excessive exposure may be anesthetic or narcotic effects; dizziness and drowsiness may be observed.

- **Other** – n-Butanol has caused birth defects and has been toxic to the fetus in laboratory animals at doses nontoxic to the mother. However, dose levels producing these effects were many times higher than any dose levels expected from exposure due to use.

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According to the European Centre for Ecotoxicology and Toxicology of Chemicals (ECETOC), there is no evidence that n-butanol causes cancer or damages DNA.

For more information, request the relevant Safety Data Sheet from the Dow Customer Information Group.

Environmental Information

The greatest potential for an environmental release of DOW™ n-butanol is to the atmosphere when used as a solvent. n-Butanol degrades readily in soil and water and photodegrades readily in the atmosphere. Mobility in soil is high. The potential for bioconcentration (tendency to accumulate in the food chain) is low.

DOW n-butanol is considered a volatile organic compound (VOC) and traces are emitted by natural sources such as plants (rape, rye, and grass), trees (beech, birch, and hornbeam), animal waste, microbes, and insects.

n-Butanol is practically nontoxic to aquatic organisms and microorganisms on an acute basis.

For more information, request the relevant Safety Data Sheet from the Dow Customer Information Group.

Physical Hazard Information

DOW™ n-butanol has a flash point of 35°C (95°F) and is considered a flammable liquid. When mixed with air at room temperature, n-butanol can form flammable mixtures. Prevent exposure to ignition sources. Keep containers closed and use with adequate ventilation. Proper grounding and bonding procedures should be followed to minimize the risk of ignition through static build up, heat, sparks, or flame. Never use air pressure to transfer the product. Vapors are heavier than air and may travel a long distance and accumulate in low-lying areas. Ignition and/or flash back may occur.

n-Butanol is therminally stable at typical use temperatures, but can decompose at elevated temperatures. During a fire, smoke may contain the original material in addition to carbon monoxide and carbon dioxide.

Do not store n-butanol in aluminum, copper, or copper-alloy containers.

For more information, request the relevant Safety Data Sheet from the Dow Customer Information Group.

Regulatory Information

Regulations may exist that govern the manufacture, sale, transportation, use, and/or disposal of DOW™ n-butanol. These regulations may vary by city, state, country, or geographic region. Information may be found by requesting the relevant Safety Data Sheet or Contact Us. Dow has filed a REACH dossier for this material and the public can access relevant information by requesting the European Safety Data Sheet.

Additional Information

- Safety Data Sheet (www.dow.com/assistance/dowcig.htm)
- Dow has filed a REACH dossier for this material and the public can access relevant information on the European Safety Data Sheet
- Contact Us (www.dow.com/oxysovents/contact/index.htm)
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- “N-Butanol (CAS No. 71-36-3),” European Centre for Ecotoxicology and Toxicology of Chemicals (ECETOC), Joint Assessment of Commodity Chemicals (JACC) Report No. 41, March 2004 (http://www.ecetoc.org/index.php?mact=MCSOap.cntnt01.details_0&cntnt01by_category=3&cntnt01order_by=Reference%20Desc&cntnt01template=display_list_v2&cntnt01display_template=display_details_v2&cntnt01document_id=111&cntnt01returnid=91)

- n-Butanol, Technical Data Sheet, The Dow Chemical Company, Form No. 327-00014, August 2012 (www.dow.com/PublishedLiterature/dh_0119/0901b803801195a5.pdf?filepath=oxysolvents/pdfs/noreg/327-00014.pdf&fromPage=GetDoc)

For more business information about DOW™ n-butanol, visit the Dow Oxygenated Solvents web site at www.dow.com/oxysolvents/prod/index.htm.

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NOTICES

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