Product Safety Assessment
Propylene Glycol n-Butyl Ether

Select a Topic:

Names

- CAS No. 5131-66-8 (major isomer)
- Propylene glycol *n*-butyl ether
- PnB
- 1-Butoxy-2-propanol
- 1-Butoxypropan-2-ol
- 1-Butoxy-2-propanol
- Propylene glycol *normal*-butyl ether
- DOWANOL™ PnB glycol ether

Product Overview

- Propylene glycol n-butyl ether (PnB) is a colorless liquid with an ether odor. PnB evaporates quickly and doesn't mix well with water. The Dow Chemical Company (Dow) manufactures PnB and other propylene oxide-based glycol ethers under the trade name DOWANOL™ glycol ethers.[1] For further details, see Product Description.
- PnB glycol ether is used in heavy-duty cleaning formulations. It is also used as a solvent, chemical intermediate, coalescing agent, and coupling agent.[2] For further details, see Product Uses.
- Because PnB is formulated into a broad range of products, consumer contact is possible. Workplace exposure is also possible.[3] For further details, see Exposure Potential.
- Eye contact with liquid PnB may cause moderate irritation and moderate corneal injury. Eye contact with PnB vapor may cause mild irritation and redness. Brief skin contact may cause moderate irritation with redness. Prolonged skin contact is not likely to result in absorption of harmful amounts. Briefly inhaling (minutes) PnB is not likely to cause adverse effects.[4] For further details, see Health Information.
- PnB is readily biodegradable, unlikely to accumulate in the food chain, and is practically non-toxic to fish and aquatic organisms. For further details, see Environmental Information.
- PnB, both liquid and vapor, is combustible. It is stable under recommended storage conditions. PnB is incompatible with strong acids, strong bases, and strong oxidizers and contact should be avoided.[5] For further details, see Physical Hazard Information.

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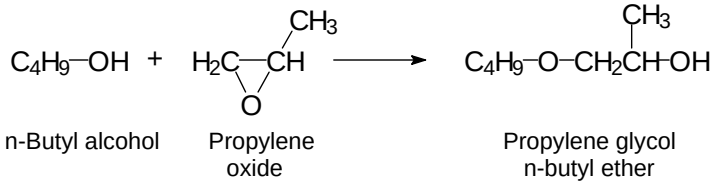
Manufacture of Product[6]

- **Capacity –** Western Europe is the largest producer and consumer of propylene oxide-based glycol ethers. Dow produces both ethylene oxide- and propylene oxide-based glycol ethers in the United States at facilities Plaquemine, Louisiana; these products are also produced by a

Dow subsidiary in Europe at the Stade, Germany site. Union Carbide Corporation ("UCC"), also a Dow subsidiary, manufactures glycol ethers in Taft, Louisiana, and Seadrift, Texas. The estimated 2007 U.S. production capacity for propylene oxide-based glycol ethers was 191,000 metric tons (420 million pounds). The U.S. 2007 production capacity for PnB is estimated at 13,600 metric tons (30 million pounds).

- **Process –** PnB is manufactured by reacting propylene oxide with n-butanol as shown below.



n-Butyl alcohol | Propylene oxide | Propylene glycol n-butyl ether

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Product Description[7,8]

Propylene glycol n-butyl ether (PnB) is a colorless liquid with an ether-like odor. It evaporates quickly and is hydrophobic (doesn't mix well with water). PnB is a propylene oxide-based, or P-series, glycol ether and a blend of two isomers: 1-butoxy-2-propanol (>95.0%, CAS# 5131-66-8), and 1-propanol-2-butoxy (<5.0%, CAS# 15821-83-7). Dow markets PnB and other P-series glycol ethers under the trade name DOWANOL™ glycol ethers.

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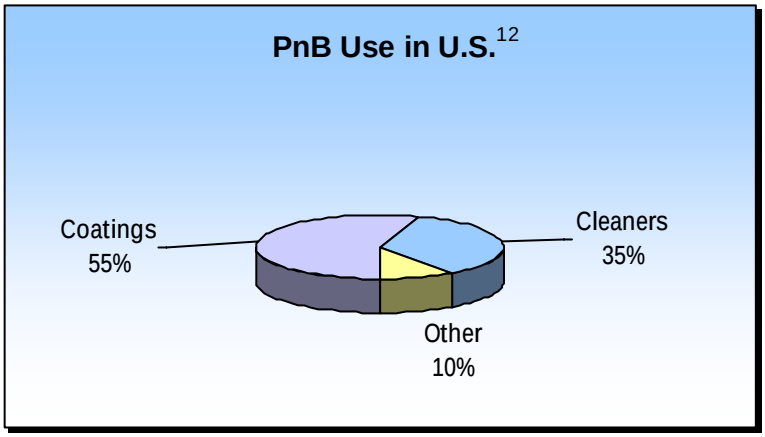
Product Uses[9,10,11,12]

PnB is widely used for industrial and residential applications such as:

- **Cleaners –** as a coupling agent and solvent for household and industrial cleaners such as grease and paint removers, metal cleaners, hard-surface cleaners, glass and window cleaners, bathroom and kitchen cleaners, and laundry pre-wash stain removers
- **Coatings –** as a coalescing agent for latex coatings or as a coupling agent and solvent for water-reducible and solvent-based coatings



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Exposure Potential

PnB is used in the production of industrial and consumer products. Based on the uses for PnB, the public could be exposed through:

- **Workplace exposure**[13,14] – Exposure can occur either in a PnB manufacturing facility or in the various industrial or manufacturing facilities that use PnB. Those working with PnB in manufacturing operations could be exposed during maintenance, sampling, testing, or other procedures. Each manufacturing facility should have a thorough training program for employees and appropriate work processes, ventilation, and safety equipment in place to limit unnecessary exposure. See Health Information.
- **Consumer exposure to products containing PnB**[15] – Dow does not sell PnB for direct consumer use, however, consumers can be exposed through the use of home-cleaning

products containing PnB. The typical PnB concentration in cleaners is 2 to 10%. See Health Information.

- **Environmental releases**[16] – PnB may be released to air by evaporation from cleaners, coatings or other products containing it. However, once PnB is introduced into water, the compound will tend to remain dissolved because it is moderately soluble in water. PnB is readily biodegradable, and the compound will be removed by sewage treatment plants.
- **Large release** – Industrial spills or releases are infrequent and generally contained. If a large spill does occur, isolate the area. Contain the material if possible. Eliminate all sources of ignition immediately. Pump the material into suitable and properly labeled containers using appropriate safety equipment.
- **In case of fire** – Keep people away and deny any unnecessary entry. Wear positive-pressure, self-contained breathing apparatus (SCBA) and protective fire-fighting clothing or fight the fire from a safe distance. Consider the use of unmanned hose holders or monitor nozzles. *Do not use* a direct water stream; it may spread the fire. Use water fog or fine spray, carbon-dioxide or dry-chemical extinguishers, or foam. Follow all emergency procedures carefully. See Environmental Information, Health Information, and Physical Hazard Information.

For more information, see the relevant Safety Data Sheet.

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Health Information[17]

Eye contact with liquid PnB may cause moderate irritation and corneal injury. Eye contact with PnB vapor may cause mild irritation and redness. Brief skin contact may cause moderate irritation with redness but not sensitization. Prolonged skin contact is not likely to result in absorption of harmful amounts. Brief inhalation (minutes) is not likely to cause adverse effects. Lethal concentrations may exist in areas with poor ventilation. PnB has low toxicity if swallowed. Swallowing small amounts incidental to normal handling is unlikely to cause injury. However, swallowing larger amounts may cause injury.

Repeated inhalation exposure may cause adaptive liver and kidney effects. PnB did not cause birth defects in laboratory animals or demonstrate genetic toxicity.

For more information, see the relevant Safety Data Sheet.

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Environmental Information[18]

PnB is moderately volatile, and will evaporate from products containing it. However, because it is moderately soluble in water, once introduced, it has a tendency to remain in water. It has minimal tendency to bind to soil or sediment.

PnB is unlikely to persist in the environment. PnB is readily biodegradable, which suggests the chemical will be rapidly and completely removed from water and soil environments, including biological wastewater treatment plants.

PnB is not likely to accumulate in the food chain (bioconcentration potential is low) and is practically nontoxic to fish and other aquatic organisms on an acute basis.

For more information, see the relevant Safety Data Sheet.

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Physical Hazard Information[19]

PnB, both liquid and vapor, is combustible. It is stable under recommended storage conditions. Store PnB in carbon steel, stainless steel, or phenolic-lined steel drums. Do not store in aluminum, copper, galvanized steel, or galvanized iron. PnB can decompose at elevated temperatures. Generation of gas during decomposition can cause pressure build-up in closed systems. Decomposition products depend on temperature, air supply, and the presence of other materials and can include aldehydes, ketones, organic acids, and carbon dioxide.

PnB is incompatible with strong acids, strong bases, and strong oxidizers, and contact should be avoided.

During a fire, smoke may contain the original material in addition to toxic or irritating combustion products, which may include carbon monoxide and carbon dioxide. Violent steam generation or eruption may occur upon application of direct water stream to hot liquids.

For more information, see the relevant Safety Data Sheet.

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Regulatory Information

Regulations may exist that govern the manufacture, sale, transportation, use, and/or disposal of PnB. These regulations may vary by city, state, country, or geographic region. Information may be found by consulting the relevant Safety Data Sheet, Technical Data Sheet, or Contact Us.

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Additional Information

- Safety Data Sheet (http://www.dow.com/webapps/msds/msdssearch.asp)
- Contact Us (http://www.dow.com/oxysolvents/contact/index.htm)
- *DOWANOL™ PnB Glycol Ether Product Information,* The Dow Chemical Company, Form No. 110-00616-0304, March, 2004 (http://www.dow.com/PublishedLiterature/dh_0077/0901b80380077452.pdf?filepath=oxysolvents/pdfs/noreg/110-00616.pdf&fromPage=GetDoc)
- "Propylene Glycol Ethers," *SIDS Initial Assessment Report for 17 SIAM,* Organisation for Economic Co-operation and Development, November 11–14, 2003 (http://www.inchem.org/documents/sids/sids/pges.pdf)
- "Glycol Ethers," *Marketing Research Report: Chemical Economics Handbook*, SRI Consulting, July 2004

For more business information about PnB, visit Dow's Oxygenated Solvents web site. (http://www.dow.com/oxysolvents/index.htm)

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References

[1] *DOWANOL™ PnB Glycol Ether Material Safety Data Sheet*, The Dow Chemical Company, ID No. 41843/0000, Version 2.0, February 1, 2007, pages 1 and 4.
[2] *DOWANOL PnB Glycol Ether Product Information,* The Dow Chemical Company, Form No. 110-00616-0304, March, 2004, pages 1–2.
[3] *DOWANOL PnB Glycol Ether Material Safety Data Sheet*, The Dow Chemical Company, ID No. 41843/0000, Version 2.0, February 1, 2007, pages 3 and 4.

[4] *DOWANOL™ PnB Glycol Ether Material Safety Data Sheet*, The Dow Chemical Company, ID No. 41843/0000, Version 2.0, February 1, 2007, pages 1–2.
[5] *DOWANOL PnB Glycol Ether Material Safety Data Sheet*, The Dow Chemical Company, ID No. 41843/0000, Version 2.0, February 1, 2007, pages 1, 3, and 4.
[6] Chinn, Henry, "Glycol Ethers," *Marketing Research Report: Chemical Economics Handbook*, SRI Consulting, July 2004, pages 5, 15, 18, 27, and 29.
[7] Dow Oxygenated Solvents website – P-Series Glycol Ethers: (http://www.dow.com/oxysolvents/prod/pseries.htm).
[8] *DOWANOL PnB Glycol Ether Material Safety Data Sheet*, The Dow Chemical Company, ID No. 41843/0000, Version 2.0, February 1, 2007, pages 1–2 and 4.
[9] Dow Oxygenated Solvents website – Applications Center: (http://www.dow.com/oxysolvents/app/index.htm).
[10] *DOWANOL PnB Glycol Ether Product Information,* The Dow Chemical Company, Form No. 110-00616-0304, March, 2004, pages 1–2.
[11] Chinn, Henry, "Glycol Ethers," *Marketing Research Report: Chemical Economics Handbook*, SRI Consulting, July 2004, page 55.
[12] Estimates by The Dow Chemical Company.
[13] "Propylene Glycol Ethers," *SIDS Initial Assessment Report for 17 SIAM,* Organisation for Economic Co-operation and Development, November 11–14, 2003, Arona, Italy, pages 6, 17, and 18.
[14] *DOWANOL PnB Glycol Ether Material Safety Data Sheet*, The Dow Chemical Company, ID No. 41843/0000, Version 2.0, February 1, 2007, page 3.
[15] "Propylene Glycol Ethers," *SIDS Initial Assessment Report for 17 SIAM,* Organisation for Economic Co-operation and Development, November 11–14, 2003, Arona, Italy, pages 6, 14, 17, and 18.
[16] *DOWANOL PnB Glycol Ether Material Safety Data Sheet*, The Dow Chemical Company, ID No. 41843/0000, Version 2.0, February 1, 2007, pages 2 and 3.
[17] *DOWANOL PnB Glycol Ether Material Safety Data Sheet*, The Dow Chemical Company, ID No. 41843/0000, Version 2.0, February 1, 2007, pages 1–2 and 4–5.
[18] *DOWANOL™ PnB Glycol Ether Material Safety Data Sheet*, The Dow Chemical Company, ID No. 41843/0000, Version 2.0, February 1, 2007, page 5.
[19] *DOWANOL PnB Glycol Ether Material Safety Data Sheet*, The Dow Chemical Company, ID No. 41843/0000, Version 2.0, February 1, 2007, pages 1–4.

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