Product Safety Assessment

Ethylene Glycol Butyl Ether

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Names
- CAS No. 111-76-2
- Ethylene glycol monobutyl ether
- Ethylene glycol butyl ether (EGBE)
- Butyl glycol ether
- EC No. 203-905-0
- 2-Butoxyethanol
- Butyl CELLOSOLVE™ solvent
- 2-Butoxy-1-ethanol

Product Overview
- Ethylene glycol butyl ether (EGBE) is a type of glycol ether and remains the single most widely produced glycol ether.\(^1\) It is primarily used as a solvent.\(^2\) It evaporates quickly and is completely soluble in water.\(^3\) Dow sells EGBE under the trade name Butyl CELLOSOLVE™ solvent. See Product Uses, Product Description and Manufacture of Product.
- Although some glycol ethers have been shown to cause adverse reproductive effects and birth defects in laboratory animals, EGBE does not show the same pattern of toxicity as these other glycol ethers. Human experience and animal studies have shown that EGBE is unlikely to cause adverse health effects when products are used as directed.\(^4\) Still, when used improperly, EGBE can cause eye, respiratory tract and skin irritation and even burns.
- Inhalation may cause headaches and hemolysis (red blood cell breakage). Ingesting products that contain EGBE can cause irritation and toxic effects.\(^5\) See Health Information.
- Occupational and consumer exposure is possible because EGBE is used in a wide variety of industrial and consumer products like cleaning products, paints, brake fluids and inks. See Exposure Potential.
- EGBE is unlikely to cause adverse environmental impact because it is not persistent, does not bioaccumulate and has low toxicity to aquatic organisms.\(^4\) After extensive review of EGBE toxicity and exposure data, the Environmental Protection Agency (EPA) removed it from its list of Hazardous Air Pollutants (HAPs) in November 2004.\(^6\) See Environmental Information and Health Information.

Manufacture of Product
- **Capacity** – Dow is a full-spectrum supplier of glycol ethers,\(^7\) and is the world’s leading producer of ethylene-oxide-based glycol ethers.\(^8\) Dow has a production facility for ethylene glycol butyl ethers production in Seadrift, Texas.
• **Process** – EGBE is produced by reacting ethylene oxide and normal butanol (n-butanol) using a catalyst. If the ratio of ethylene oxide to n-butanol is greater than one, di- and tri-ethylene glycol monoethers are produced along with the EGBE.

\[
\text{H}_2\text{C} \xrightarrow{\text{CH}_2} \text{CH}_2\xrightarrow{\text{CH}_3\text{CH}_2\text{OH}} \rightarrow \text{C}_4\text{H}_9\text{OCH}_2\text{CH}_2\text{OH}
\]

**Product Description**

Butyl CELLOSOLVE™ solvent is a clear, combustible liquid with a mild ether odor. It is completely soluble in water, and is miscible with mineral oils and soaps. It is a good solvent often used in cleaners, inks, paints, coatings and lacquers. Ethylene glycol butyl ether is an ethylene-series (or E-series) glycol ether and is manufactured and marketed by The Dow Chemical Company and its global affiliates under the trade name Butyl CELLOSOLVE Solvent.

**Product Uses**

Butyl CELLOSOLVE™ solvent is used in coatings and cleaner applications, including many in consumer markets. Butyl CELLOSOLVE solvent is used for:

- Active solvent for solvent-based coatings
- Coalescent for industrial water-based coatings
- Coupling agent for architectural water-borne coatings
- Coupling agent and solvent in household and industrial cleaners, rust removers, hard surface cleaners and disinfectants
- Primary solvent in solvent-based silk screen printing inks
- Coupling agent for resins and dyes in water-based printing inks
- Solvent for agricultural pesticides

**Exposure Potential**

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

- **Workplace exposure** – Exposure can occur either in an EGBE manufacturing facility or in the various industrial or consumer product manufacturing facilities that use EGBE. Each manufacturing or application facility should have appropriate work processes and safety equipment policies in place to limit unnecessary EGBE exposure. See Health Information.

- **Consumer exposure to products containing EGBE** – Dow does not sell EGBE for direct consumer use, but it is used as a component in coatings, paints, brake fluids, cleaners, etc. Consumers will likely have contact with EGBE. Please review product labels and follow all instructions and guidelines for proper use to help prevent unnecessary exposure. See Health Information.

- **Environmental releases** – In the event of a spill, the focus is on containing the spill to prevent contamination of soil, surface or ground water. For small spills, the EGBE should be absorbed with materials such as dirt or sand. This material is considered practically non-toxic to aquatic organisms on an acute basis. Adequately ventilate the area to control airborne levels below the exposure guidelines. Keep away from heat, sparks and flame. Consult the relevant SDS for more information about protective equipment and procedures. See Environmental, Health and Physical Hazard Information.

- **Large release** – Industrial spills or releases are infrequent and are generally contained. If a large spill does occur, the material should be captured, collected and re-processed, or
disposed of according to applicable governmental requirements. If EGBE is present in a fire situation, it can produce carbon monoxide (highly toxic) and carbon dioxide (an asphyxiant at sufficient concentrations). Containers may rupture from gas generation in a fire situation. Use water spray to cool fire-exposed containers until danger of re-ignition has passed. Violent steam generation may occur upon applications of direct water stream to hot liquids. Deny any unnecessary entry into the area and consider the use of unmanned hose holders. Use of a direct water stream may spread fire. Immediately withdraw all personnel from the area in case of rising sounds from venting safety device or discolorations of the container. Emergency personnel should wear proper protective equipment, including self-contained breathing apparatus (SCBA), and follow emergency procedures carefully. When relevant in scale or risk, the community should be notified of the hazards associated with the specific release event. See Environmental, Health and Physical Hazard Information.

**Health Information**

Although some glycol ethers, specifically ethylene glycol methyl ether (EGME) and ethylene glycol ethyl ether (EGEE), cause adverse reproductive effects and birth defects in laboratory animals, EGBE does not show the same pattern of toxicity as these other glycol ethers. Human experience and animal studies have shown that EGBE is unlikely to cause adverse health effects when products are used as directed. Skin contact with EGBE before it is diluted in commercial formulations should be avoided. Airborne concentrations of EGBE should be maintained below permissible exposure limits.\(^{14}\)

When used improperly, EGBE can cause eye, respiratory tract and skin irritation. It may cause moderate corneal injury and the eye may be slow to heal. Repeated skin exposure may cause irritation and even a burn. EGBE should not be ingested. Intentional ingestion of EGBE-containing products can be toxic to humans.\(^{15}\)

Inhalation may cause headaches, hemolysis (red blood cell breakage) and secondary effects to the kidney and liver. Human red blood cells have been shown to be significantly less sensitive to hemolysis than those of rodents and rabbits.

EGBE inhalation exposure in laboratory animals has been found to reduce body weight gain and food consumption in addition to hemolysis. After exposure was discontinued, these effects in animals disappeared. EGBE does not cause adverse reproductive or birth effects in animals, unless exposures are so high that they cause significant material toxicity.

When EGBE is ingested and metabolized in animals or humans, it is broken down into butoxyacetic acid (BAA), which can cause hemolysis. Humans are less sensitive to the hemolytic effects of BAA seen in rats. Humans could not achieve blood concentrations high enough to cause hemolysis when EGBE is used as directed.

In the most recent inhalation studies, rats and mice were exposed to EGBE in air for their lifetimes. These studies found “some” evidence of cancer in mice and “equivocal” (uncertain) evidence in rats. The increase in tumors was thought to result from the hemolytic effects and irritation that would not occur in humans when EGBE is used as directed. In June 2004, the International Agency for Research on Cancer (IARC) announced that its experts’ review found inadequate human evidence of carcinogenicity and limited animal evidence of carcinogenicity for EGBE. EGBE is now classified as a Group 3 substance, which is not classifiable as to its carcinogenicity to humans.\(^{16}\)

Also, after extensive review of EGBE toxicity and exposure data, the Environmental Protection Agency (EPA) removed it from its list of Hazardous Air Pollutants (HAPs) in November 2004.

The EPA concluded that the Reference Concentration (RfC) expected for EGBE presents no appreciable risk with lifetime exposure, even for susceptible individuals.\(^{6}\)

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Labeling classifications for EGBE have also changed. The European Commission Working Group on the Classification and Labeling of Dangerous Substances revised and improved classifications based on new research for EGBE. Product formulations that contain 12.5 to 20 percent EGBE no longer need to be labeled as harmful unless other components cause the product to be harmful. Formulations containing 20 to 25 percent EGBE may now be labeled as irritants rather than harmful. However, Canadian labeling for EGBE (not diluted products) may be changed to toxic.

Because EGBE is used as a component in a wide variety of products, it is best to review the product label and follow all instructions for proper use.

For specific health information, review the Safety Data Sheet (SDS).

**Environmental Information**

EGBE is practically non-toxic to aquatic organisms on an acute basis. It has caused toxicity in fish and other organisms only at high concentrations.

It is readily biodegradable and does not bioaccumulate (build up in the food chain). EGBE moves to water when it is released because of its high miscibility, low volatility and minimal tendency to bind to soil or sediment. It degrades rapidly in water.

**Physical Hazard Information**

EGBE is a combustible liquid. Containers, even those that have been emptied, can contain vapors. Keep this material away from heat, sparks and flame.

Store EGBE in carbon steel, stainless steel or Teflon containers. Do not store in aluminum, copper, galvanized iron, galvanized steel. Do not use Viton, neoprene, nitrile or natural rubber gaskets or seals. Avoid contact with strong acids, strong bases and strong oxidizers. EGBE can oxidize at elevated temperatures.

EGBE is thermally stable at typical use temperatures, but can oxidize at elevated temperatures. It should not be distilled to dryness because it can form peroxides. Decomposition can cause gas generation and pressure in closed systems. Thermal decomposition products can include and are not limited to: aldehydes, ketones and organic acids.

Spills of EGBE on hot, fibrous insulations may result in spontaneous combustion by lowering the auto-ignition temperatures.

Additional physical property information for EGBE is available on the SDS.

**Regulatory Information**

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

**Additional Information**

- Safety Data Sheet (http://www.dow.com/webapps/msds/msdssearch.aspx)
- Contact Us (http://www.dow.com/oxysolvents/contact/index.htm)
- Butyl CELLOSOLVE™ Solvent Technical Data Sheet, The Dow Chemical Company, Form No. 110-00623-0812

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The American Chemical Council Ethylene Glycol Ethers Panel (http://www.americanchemistry.com/ProductsTechnology/Glycol-Ethers)


Ecological and Toxicological Data of DOW Glycol Ethers, Form No. 170-00761-0304 (http://msdsssearch.dow.com/PublishedLiteratureDOWCOM/dh_0058/0901b8038005889d.pdf?filepath=oxysolvents/pdfs/noreg/110-00761.pdf&fromPage=GetDoc)

Solvent Property Tables (http://msdsssearch.dow.com/PublishedLiteratureDOWCOM/dh_012d/0901b8038012d976.pdf?filepath=oxysolvents/pdfs/noreg/110-00977.pdf&fromPage=GetDoc)

For more business information about EGBE, visit Dow’s Oxygenated Solvents web site.

References

3. Butyl CELLOSOLVE Ethylene Glycol Monobutyl Ether Technical Data Sheet
5. “Use Precautions,”.
8. Glycol Ethers, Dow Form No. 110-00965-1101 AMS
9. Butyl CELLOSOLVE™ Solvent Safety Data Sheet for the US
16. “Glycol Ethers Information Update,”.
18. “Ethylene Glycol Ethers Information Update,”
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