Product Safety Assessment

DOW™ Diisopropanolamine


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Names
- CAS No. 110-97-4
- Diisopropanolamine
- DIPA
- DOW™ diisopropanolamine
- DOW DIPA
- DOW DIPA GT Grades
- 1,1'-Iminobis-2-propanol
- 1,1'-Iminodipropan-2-ol
- 2-Propanol, 1,1'-iminobis-

Product Overview
- Diisopropanolamine (DIPA) is a white solid at room temperature and a colorless liquid above 111°F (44°C). It is highly soluble in water and has a slight, ammonia-like odor. Dow manufactures various grades of diisopropanolamine products, including commercial, low freeze grades, and specialized grades for gas treating applications.¹² For further details, see Product Description.
- Diisopropanolamine is a versatile chemical that is widely used as an emulsifier, stabilizer, surfactant, and chemical building block. It can neutralize pH, act as a buffer (stabilize pH), or add basicity (alkalinity) to a solution. Major applications include personal care products, metalworking products, and natural gas purification. Diisopropanolamine is also used in coatings, pesticides, paint strippers, paper, photographic intermediates, plastics, polyurethanes, and textiles.² For further details, see Product Uses.
- Diisopropanolamine is used in closed systems. Workplace exposure can occur either in facilities that manufacture diisopropanolamine or in the various industrial or manufacturing facilities that use diisopropanolamine. Diisopropanolamine is not sold directly to consumers, but small amounts may be formulated into personal care products used by consumers. Always read the product label prior to use and carefully follow instructions.² For further details, see Exposure Potential.
- Eye contact with diisopropanolamine may cause severe irritation and corneal injury. Prolonged or repeated skin contact may cause irritation with local redness or skin burns. Brief contact is essentially nonirritating to skin. Prolonged skin contact is not likely to result in absorption of harmful amounts. Swallowing small amounts as a result of normal handling operations is not likely to cause injury; however swallowing larger amounts may cause injury. At room temperature, exposure to vapor is minimal due to low volatility. Vapor from heated material may cause irritation to the nose and throat.¹ For further details, see Health Information and the relevant Safety Data Sheet.

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- Diisopropanolamine is water soluble and biodegradable according to the OECD tests for biodegradation. This material is not expected to bioaccumulate or persist in the environment. Diisopropanolamine is practically non-toxic to aquatic organisms on an acute basis. For further details, see Environmental Information.
- Diisopropanolamine is stable at recommended storage and use temperatures. Exposure to elevated temperatures can cause the product to decompose. Avoid contact with nitrites, strong acids, strong oxidizers, and halogenated organic solvents. Diisopropanolamine reacts with aluminum, zinc, copper, and galvanized metals; do not store diisopropanolamine in containers made from these metals. For further details, see Physical Hazard Information.

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Manufacture of Product

- Capacity – Global annual capacity of isopropanolamines was estimated at 144,000 metric tonnes (317 million pounds) in 2011. Dow manufactures isopropanolamines at its facility in Plaquemine, Louisiana, in the United States.
- Process – Isopropanolamines are manufactured by reacting propylene oxide with ammonia. The ratio of ammonia to propylene oxide determines which of the three products—MIPA, DIPA or TIPA—is produced. By increasing the ratio of ammonia to propylene oxide, MIPA and DIPA production is favored. The reaction is as follows:

\[ \text{NH}_3 + \text{H}_2\text{CCH–CH}_2 \rightarrow \text{H}_2\text{NCH}_2\text{CHOHCH}_3 \]

Ammonia

\[ \text{H}_2\text{NCH}_2\text{CHOHCH}_3 + \text{H}_2\text{CCH–CH}_2 \rightarrow \text{HN(CH}_2\text{CHOHCH}_3)_2 \]

Monoisopropanolamine

Diisopropanolamine

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Product Description

Diisopropanolamine is a white solid at room temperature and a colorless liquid above 111°F (44°C). It is highly soluble in water and has a slight, ammonia-like odor. Dow manufactures a variety of diisopropanolamine products, including:

- Commercial Grade (>99% purity)
- Low Freeze Grade 90 (LFG 90)
- Low Freeze Grade 85 (LFG 85). LFG 90 and LFG 85 contain 10% and 15% deionized water respectively.
- Diisopropanolamine Grades that are formulated specifically for gas purification

The addition of water reduces the freezing point of diisopropanolamine. For example, DOW™ Diisopropanolamine LFG 90 freezes at 73.4°F (23°C), while DOW Diisopropanolamine LFG 85 freezes at 55°F (13°C).

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Product Uses

Diisopropanolamine is a versatile chemical that is widely used as an emulsifier, stabilizer, surfactant, and chemical intermediate. It can neutralize pH, act as a buffer (stabilize pH), or add basicity (alkalinity) to a solution. Because diisopropanolamine is a good solubilizer of oil and fat, it is frequently used to neutralize fatty acids and sulfonic acid-based surfactants. Major applications include:

- Natural gas purification – Diisopropanolamine removes carbon dioxide and hydrogen sulfide from both natural and synthesized gases.

U.S. Applications for Isopropanolamines

![Diagram showing U.S. applications for isopropanolamines]
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- **Personal care products** – Diisopropanolamine can be used directly to adjust the pH of a product or can be chemically modified to form emulsifiers, foam stabilizers, or viscosity modifiers. Isopropanolamides are produced by the reaction of diisopropanolamine with fatty acids (lauric, oleic, or stearic) or their methyl esters. Isopropanolamides function as thickeners in shampoos and other products, and foam boosters in products like shaving cream. Fatty acid soaps made from diisopropanolamine produce stable cosmetic emulsion formulations. The diisopropanolamine-derived salts of dodecylbenzenesulfonic acid and lauryl sulfate are used in shampoos, creams, and lotions.

- **Industrial metalworking** – Diisopropanolamine-derived isopropanolamine soaps are used to produce metal-cutting fluids, strippers, and wax-emulsion formulations. They offer some corrosion protection, improve lubricity, act as a foam suppressant, and reduce friction in buffing, cutting, and cleaning fluids.

- **Other uses** – Diisopropanolamine is also used in coatings, pesticide formulations, paint strippers, paper, antistatic agents, photographic intermediates, plastics, surfactants, textile processing, and polyurethane production.

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**Exposure Potential**\(^1,2\)

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

- **Workplace exposure** – Exposure can occur either in facilities that manufacture diisopropanolamine or in the various industrial or manufacturing facilities that use diisopropanolamine. It is produced, distributed, stored, and consumed in closed systems. Those working with diisopropanolamine 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 exposure. See Health Information.

- **Consumer exposure to products containing diisopropanolamine** – Dow does not sell diisopropanolamine for consumer use. However, it is used in the manufacture of other products that consumers may use, such as soaps and personal care products. Always review product labels and follow all instructions and guidelines for proper use. 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 groundwater. Use dry absorbents (sand, clay) to soak up the spill and then wet down the area with water. Do not use cellulose or sawdust as absorbents. Dispose of contaminated absorbent in water-saturated containers in accordance with governmental requirements. Wear proper protective equipment. Diisopropanolamine is water soluble and readily biodegradable. If released to the environment, it will partition to water and degrade rapidly. Small releases will be removed by wastewater-treatment facilities. This product is considered practically non-toxic to aquatic organisms on an acute basis. 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 product should be captured, collected, and reprocessed or disposed of according to applicable governmental requirements. For small spills, absorb with non-combustible materials such as sand, clay, vermiculite or Zorb-all®. Do NOT use absorbent materials such as sawdust or cellulose to absorb spills. For large spills, contain the spilled material if possible. Pump into suitable and properly labeled containers. Isolate the area. Keep unnecessary and unprotected personnel from entering the area. Use appropriate safety equipment. Prevent from entering into soil, ditches, sewers, waterways, and/or groundwater. See Environmental, Health, and Physical Hazard Information.

- **In case of fire** – Keep people away. Isolate the fire and deny unnecessary entry. Use water spray to cool fire-exposed containers and the fire-affected zone until the fire is out and the danger of reignition has passed. Fight the fire from a protected location or safe distance. Consider the use of unmanned hose holders or monitor nozzles. Immediately withdraw all personnel from the area in case of rising sound from venting safety device or discoloration of the container. Burning liquids may be extinguished by dilution with water. Do not use direct water stream, which may spread the fire. Move container from the fire area if this is possible without hazard. Burning liquids may be moved by flushing with water to protect personnel and minimize property damage. Keep fire water out of waterways and sewers to minimize the potential for environmental damage. Wear positive-pressure self-contained breathing apparatus (SCBA) and protective firefighting clothing (includes firefighting helmet, coat, trousers, boots, and gloves). If protective equipment is not available or not used, fight the fire from a protected location or safe distance. Container may rupture from gas generation in a fire situation. Violent steam generation or eruption may occur upon application of direct water stream to hot liquids. During a fire, smoke may contain the original material in addition to combustion products of varying composition that may be toxic and/or irritating. Combustion products may include, and are not limited to, nitrogen oxides, carbon monoxide, and carbon dioxide. Follow emergency procedures outlined in the Safety Data Sheet carefully. See Environmental, Health, and Physical Hazard Information.

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For more information, see the relevant Safety Data Sheet.

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**Health Information**

*Eye contact* – May cause severe eye irritation and severe corneal injury.

*Skin contact* – Prolonged contact may cause moderate skin irritation with local redness. Brief contact is essentially nonirritating to skin. Repeated contact may cause skin burns. Symptoms may include pain, severe local redness, swelling, and tissue damage. Prolonged skin contact is unlikely to result in absorption of harmful amounts. Diisopropanolamine is not classified as corrosive to the skin according to DOT guidelines.

*Inhalation* – At room temperature, exposure to vapor is minimal due to low volatility. Vapor from heated material may cause respiratory irritation.

*Ingestion* – Diisopropanolamine has low toxicity if swallowed. Swallowing small amounts incidentally as a result of normal handling operations is not likely to cause injury; however, swallowing larger amounts may cause injury. Based on physical properties, this material is not likely to be an aspiration hazard.

*Repeated exposure* – This material contains components that have been reported to cause effects on the kidney and bladder in animals. These effects were only observed at exaggerated doses.

For more information, see the relevant Safety Data Sheet.

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**Environmental Information**

Diisopropanolamine is expected to partition (preferentially locate) in water when released to the environment. It is not likely to accumulate in the food chain (bioconcentration potential is low). Diisopropanolamine is water soluble and readily biodegradable according to OECD 301F and 302B Tests for biodegradation. This material is practically non-toxic (LC/EC$_{50}$ >100 mg/L in the most sensitive species tested) 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**

Diisopropanolamine is stable at recommended storage and use temperatures. Exposure to elevated temperatures can cause the product to decompose. Generation of gas during decomposition can cause pressure build-up in closed systems. Decomposition products depend upon temperature, air supply, and the presence of other materials.

Avoid contact with nitrites, strong acids, strong oxidizers, and halogenated organic solvents. Diisopropanolamine reacts with aluminum, zinc, copper, and galvanized metals; do not store diisopropanolamine in containers made from these metals. Heating diisopropanolamine above 60°C (140°F) in the presence of aluminum can result in corrosion and generation of flammable hydrogen gas.

For more information, see the relevant Safety Data Sheet.

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**Regulatory Information**

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Regulations may exist that govern the manufacture, sale, transportation, use, and/or disposal of diisopropanolamine. 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 (www.dow.com/webapps/msds/msdssearch.aspx)
- Contact Us (www.dow.com/amines/contact/index.htm)
- DOW™ Diisopropanolamine (DIPA): DIPA Commercial Grade, DIPA Low Freeze Grade 90, & DIPA Low Freeze Grade 85, Technical Data Sheet, The Dow Chemical Company, Form No. 111-01413-1104 AMS (http://www.dow.com/amines/prod/iso-dipa.htm)
- Product Information: Isopropanolamines, Basic Chemicals with Surfactants Properties for Personal Care Products, Form No. 111-01344-1198 AMS (http://www.dow.com/amines/prod/iso-dipa.htm)

For more business information about DOW™ diisopropanolamine, visit the Dow Specialty Amines web site at www.dow.com/amines/index.htm or the product webpage at www.dow.com/amines/prod/iso-dipa.htm.

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References
1 Diisopropanolamine, Material Safety Data Sheet, The Dow Chemical Company
2 DOW™ Diisopropanolamine (DIPA): DIPA Commercial Grade, DIPA Low Freeze Grade 90, & DIPA Low Freeze Grade 85, Technical Data Sheet, The Dow Chemical Company, Form No. 111-01413-1104 AMS

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