Product Safety Assessment

**DOW™ Diethylenetriamine**


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**Names**

- CAS No. 111-40-0
- DOW™ diethylenetriamine
- DETA
- N-(2-aminoethyl)-1,2-ethanediame
- 2,2’-diaminodiethylamine
- 2,2’-iminobis(ethanamine)
- 3-azapentane-1,5-diamine
- 1,4,7 triazaheptane
- Diethylenetriamine
- bis(2-aminoethyl)amine
- bis(β-aminoethyl)amine
- 2,2’-diaminoethylamine
- 2,2’-iminodiethylamine
- 3-aza-1,5-pentanediamine

**Product Overview**

- **DOW™ diethylenetriamine (DETA)** is a member of the ethyleneamines family. At room temperature it is a colorless to light yellow liquid with an ammonia-like odor. It is readily soluble in both water and organic solvents.¹ For further details, see **Product Description**.
- DOW diethylenetriamine is used in asphalt additives, chelating agents, corrosion inhibitors, drainage aids, epoxy curing agents, fabric softeners, fuel additives, ion-exchange resins, lubrication-oil additives, mineral-processing aids, paper wet-strength resins, petroleum production chemicals, polyamide resins, and surfactants. For further details, see **Product Uses**.
- DOW diethylenetriamine is used and stored in closed systems. However, workplace exposure is possible during maintenance, transfer, or sampling operations. Although DOW diethylenetriamine is not sold for direct consumer use, it can be a component of products used by the public, so product safety labels should be followed carefully.² For further details, see **Exposure Potential**.
- DOW diethylenetriamine liquid can cause severe burns to the eyes and skin or to the mouth and throat if swallowed. Exposure to liquid or vapor may result in allergic skin or respiratory reactions.³ For further details, see **Health Information**.
- DOW diethylenetriamine is slightly toxic to aquatic organisms. Its bioconcentration potential is low and mobility in soil is very high. Since it will biodegrade slowly, it would not persist in the environment and would be removed by normal wastewater-treatment processes. For further details, see **Environmental Information**.

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The Dow Chemical Company
DOW™ diethylenetriamine is a combustible liquid. It is stable under normal conditions of storage and use, but can decompose at higher temperatures. Ethylenamines react with a variety of other chemicals and require substantial care in handling. For further details, see Physical Hazard Information.

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Manufacture of Product

- **Capacity** – Global annual production of ethylenamines was estimated at 468,100 metric tons (approximately 1 billion pounds) in 2012. Dow produces ethylenamines in the following locations: Freeport, Texas; Hahnville, Louisiana (St. Charles Operations); and Terneuzen, The Netherlands.
- **Process** – DOW™ diethylenetriamine is produced by reacting ethylene dichloride with an excess of ammonia under high pressure and moderate temperature. The resultant ethylenamine hydrochloride solution is neutralized with caustic soda to form diethylenetriamine and other ethylenamines, which are then separated and purified by distillation. Sodium chloride is formed as a by-product. The reaction sequence is shown below.

![Chemical Reaction Diagram]

Dow also produces diethylenetriamine using transamination technology.

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Product Description

DOW™ diethylenetriamine is a member of the ethyleneamines family. At room temperature it is a colorless to light yellow viscous liquid with an ammonia-like odor and an alkaline pH. It is readily soluble in both water and organic solvents. DOW diethylenetriamine may have 0.1–1.0% aminoethylpiperazine (CAS No. 140-31-8) present as an impurity.

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Product Uses

DOW™ diethylenetriamine is used to produce:

- **Chelating agents** – to form complexes with certain metal ions to prevent the ions from interfering with processing or to promote buffering, concentration, separation, or transport
- **Corrosion inhibitors** – to slow corrosion in petroleum production operations
- **Epoxy curing agents** – to enhance the

### U.S. Uses for Diethylenetriamine (2012)

- Reactive Polyamide Resins 9%
- Other 5%
- Corrosion Inhibitors 28%
- Polychloro-epichlorohydrin Resins 41%
- Chelating Agents 17%
- Other 5%
performance and application of DOW™ Diethylenetriamine

- **Fabric softeners** – for industrial operations to make textiles softer, fluffier, and more resistant to soil and static build-up
- **Footwear**
- **Paper wet-strength resins** – to promote wet-strength properties in towels and tissues
- **Petroleum production chemicals** – for corrosion inhibitors, demulsifiers, and neutralizers used in the oil field, as well as additives that enhance certain separation techniques
- **Polyamide resins** – for use in varnishes, adhesives, and binders for printing inks
- **Spandex** – for use in clothing
- **Surfactants** – for mild soaps and detergents with good foaming characteristics

**Exposure Potential**

DOW™ diethylenetriamine is used in the production of a variety of industrial products. Based on the uses for this material, the public could be exposed through:

- **Workplace exposure** – Exposure can occur either in a diethylenetriamine manufacturing facility or in the various industrial or manufacturing facilities that use this material. It is produced, distributed, stored, and consumed in closed systems. Those working with this material 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 DOW diethylenetriamine** – Dow does not sell diethylenetriamine for direct consumer use. It is possible that small, residual amounts of the material can remain in materials made from these products. Always read the product information before use and follow the label/use instructions. 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. Eliminate all sources of ignition and ground and bond all containers and handling equipment. For small spills, diethylenetriamine should be absorbed with inert materials such as sand, clay, or dirt. Do not use organic absorbents, such as peat moss, ground corn cobs, cellulose, or sawdust. For cleaning up spills and leaks, wear an approved air-purifying respirator with an organic vapor cartridge and a particulate prefilter or an air-supply full-face respirator. Knockdown and dilute vapors with a water spray or fog and collect diluted material with vacuum equipment. Diethylenetriamine is slightly toxic to aquatic organisms on an acute basis. It would not persist in the environment and would be removed by normal wastewater-treatment processes. 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. An approved air-purifying respirator with an organic vapor cartridge and a particulate prefilter is recommended for emergency work. Eliminate all sources of ignition immediately. Use only explosion-proof equipment; ground and bond all containers and handling equipment. See Environmental, Health, and Physical Hazard Information.

- **In case of fire** – Deny any unnecessary entry into the area. Burning liquids may be extinguished by diluting with water, but use of a direct water stream may spread the fire. Use water fog or fine spray, dry-chemical or carbon-dioxide extinguishers, or foam. Alcohol-resistant foams are preferred. Firefighters should wear positive-pressure, self-contained breathing apparatus (SCBA) and protective firefighting clothing and avoid contact with diethylenetriamine. If contact is likely, firefighters should wear full chemical-resistant clothing in addition to SCBA gear. Follow emergency procedures carefully. See Health and Physical Hazard Information.
For more information, see the relevant Safety Data Sheet.

Health Information\(^3,10\)

**Eye contact** – Contact may cause severe irritation or chemical burns with corneal injury, which could result in permanent vision impairment. Vapor may cause irritation with mild discomfort and redness.

**Skin contact** – Brief contact with diethylenetriamine may result in severe burns. Symptoms may include pain, severe local redness, and tissue damage. Prolonged contact may result in absorption of harmful amounts. Skin contact may cause an allergic reaction, particularly for people who have had allergic reactions to similar materials in the past.

**Inhalation** – Vapor inhalation, especially if the material is heated or dispersed as a spray or mist, may cause serious adverse effects, even death. Excessive exposure may cause severe irritation to the upper respiratory tract (nose and throat) and lungs.

**Ingestion** – Diethylenetriamine has low toxicity when swallowed, but may result in burns to the mouth and throat, as well as gastrointestinal irritation and ulceration. Do not induce vomiting, which could result in aspiration of material into the lungs and consequent lung and tissue damage.

**Other** – Diethylenetriamine has not caused cancer in laboratory animals. It has caused fetal death in laboratory animals. *In vitro* and animal genetic toxicity studies have been negative.

For more information, see the relevant Safety Data Sheet.

Environmental Information\(^2,3\)

DOW™ diethylenetriamine is slightly toxic to aquatic organisms. Its bioconcentration potential is low. Although DOW diethylenetriamine is not considered readily biodegradable according to Organisation for Economic Co-operation and Development (OECD) guidelines, it will biodegrade slowly in the environment. Therefore it would not persist in the environment and would be removed by normal wastewater-treatment processes.

For more information, see the relevant Safety Data Sheet.

Physical Hazard Information\(^3,11,12\)

DOW™ diethylenetriamine is stable under normal storage and use conditions. Elevated temperatures can cause diethylenetriamine to decompose, with the possible release of ammonia, ethylenediamine, or other volatile amines. It can also react with carbon dioxide in the air to form amine-carbamate salts, which tend to plug vent and relief lines, compromising pressure-relief systems and introducing solid contaminants into the storage system.
Avoid contact with oxidizing materials, acids,

For more information, see the relevant Safety Data Sheet.

Regulatory Information

Regulations may exist that govern the manufacture, sale, transportation, use, and/or disposal of DOW™ diethylenetriamine. 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.

Additional Information

- Safety Data Sheet (http://www.dow.com/webapps/msds/msdssearch.aspx)
- Contact Us (http://www.dow.com/amines/contact.htm)
- Ethyleneamines: Storage and Handling, The Dow Chemical Company, Form No. 108-01350, November 2001

For more business information about DOW™ diethylenetriamine, visit the Dow Amines web site at www.dow.com/amines/.

References

1. Diethylenetriamine Technical Data Sheet, The Dow Chemical Company, Form No. 108-01352-1001 AMS
3. Diethylenetriamine Material Safety Data Sheet, The Dow Chemical Company

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