Product Safety Assessment

*DOW™ Acrylic Acid*


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Names
- CAS No. 79-10-7
- EC No. 201-177-9
- Acrylic acid
- Acrylic acid, Glacial (98–99.5%)
- Acrylic acid, Technical (94%)
- DOW™ Acrylic acid
- Vinylformic acid
- Ethylenecarboxylic acid
- 2-Propenoic acid
- Propenoic acid

Product Overview

- DOW™ Acrylic acid is a colorless flammable liquid with a pungent acidic odor.¹ For further details, see Product Description.
- DOW Acrylic acid has been used as an essential building block in the production of our most commonly used industrial and consumer products, such as paints, coatings, textiles, adhesives, plastics, hygienic products, detergents and waste water treatment chemicals.² For further details, see Product Uses.
- Acrylic acid is not sold directly to consumers, so the workplace is the most likely place for potential exposure. Acrylic acid is stored, transported and used in closed systems to minimize the risk of exposure. However, skin and inhalation exposures could occur during material transfer or sampling, or in the event of a spill. For further details, see Exposure Potential.
- Acrylic acid is corrosive and can result in severe skin burns and severe eye irritation which may result in permanent impairment of vision, even blindness. Prolonged or widespread skin contact is unlikely to result in absorption of harmful amounts, and skin contact has not caused allergic skin reactions when tested in guinea pigs. Excessive exposure to acrylic acid vapors may cause severe irritation to the nose, throat and lungs. Repeated over exposure may cause kidney damage. It is slightly toxic if swallowed. Swallowing may result in irritation or burns of the mouth, throat, and gastrointestinal tract.¹ For further details, see Health Information.

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- DOW™ Acrylic acid released to the air will be degraded by reaction with photochemically-produced hydroxyl radicals. Acrylic acid is classified as readily biodegradable including removal by wastewater treatment facilities. Acrylic acid is not likely to accumulate in the food chain as its bioconcentration potential is low. It is considered highly toxic to aquatic organisms on an acute basis (exposure to a large amount). For further details, see Environmental Information.
- Acrylic acid liquid and vapor is flammable. Its vapor is an explosion hazard. Exposing acrylic acid to elevated temperatures or materials such as oxidizing agents, acids, alkalis, or moisture can increase the chance of a violent exothermic polymerization. For further details, see Physical Hazard Information.

**Manufacture of Product**

- **Capacity** – Dow produces crude acrylic acid in the U.S. at the following plants: St. Charles Operations in Hahnville, Louisiana, and Deer Park, Texas. Dow also produces acrylic acid in Böhlen, Germany; Marl, Germany; Cangrejera, Mexico; and at The Saudi Acrylic Monomer Company (SAMCo) joint venture plant in Al-Jubail, Saudi Arabia.
- **Process** – DOW™ Acrylic acid is made by vapor-phase oxidation of propylene in the presence of air, via acrolein to acrylic acid. A reaction sequence and diagram of the process are shown.

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H₂C=CH–CH₃ + O₂ → H₂C=CH–CH + H₂O
[š]          [š]          [š]
          Propylene     Acrolein
[š]   H₂C=CH–CH + H₂O → H₂C=CH–C–OH
[š]
          [š]          Acrylic Acid
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**Product Description**

At room temperature, acrylic acid is a corrosive, colorless liquid with a pungent odor. It has a boiling point of 141 °C (286 °F) and a freezing point of 13 °C (55 °F) at normal pressure (1013 hPa). It mixes readily with water, alcohols and common organic solvents. Glacial acrylic acid is typically min. 99.5% pure with water content less than 0.3% and acrylic acid dimer less than 0.1%. Because of its reactive polymerization potential, acrylic acid is normally shipped with a polymerization inhibitor such as monomethyl ether of hydroquinone (CAS 150-76-5) or phenothiazine (CAS 92-84-2).

**Product Uses**

There are two main uses for acrylic acid:
- Use as a chemical intermediate to produce acrylic esters (methyl acrylate, ethyl acrylate, butyl acrylate, etc.), which in turn are used to make ingredients in paints, coatings, woven and non-woven textiles, adhesives, plastics, and many other applications.
- Use as a building block to produce polyacrylic acid or crosslinked polyacrylic acid compounds, which are used to make hygienic products (diapers, etc.), detergents and waste water treatment chemicals.
Exposure Potential

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

- **Workplace exposure** – Exposure can occur either in an acrylic acid manufacturing facility or in the various industrial or manufacturing facilities that use acrylic acid to produce acrylic polymers or acrylate esters. Acrylic acid is produced, distributed, stored and consumed in closed systems. Those working with acrylic acid in manufacturing and transport operations could be exposed during maintenance, sampling, testing or other procedures. Each manufacturing facility should have a thorough training program for employees, appropriate work processes and safety equipment in place to monitor and limit exposure to acrylic acid. Safety showers and eye-wash stations should be accessible nearby. See Health Information.

- **Consumer exposure to products containing acrylic acid** – Because consumer products contain only trace levels of acrylic acid, the general population is not generally exposed to it in finished products. Only trace amounts of acrylic acid may be present in polyacrylate products such as latex paints or adhesives. However, carefully read and follow the instructions given on product labels for proper use. See Health Information.

- **Environmental releases** – In the event of a spill, the focus is on personal protection and containing the spill to prevent contamination of soil and surface or ground water. Eliminate nearby ignition sources. Absorb spills with materials such as sand. If fire potential exists, blanket spill with alcohol-type aqueous film-forming foam or use water fog stream to disperse vapors. Avoid run-off into storm sewers and ditches leading to waterways. If required, notify state and local authorities. For emergency work, workers should wear impervious boots, gloves, and clothing. Neoprene is recommended. Face, eye and respiratory protection depends on the potential level of exposure. The minimum would be chemical workers goggles and an approved respirator, but wear a face shield if there is a reasonable chance for a splash to the face. Consult the relevant Safety Data Sheet for more information about respirators, other 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 reprocessed, or disposed off according to applicable governmental requirements. Eliminate nearby ignition sources. If fire potential exists, blanket spill with alcohol-type aqueous film-forming foam or use water fog stream to disperse vapors. Avoid run-off into storm sewers and ditches leading to waterways. If required, notify state and local authorities. Use only explosion-proof equipment; ground and bond all containers and handling equipment. Ensure safety showers and eye-wash stations are nearby. For emergency work, workers should wear impervious boots, gloves, and clothing. Neoprene is recommended. For potential exposure to unknown concentrations, use self-contained breathing apparatus (SCBA) with a full face piece in positive pressure mode or an appropriate positive-pressure full face piece supplied-air respirator with an auxiliary positive-pressure self-contained breathing apparatus escape system. Follow emergency procedures carefully. See Environmental, Health and Physical Hazard Information.

For more information, request the relevant Safety Data Sheet.
Health Information

Eye or skin contact
Acute exposure to acrylic acid can occur by: direct contact with the skin or eyes, contact with liquid or spray mists, inhalation of vapors or mists, or ingestion. Acrylic acid is corrosive and harmful if absorbed through the skin or inhaled. Undiluted acrylic acid causes skin burns. Exposure to acrylic acid is not anticipated to cause an allergic skin reaction. Symptoms of exposure may include redness or discoloration, swelling, itching, burning or blistering of skin.

Acrylic acid causes severe eye burns with possibly irreversible injury. Exposure to vapors causes eye irritation. Symptoms of exposure may include eye irritation, burning sensation, pain, watering, and/or change in vision.

Inhalation
Acrylic acid is considered slightly toxic to animals by inhalation. Because of its strong odor, acrylic acid leaks and releases can be detected early. The odor is usually detected before the vapor concentration reaches the level of current exposure standards. Prolonged excessive exposure may cause adverse effects. Vapor may cause severe irritation of the upper respiratory tract (nose and throat) and lungs. Mist may cause severe irritation of the upper respiratory tract (nose and throat) and lungs.

Ingestion
Small amounts swallowed incidentally as a result of normal handling operations are not likely to cause injury. Acrylic acid causes digestive tract burns, with possibly severe damage to the mouth, throat, esophagus, and/or stomach. Symptoms of exposure may include nausea, vomiting, loss of appetite, gastrointestinal irritation and/or diarrhea.

Other Effects
Animal exposure studies have not indicated that acrylic acid poses a cancer hazard. Acrylic acid did not cause birth defects in laboratory animals and showed no reproduction effects at doses that were not significantly toxic to the parent animals. In vitro and animal genetic toxicity studies were predominantly negative.

For more information, request the relevant Safety Data Sheet.

Environmental Information

Small quantities of acrylic acid are produced by a wide variety of marine algae as a natural byproduct of biological action. It can range from practically non-toxic to highly toxic to aquatic organisms, depending on the extent and concentration of exposure. Acrylic acid may decrease the pH of aquatic systems to less than 5.0, which can be harmful to some aquatic organisms.

If released to surface water, acrylic acid rapidly biodegrades. Acrylic acid is biodegraded under both aerobic and anaerobic conditions, including biological wastewater treatment facilities. It is rapidly metabolized in soil under aerobic conditions. In many cases acrylic acid will slowly polymerize in the environment. It does not accumulate in the food chain (bioconcentration potential is low).

For more information, request the relevant Safety Data Sheet.

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Physical Hazard Information

Acrylic acid liquid and vapor is flammable. It is a vapor explosion hazard. Vapors may travel long distances; ignition or flashback may occur. Avoid heat, flames, sparks and other sources of ignition. Small fires should be extinguished with a CO₂ or dry-chemical extinguisher. Larger fires should use alcohol-type aqueous film-forming foam.

Polymerization Control

Acrylic acid contains inhibitors to prevent polymerization at normal storage temperatures. To be effective, most of the inhibitors used with acrylic acid require oxygen-containing atmospheres. If the material freezes, the inhibitor may separate. If frozen, the material must be warmed and remixed gently per pre-defined procedures to ensure the acrylic acid remains properly inhibited.

Hazardous polymerization can occur with acrylic acid. It may polymerize violently or explosively if contaminated or overheated. Uncontrolled polymerization can cause rapid evolution of heat and increased pressure, which can result in violent rupture of storage vessels or containers. Keep acrylic acid away from peroxides and other polymerization initiators, caustic soda, lime, other alkalils, sulfuric acid, iron salts, amines, and oxidizing agents such as nitric or perchloric acid or chromium trioxide.

Avoid storage in direct sunlight, x-ray or ultraviolet radiation. Avoid exposure to heat, flames, steam, sparks and other sources of ignition. Avoid contamination with impurities such as peroxides, and peroxide-forming / free-radical-forming compounds (aldehydes, ethers, azides, etc.) – even in part per million concentrations – which promote polymerization.

For more information, request the relevant Safety Data Sheet.

Regulatory Information

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

Additional Information

- Safety Data Sheet (http://www.dow.com/webapps/msds/msdssearch.aspx)
- Acrylic Acid Technical Data Sheet, The Dow Chemical Company, Form No. 745-00106-1004
- Contact Us (http://www.dow.com/acrylates/contact)
- Basic Acrylic Monomer Manufacturers’ website
- Acrylates and Human Health, Basic Acrylic Monomer Manufacturers Association, Category Review (5/7/12)
- The European Basic Acrylic Monomer Group (www.petrochemistry.eu/about-petrochemistry/products.html?filter_id=7)
- U.S. Department of Health and Human Services Hazardous Substances Data Bank (HSDB), National Library of Medicine, TOXNET web site (http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?HSDB), type in acrylic acid and/or CAS No. (79-10-7) then select “search”

For more business information about DOW™ acrylic acid, visit Dow's Acrylate web site.

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References

1. Glacial Acrylic Acid 180-220 ppm MEHQ, Material Safety Data Sheet for US, The Dow Chemical Company
2. “Acrylic Acid Background Information,” Basic Acrylic Monomer Manufacturers’ website, (http://www.bamm.net/index.html)
5. Dow Acrylates website (www.dow.com/acrylates)
9. Acrylic Acid, Glacial, Technical Data Sheet, Form No. 745-00106-1004
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