Product Safety Assessment

Dicyclopentadiene

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Names

- CAS No. 77-73-6
- Dicyclopentadiene
- DCPD
- Bicyclopentadiene
- 3a,4,7,7a-tetrahydro-4,7-methano-1H-indene
- Tricyclo-(5,2,1,0)-3,8-decadiene
- DOW™ Dicyclopentadiene
- DOW™ DCPD
- DOW DCPD UPRG (unsaturated polyester resin grade)
- DOW™ DCPD high purity
- DOW™ DCPD resin grade

Product Overview

- Dicyclopentadiene (DCPD) is typically a clear liquid with a fragrant (strong) musty odor.\(^1\,\,^2\)
  DCPD is a dimer of cyclopentadiene (CPD) and is formed during high-temperature cracking of petroleum fractions and recovered by distillation. For further details, see Product Description.
- DCPD is a highly reactive intermediate used to produce a wide range of resins, including aromatic hydrocarbon resins, unsaturated polyester resins, phenolics, and epoxies.\(^3\) For further details, see Product Uses.
- DOW™ DCPD is produced in closed systems as an intermediate for polymers, elastomers, synthetic rubbers, and other chemicals. Occupational exposures to DCPD in production sites may occur during quality-control sampling, analysis, or tank-truck loading operations. The main route of exposure is inhalation, but skin or eye exposure may be possible, especially during sampling operations.\(^4\) As a chemical intermediate, DCPD is consumed (reacted) in the production process and it is not present in the final product. It is not used in consumer products, so consumer exposure is unlikely. For further details, see Exposure Potential.
- DCPD is harmful if inhaled or swallowed in large amounts and irritating to the eyes, respiratory system, and skin.\(^2\) For further details, see Health Information.
- DCPD is flammable. It is stable under recommended storage conditions. However, potentially violent decomposition can occur above 150°C (302°F).\(^2\) For further details, see Physical Hazard Information.

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Product Safety Assessment: Dicyclopentadiene (DCPD)

Manufacture of Product

- **Locations** – DOW™ DCPD is produced in Terneuzen, The Netherlands and Kallo, Belgium.
- **Process** – DCPD is produced via the thermal or catalytic cracking of petroleum distillates. DCPD is obtained as a by-product of petroleum processing. For example, DCPD is a by-product of ethylene production, via distillation of pyrolysis gasoline. The structures of DCPD and cyclopentadiene (CPD) are shown below. Dicyclopentadiene (DCPD) is a dimer of cyclopentadiene (CPD). In other words, DCPD is a molecule made up of two CPD molecules that have reacted together.

![CPD and DCPD structures](image)

Product Description

DCPD is a clear liquid with a fragrant (strong) musty odor. Dow manufactures three grades of DCPD:

- **DOW™ DCPD High Purity** can be used for the production of flavors and fragrances, antioxidants, ethyl norbornene, or cyclic olefin co-polymers, but it is also used for the production of unsaturated polyester resins. This grade is typically 90 to 95% DCPD, with CPD and various dimers making up the remaining 5 to 10%.

- **DOW DCPD UPRG (unsaturated polyester resin grade)** is designed for use in the production of unsaturated polyester resins. It contains fewer trimers and co-dimers and has favorable color characteristics compared to DCPD resin grade. This grade is typically 83 to 88% DCPD, with CPD and various dimers making up the remaining 12 to 17%.

- **DOW DCPD Resin Grade** is generally used in the production of cyclo-aliphatic and C5/C9 aromatic hydrocarbon resins, but may be used in the production of unsaturated polyester resins. This grade is typically 73 to 83% DCPD, with CPD and various dimers making up the remaining 17 to 27%.

Product Uses

DCPD products are best characterized as highly reactive intermediates. Because DCPD is reactive with other monomers, it is a useful raw material for the production of aromatic hydrocarbon resins, unsaturated polyester resins, phenolic resins, epoxy resins, alkyls, acrylates, latexes, specialty resins, and other specialty intermediates.

There are two general categories of industrial end uses for DCPD:

- Commodity resins and polymers, which is the major use and includes hydrocarbon resins, unsaturated polyester resins, and ethylene-propylene-diene rubbers (EPDM).
Specialty polymers and fine chemicals, which include cyclic olefin copolymers, resins for reaction/injection molding (RIM), flame retardants, agrochemicals, antioxidants, catalysts, specialty norbornenes, and flavor and fragrance intermediates.

Exposure Potential

DOW™ DCPD is used in closed systems and is not used in consumer products. Exposure to DCPD may occur through:

- **Workplace exposure** – Exposure can occur either in a DCPD manufacturing facility or in the various industrial or manufacturing facilities that use it in production. Those working with DCPD in manufacturing operations could be exposed during maintenance, sampling, testing, or other procedures. Adequate ventilation should be used to maintain vapor levels below recommended guidelines. Workers should wear safety glasses and protective gloves and clothing when prolonged or frequently repeated contact could occur. Each manufacturing facility should have a thorough training program for employees and appropriate work processes and safety equipment in place to limit unnecessary exposure. The American Conference of Governmental Industrial Hygienists (ACGIH) and the U.S. Occupational Safety and Health Administration (OSHA) have established threshold limit values (TLV) and permissible exposure limits (PEL) for DCPD. These occupational exposure limits are used in the workplace to limit exposure to the components of this material. See Health Information.

- **Consumer exposure to products containing DOW DCPD** – DOW DCPD is used to produce industrial products. As a chemical intermediate, DOW DCPD is consumed (reacted) in the production process and it is not present in the final product. It is not used in consumer products, so consumer exposure is unlikely.

- **Environmental releases** – Environmental exposure to DCPD is limited since it is produced, processed, transferred, and stored in closed systems. DCPD is transported using pipelines, barges, railroad tank cars, or tank trucks, where the material is typically contained within the transport container except for infrequent accidental spills or leaks. In the event of a spill or leak, appropriate actions should be taken to avoid fire, contamination of the environment or exposure to the material. Consult the relevant Safety Data Sheet for more information regarding actions to take if a spill or leak of this material occurs. See Environmental, Health, and Physical Hazard Information.

- **Large release** – Industrial spills or releases are infrequent and generally contained. A large spill or release of DCPD can be hazardous. If a large release occurs, contact local and/or state or provincial authorities. See Environmental, Health, and Physical Hazard Information sections for additional information.

For more information, see the relevant Safety Data Sheet.

Health Information

Eye contact with DCPD may cause slight temporary irritation. Brief skin contact may cause skin irritation with local redness. Prolonged or repeated skin exposure may cause a burn which may be accompanied by pain, severe local redness, swelling, and tissue damage. Drying and flaking of the skin may also occur. Prolonged exposure is not likely to result in the material being absorbed through skin in harmful amounts.

The single dose oral toxicity for DCPD is moderate. As observed with other hydrocarbons, if DCPD is aspirated into the lungs, it may be rapidly absorbed and result in injury to the lungs and
other body systems. Small amounts swallowed incidental to normal handling operations are not likely to cause injury. However, swallowing larger amounts may cause serious injury, even death.

Excessive vapor concentrations are attainable, and prolonged excessive exposure may cause serious adverse effects, even death. Symptoms of excessive exposure may be anesthetic or narcotic effects, such as dizziness or drowsiness.

In repeated dose testing with animals, effects have been reported on the central nervous system, kidneys, and liver.

Animal studies have shown birth defects to be unlikely. Exposures to DCPD having no adverse effects on the mother should have no effect on the fetus. In animal studies, DCPD has been shown not to interfere with reproduction.

For specific health information, review the relevant Safety Data Sheet.

Environmental Information

The bioconcentration potential of DCPD is low, and biodegradation under aerobic static laboratory conditions is undetectable. However, degradation is expected in the atmospheric environment within days to weeks. DCPD is toxic to aquatic organisms on an acute basis. DCPD has limited solubility in water and will float on the surface. It should be prevented from entering soil, ditches, sewers, waterways, and/or groundwater.

For more information, review the relevant Safety Data Sheet.

Physical Hazard Information

Dicyclopentadiene is a flammable liquid. It is stable at ambient temperatures and under recommended storage conditions, but can decompose at elevated temperatures. Above, 150°C (302°F) this may result in a runaway reversed Diels-Alder reaction. Decomposition products depend upon temperature, air supply, and the presence of other materials, and may include cyclopentadiene, ethane, hydrogen, and methane. Generation of gas during decomposition can cause a rapid increase in pressure in closed systems (explosion).

Avoid contact with absorbent materials such as clay-based absorbents or sawdust. Avoid contact with acids, oxidizing materials, and polymerization catalysts such as boron or aluminum compounds.

For more information, review the relevant Safety Data Sheet and the Product Safe Handling Guide.

Regulatory Information

Regulations may exist that govern the manufacture, sale, transportation, use, and/or disposal of dicyclopentadiene. 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)
- Dow's Aromatics website http://www.dow.com/hydrocarbons/aromatics/

For more business information about DOW™ dicyclopentadiene, visit Dow's Aromatics Co-Products web site at www.dowaromatics.com.

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References

1. Dicyclopentadiene High Purity, Material Safety Data Sheet, The Dow Chemical Company
2. Dicyclopentadiene Resin Grade, Material Safety Data Sheet, The Dow Chemical Company
3. Dicyclopentadiene (DCPD), Product Data Sheet, The Dow Chemical Company, Form No. 778-00101
Organisation for Economic Co-operation and Development (OECD), 25-27
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