Product Safety Assessment

*DOW™* Biphenyl

Select a Topic:

- Names
- Product Overview
- Manufacture of Product
- Product Description
- Product Uses
- Exposure Potential
- Health Information
- Environmental Information
- Physical Hazard Information
- Regulatory Information
- Additional Information
- References

**Names**

- CAS No. 92-52-4
- Biphenyl
- Diphenyl
- DOW™ biphenyl
- Phenylbenzene
- 1,1-Biphenyl
- Lemonene

**Product Overview**

- Biphenyl is manufactured as solid crystals or flakes varying in color from white to pale yellow or tan. It is insoluble (does not dissolve) in water and has a pleasant, fragrant odor. Biphenyl occurs naturally in trace amounts. For further details, see Product Description.
- DOW™ biphenyl is used as a chemical intermediate or in the production of heat-transfer fluids.
- Other reported biphenyl uses involve carrier for textile dyes; mostly obsolete uses in food preservative applications, and as a fungistat (a material that stops fungi from growing) in the paper packaging of citrus fruits. For further details, see Product Uses.
- Eye contact with biphenyl may cause slight irritation, although corneal injury is unlikely. Its vapors may cause eye irritation experienced as mild discomfort and redness. Repeated skin contact may cause irritation with local redness. Repeated skin exposure to large quantities may result in absorption of harmful amounts. At room temperature, exposure to vapor is minimal. Vapor from heated material may cause irritation to the nose, throat, and lungs, and anesthetic effects. When processed/handled in its molten (liquid) form at elevated temperatures, contact with the heated material may cause thermal burns. Biphenyl has caused cancer in some laboratory animals after life-time exposures to very high doses. U.S. EPA evaluated the carcinogenicity of biphenyl and concluded only "suggestive evidence of carcinogenic potential". For further details, see Health Information.
- Worker exposure can occur at a biphenyl manufacturing facility or facilities that use biphenyl for other purposes. Government sources indicate that consumer exposure is possible from contact with residues from citrus fruit or from consuming contaminated drinking water. Biphenyl has been reported in diesel exhaust. For further details, see Exposure Potential.
• Biphenyl is a solid crystalline substance with low solubility in water. It is considered to be readily biodegrade, so it will rapidly degrade to carbon dioxide and water in the environment and will be efficiently removed from wastewaters by biological wastewater-treatment facilities. This substance has a tendency to adsorb to solid particles, such that environmental releases would tend to be associated with soil and sediments. This product will not persist in the environment, but is toxic to aquatic organisms and has a moderate bioconcentration potential. For further details, see Environmental Information.

• Biphenyl is stable at typical storage and use temperatures. Exposure to elevated temperatures can cause the product to decompose. Avoid contact with oxidizing materials. For further details, see Physical Hazard Information.

Manufacture of Product

• Capacity – Dow currently manufactures biphenyl at its Plaquemine, Louisiana, U.S. manufacturing facility.

Product Description

Biphenyl is manufactured as solid crystals or flakes varying in color from white to pale yellow or tan. It is insoluble (does not dissolve) in water and has a pleasant, fragrant odor. It occurs naturally in trace amounts.

Product Uses

Biphenyl is an industrial chemical mainly used by Dow as an intermediate in the production of heat-transfer fluids. Biphenyl is also reported to be used in the following applications:

• Textile dye carrier – to help dissolve dyes
• Chemical intermediate
• Food preservative
• Fungistat – to treat paper packaging for citrus fruit to prevent damage from fungus during shipment and storage

Estimated Use Pattern for Biphenyl

Heat Transfer Fluids 35%
- Dyestuff Carriers for Textiles 20%
- Chemical Intermediate 20%
- Solvent for Pharmaceutical Production 5%
- Dyestuff Carrier for Copying Paper 5%
- Preservative for Citrus Fruit 5%
- Other 10%

Exposure Potential

Biphenyl is primarily used in the production of industrial products. Based on the reported uses for biphenyl, the public could be exposed through:

• Workplace exposure – Exposure can occur in a biphenyl manufacturing facility or in facilities using biphenyl for other applications. Those working with biphenyl in manufacturing operations could be exposed during maintenance, sampling, testing, or other procedures. Each facility should have a thorough training program for employees and appropriate work processes and protective safety equipment in place to limit unnecessary exposure. The U.S.
Occupational Safety and Health Administration (OSHA) has established a Permissible Exposure Limit for biphenyl of 0.2 ppm (1 mg/m$^3$). The American Conference of Governmental Industrial Hygienists (ACGIH) also has established a Threshold Limit Value (TLV) of 0.2 ppm. See Health Information.

- **Consumer exposure to biphenyl** – Dow does not sell biphenyl for consumer use or consumer applications. The public could contact biphenyl residue from citrus fruit, from consuming drinking water contaminated with it, or handling products which contain additives produced from biphenyl.$^{1,6}$ Because biphenyl is a solid that binds to soil, it is not likely to move through the ground and enter groundwater.$^5$ Biphenyl has been reported in diesel exhaust.$^1$ See Health Information.

- **Environmental releases**$^4$ – Biphenyl is a crystalline solid with low solubility in water. In the event of a spill, the focus is on containing the spill and quickly removing the solid material to prevent further contamination of soil, ditches, sewers, waterways, or groundwater. See Environmental, Health, and Physical Hazard Information.

- **Large release** – Industrial spills or releases are infrequent and generally contained. If a large spill does occur, dike the area to contain any spilled material. Isolate the area and evacuate unnecessary personnel. Ventilate the area, keeping upwind of spill. Collect material in suitable and properly labeled containers and dispose of properly. See Environmental and Physical Hazard Information.

- **In case of fire** – There is little or no potential for consumers to experience a fire situation with this product. Industrial users should go to the Safety Data Sheet for information on fires.

For more information, see the relevant Safety Data Sheet.

**Health Information**$^4$

**Eye and Skin Contact** – Eye contact with biphenyl may cause slight irritation, although corneal injury is unlikely. Vapors may cause eye irritation experienced as mild discomfort and redness. Biphenyl is often processed and used at elevated temperatures. Contact with heated material may cause thermal burns to the eyes or skin. Repeated skin contact may cause irritation with local redness. Repeated skin exposure to large quantities may result in absorption of harmful amounts.

**Inhalation** – At room temperature, exposure to vapor is minimal. Vapor from heated material may cause irritation to the nose, throat, and lungs. Symptoms of excessive inhalation may be anesthetic or narcotic effects and dizziness or drowsiness.

**Ingestion** – This material has low toxicity if swallowed. Small amounts swallowed incidental to normal handling operations are not likely to cause injury. However, swallowing larger amounts may cause injury. Intentionally swallowing large amounts of biphenyl may cause nausea, vomiting, abdominal discomfort, or diarrhea.

**Effects of Repeated Exposure** – In humans, chronic (long-term) excessive occupational exposure (significantly greater than current occupational exposure guidelines) was characterized mostly by central nervous system symptoms such as fatigue, headache, tremor, insomnia, sensory impairment, and mood changes. However, such symptoms are rare and were not seen in all published occupational reports with biphenyl.$^{1,6,7}$

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Cancer Information – Biphenyl has caused cancer in some laboratory animals after life-time exposures to very high doses. Mechanistic effects underlying these animal tumors have been investigated. These neoplastic effects would not be relevant to humans as these high-dose, chronic (long-term) exposures are not likely to occur in general population. U.S. EPA evaluated the carcinogenicity of biphenyl and concluded only "suggestive evidence of carcinogenic potential."³

For more information, see the relevant Safety Data Sheet.

Environmental Information⁴,⁵

Biphenyl is a solid crystalline substance with low solubility in water and low vapor pressure. It is considered to be readily biodegrade, so it will rapidly degrade to carbon dioxide and water in the environment and will be efficiently removed from wastewaters by biological wastewater-treatment facilities. This substance has a tendency to adsorb to solid particles, such that environmental releases would ultimately be associated with soil and sediments. The bioconcentration potential (tendency to accumulate in the food chain) for biphenyl is moderate. Biphenyl is toxic to fish and other aquatic organisms on an acute basis (single exposure to high dose).⁸

For more information, see the relevant Safety Data Sheet.

Physical Hazard Information⁴

Biphenyl is stable at typical storage and use temperatures. Exposure to elevated temperatures can cause the material to decompose. Carefully read product labels and follow instructions for use. Decomposition products depend upon temperature, air supply, and the presence of other materials, and can include benzene and other compounds. Avoid contact with oxidizing materials.

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 biphenyl. 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 and/or Contact Us (http://www.dow.com/assistance/dowcig.htm)
- “1,1-Biphenyl (CASRN 92-52-4),” Integrated Risk Management System (IRIS) web site, U.S. Environmental Protection Agency (http://www.epa.gov/NCEA/iris/subst/0013.htm)
- OPPT Chemical Fact Sheets: 1,1-Biphenyl (CAS No. 92-52-4), U.S. Environmental Protection Agency, Office of Pollution Prevention and Toxics, EPA 749-F-95-003 (http://www.epa.gov/chemfact/biphe-fs.txt)
Product Safety Assessment: DOW™ Biphenyl

- **U.S. Environmental Protection Agency (EPA) – EPA High Production Volume (HPV)**

- **IUCLID Chemical Data Sheet for Biphenyl**, ESIS (European Chemical Substances Information System) (http://www.chemicalbook.com/ProductChemicalPropertiesCB2491271_EN.htm – search by CAS# 92-52-4)


For more information about biphenyl, request the relevant **Safety Data Sheet** from the Customer Information Group (http://www.dow.com/assistance/dowcig.htm).

**References**


**NOTICES:**

As part of its 2015 Sustainability Goals, Dow has committed to make publicly available safety assessments for its products globally. This product safety assessment is intended to give general information about the chemical (or categories of chemicals) addressed. It is not intended to provide an in-depth discussion of health and safety information. Additional information is available through the relevant Safety Data Sheet, which should be consulted before use of the

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Product Safety Assessment: DOW™ Biphenyl

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Back to top

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