

Product Stewardship Summary

Dicyclopentadiene

General Statement

Dicyclopentadiene is a colorless liquid produced by heating crude oil (recovery of hydrocarbon streams from high temperature cracked petroleum fractions). It is a reactive intermediate used to produce a wide range of resins. The majority of dicyclopentadiene interacts with the environment from releases during its production, use, transport, or disposal.

Dicyclopentadiene is a low to moderate hazard material and the risk of adverse health effects associated with both occupational and consumer use of this chemical is anticipated to be low. Exposure controls in the workplace serve to prevent adverse health effects to workers. Consumers are unlikely to come into contact with harmful levels of dicyclopentadiene, as this substance is found only in trace quantities in consumer products.

Chemical Identity

Name: Dicyclopentadiene

Brand Names: Not Applicable

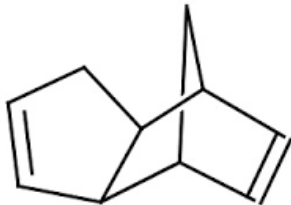
Chemical name (IUPAC): tricyclo[5.2.1.0^{2,6}]deca-3,8-diene

CAS number(s): 77-73-6

EC number: 201-052-9

Molecular formula: C₁₀H₁₂

Structure:



Uses and Applications

Dicyclopentadiene is used in the production of commodity resins and polymers, such as hydrocarbon resins, unsaturated polyester resins and ethylene-propylene-diene rubbers. Other uses for dicyclopentadiene are seen in the creation of specialty polymers and fine chemicals such as flame retardants, agrochemicals, specialty norbornenes, flavor and fragrance intermediates. Ashland uses dicyclopentadiene in multiple products.



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Physical/Chemical Properties

Phys/Chem Safety Assessment

Property	Value
Form	Colorless liquid
Physical state	Liquid
Color	Colorless
Odor	Musty
Density	0.976 g/cm ³ @ 20°C
Melting / boiling point	33.6°C / 172°C
Flammability	Flammable liquid
Explosive properties	Not explosive
Self-ignition temperature	503°C
Vapor pressure	0.305 kPa @ 25°C
Mol weight	132.21 g/mol
Water solubility	26.5 mg/L @ 20°C
Flash point	32°C
Octanol-water partition coefficient (Log _{k_{ow}})	2.89

Exposure, Hazard and Safety Assessment

The following section describes possible exposures scenarios and hazards associated with dicyclopentadiene. The exposure assessment describes both the amount of and the frequency with which a chemical substance reaches a person, a population of people, or the environment. Hazard refers to the inherent properties of a substance that make it capable of causing harm to human health or the environment. The safety assessment reports the possibility of a harmful event arising from exposure to a chemical or physical agent under specific conditions. Just because a substance may possess potentially harmful properties does not mean that it automatically poses a risk. It is not possible to make that determination without understanding the exposure.

Human Health Effects

Human Exposure Assessment

Consumer: Dicyclopentadiene is produced as an intermediate for resins, synthetic rubbers and other chemicals, in closed systems. Consumer exposure is anticipated to be limited to extremely low levels of residual dicyclopentadiene present within final product formulations.

Worker: In industrial settings, dicyclopentadiene is manufactured and handled in closed processes as much as possible, which ensures that worker exposure to dicyclopentadiene is minimized. When there is potential for exposure, such as during loading, unloading, sampling or maintenance operations, exposure to dicyclopentadiene can be further minimized by the proper use of personal protective equipment. Therefore, it is highly unlikely that applicable occupational exposure limits will be exceeded under reasonably foreseeable manufacturing operations.

Human Hazard Assessment:

Dicyclopentadiene has moderate toxicity via acute oral exposure, low toxicity via acute dermal exposure and high toxicity via acute inhalation exposure. Skin contact causes irritation and eye contact causes serious eye irritation. Dicyclopentadiene does not cause allergic reactions upon contact with skin. Inhalation may cause respiratory irritation. Prolonged or repeated exposure does not cause harmful effects to internal systems. Dicyclopentadiene is neither mutagenic nor genotoxic, is not associated with reproductive or

developmental toxicity, and is not classified for carcinogenicity.

Effect Assessment	Result
Acute Toxicity Oral / inhalation / dermal	Moderate acute toxicity via oral route. Low acute toxicity if applied on skin. High acute toxicity via inhalation.
Irritation / corrosion Skin / eye / respiratory test	Skin contact causes irritation. Eye contact can result in serious eye irritation. Inhalation of vapors may cause respiratory irritation.
Sensitization	Does not cause allergic reactions upon contact with skin
Toxicity after repeated exposure Oral / inhalation / dermal	Does not cause damage to internal organs/systems through prolonged or repeated exposure
Genotoxicity / Mutagenicity	Does not affect genetic system
Carcinogenicity	Not considered as carcinogen according to CLP/GHS
Reproductive/Developmental Toxicity	Not toxic to reproduction or unborn children
Aspiration hazard	Not harmful if accidentally enter airways

Human Health Safety Assessment

Consumer: Consumer exposure is most likely limited to extremely low levels of dicyclopentadiene present within final product formulations. Based on the extremely low levels of dicyclopentadiene present in consumer products, exposure to the chemical via this pathway and subsequent risk is unlikely.

Worker: In industrial settings, dicyclopentadiene is manufactured and handled primarily in closed processes which limit worker exposure. Based on the implementation of good manufacturing processes and industrial hygiene practices, the occupational health risk associated with dicyclopentadiene is anticipated to be low.

Environmental Effects

Environmental Exposures

Environmental exposure is possible from occasional leakages from industrial processes.

Environmental Hazard Assessment

Dicyclopentadiene is not readily biodegradable and has a low potential for bioaccumulation. It is only slightly soluble in water and volatilizes appreciably from water surfaces. Based on its physical and chemical properties, if released into water, dicyclopentadiene is expected to adsorb to suspended solids and sediment.

Effect Assessment	Result
Aquatic Toxicity	Toxic to aquatic life with long lasting effects

Fate and behavior	Result
Biodegradation	Not readily biodegradable
Bioaccumulation potential	Low potential for bioaccumulation (BCF = 55)
PBT / vPvB conclusion	This substance is not considered to be persistent, bioaccumulating and toxic (PBT) or very persistent and very bioaccumulating (vPvB)

Environmental Safety Assessment

Dicyclopentadiene is predominantly used in closed industrial processes. Therefore, emissions and environmental exposure to dicyclopentadiene are anticipated to be very low. If released into the environment, dicyclopentadiene is not readily biodegradable and has the potential to cause toxic effects to aquatic life.

Risk Management Recommendations

Consumer products that contain extremely low levels of residual dicyclopentadiene present within final product formulations should include necessary safety labeling to describe method and frequency of recommended use and provide appropriate handling and disposal methods.

Exposure to dicyclopentadiene in the workplace can be controlled by sufficient ventilation, proper handling and storage techniques, and the use of appropriate personal protective equipment as recommended in the SDS for this substance.

National and local governments regulate dicyclopentadiene emissions from facilities. The regulatory emission limits for each facility are established to protect the health and environment of the community surrounding the facility and are written into the facility's operating permit.

Exposure to dicyclopentadiene in the workplace is covered by established occupational exposure limits. A partial list of references follows:

- US OSHA PEL: 30 mg/m³ (8 hr. TWA)
- US ACGIH: 27 mg/m³ (8 hr. TWA)
- NIOSH Recommended Exposure Limit: 30 mg/m³ (10 hr. TWA)
- EU and member countries: 27 mg/m³ (Belgium and UK), 3 mg/m³ (Austria), 2.7 mg/m³ (Denmark, Germany (AGS and DFG)), 30 mg/m³ (Ireland, France) (8 hr. TWA)
- China: 25 mg/m³ (8 hr. TWA)

Regulatory Agency Review

Dicyclopentadiene is on the following regulatory agency lists:

- Taiwan Chemical Substance Inventory (TCSI)
- Australia Inventory of Chemical Substances (AICS)
- Canadian Domestic Substances List (DSL)
- China. Inventory of Existing Chemical Substances in China (IECSC)
- ECHA List of Publishable Substances Registered
- European Inventory of Existing Commercial Chemical Substances (EINECS)
- Japan. ENCS - Existing and New Chemical Substances Inventory
- Korea. Korean Existing Chemicals Inventory (KECI)
- New Zealand. Inventory of Chemical Substances
- Philippines Inventory of Chemicals and Chemical Substances (PICCS)
- United States TSCA Inventory
- Japan. ISHL - Inventory of Chemical Substances

Regulatory Information / Classification and Labeling

Under the Globally Harmonized System for classification and labeling (GHS), substances are classified according to their physical, health, and environmental hazards. The hazards are communicated via specific labels and the (Extended) SDS. GHS attempts to standardize hazard communication so that the intended audience (workers, consumers, transport workers, and emergency responders) can better understand the hazards of the chemicals in use.

GHS Classification:

Acute toxicity (Oral) - Category 4
Acute toxicity (Inhalation) - Category 2
Acute toxicity (Dermal) - Category 5
Skin corrosion/irritation - Category 2
Serious eye damage/eye irritation - Category 2A
Specific target organ toxicity - single exposure - Category 3 (Respiratory system)
Acute aquatic toxicity - Category 2
Chronic aquatic toxicity - Category 2

Hazard Statements:

H302: Harmful if swallowed.
H313: May be harmful in contact with skin.
H315: Causes skin irritation.
H319: Causes serious eye irritation.
H330: Fatal if inhaled.
H335: May cause respiratory irritation.
H411: Toxic to aquatic life with long lasting effects.

Signal Word: Danger

Precautionary Statements:

P260: Do not breathe dust/ fume/ gas/ mist/ vapors/ spray.
P264: Wash skin thoroughly after handling.
P270: Do not eat, drink or smoke when using this product.
P271: Use only outdoors or in a well-ventilated area.
P273: Avoid release to the environment.
P280: Wear eye protection/ face protection.
P280: Wear protective gloves.
P284: Wear respiratory protection.

Hazard Pictograms:



Conclusion

Dicyclopentadiene is a useful intermediate chemical used in the production of resins, synthetic rubbers and other chemicals. Because dicyclopentadiene is used predominantly in industrial systems as a raw material or intermediate, direct consumer contact is expected to be low. When handled responsibly, the potential for toxicity can be minimized, allowing workers to use materials containing dicyclopentadiene safely.

Contact Information with Company

Ashland LLC
5200 Blazer Parkway
Dublin, Ohio 43017
<http://www.ashland.com/contact>

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Additional Information

For more information on GHS, visit <http://www.osha.gov/dsg/hazcom/ghsguideoct05.pdf> or http://live.unece.org/trans/danger/publi/ghs/ghs_welcome_e.html.

Ashland product stewardship summaries are located at <http://www.ashland.com/sustainability/product/product-stewardship>

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REACH registration is specific to Importers/Manufacturers that place the chemical on the EU market, and is specific to registered uses. Inclusion on the list of REACH Registered Substances does not automatically imply registration by Ashland.

Inclusion on the New Zealand Inventory of Chemicals applies only to the pure substance listed. The importer of record must determine whether or not their substances are in compliance.