Product Stewardship Summary

Dicyclopentadiene

General Statement

Dicyclopentadiene is a manufactured chemical that is 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 risk of adverse health effects associated with both occupational and consumer use of this chemical is anticipated to be low.

Chemical Identity

Name: Dicyclopentadiene
Brand Names: Not Applicable
Chemical name (IUPAC): 3a,4,7,7a-tetrahydro-1H-4,7-methanoindene
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.
**Physical/Chemical Properties**

**Phys/Chem Safety Assessment**

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Form</td>
<td>Mixture</td>
</tr>
<tr>
<td>Physical state</td>
<td>Liquid</td>
</tr>
<tr>
<td>Color</td>
<td>Colorless</td>
</tr>
<tr>
<td>Odor</td>
<td>Musty</td>
</tr>
<tr>
<td>Density</td>
<td>0.976 g/cm³ @ 20°C</td>
</tr>
<tr>
<td>Melting / boiling point</td>
<td>33.6°C / 170°C</td>
</tr>
<tr>
<td>Flammability</td>
<td>Flammable</td>
</tr>
<tr>
<td>Explosive properties</td>
<td>Not explosive</td>
</tr>
<tr>
<td>Self-ignition temperature</td>
<td>No data available</td>
</tr>
<tr>
<td>Vapor pressure</td>
<td>2.29 Hg @ 25°C</td>
</tr>
<tr>
<td>Mol weight</td>
<td>132.22 g/mol</td>
</tr>
<tr>
<td>Water solubility</td>
<td>26.5 mg/L @ 20°C</td>
</tr>
<tr>
<td>Flash point</td>
<td>26°C</td>
</tr>
<tr>
<td>Octanol-water partition coefficient (Log k_{ow})</td>
<td>3.16</td>
</tr>
</tbody>
</table>

**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 most likely 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, during loading, unloading, sampling or during maintenance operations, exposure to dicyclopentadiene can be further minimized by the proper use of personal protective equipment. Therefore, it is highly unlikely that the occupational exposure limits will be exceeded under reasonably foreseeable manufacturing operations.

**Human Hazard Assessment:**

Dicyclopentadiene has moderate toxicity following both acute and repeat dose inhalation and oral exposures. It is neither mutagenic nor genotoxic, is not associated with reproductive or developmental toxicity, and is not classified for carcinogenicity. Dicyclopentadiene can cause eye, skin and respiratory irritation.
<table>
<thead>
<tr>
<th>Effect Assessment</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute Toxicity</td>
<td>H302: Harmful if swallowed</td>
</tr>
<tr>
<td>Oral / inhalation / dermal</td>
<td>H332 Harmful if inhaled</td>
</tr>
<tr>
<td>Irritation / corrosion</td>
<td>H315: Causes skin irritation</td>
</tr>
<tr>
<td>Skin / eye / respiratory test</td>
<td>H319: Causes serious eye irritation</td>
</tr>
<tr>
<td></td>
<td>H335 May cause respiratory</td>
</tr>
<tr>
<td>Toxicity after repeated exposure</td>
<td>Associated with moderate toxicity to internal organs after repeated exposure in animal studies by inhalation and oral routes.</td>
</tr>
<tr>
<td>Oral / inhalation / dermal</td>
<td></td>
</tr>
<tr>
<td>Genotoxicity / Mutagenicity</td>
<td>Neither mutagenic or genotoxic</td>
</tr>
<tr>
<td>Carcinogenicity</td>
<td>Not classified for carcinogenicity</td>
</tr>
<tr>
<td>Toxicity for reproduction</td>
<td>Based on available data no developmental toxicity or reproductive toxicity is anticipated</td>
</tr>
</tbody>
</table>

Human Health Safety Assessment

**Consumer:** Dicyclopentadiene is used as an intermediate in the development of resins, synthetic rubbers and other chemicals, in closed systems. Consumer exposure is most likely limited to extremely low levels of dicyclopentadiene present within final product formulations. Dicyclopentadiene has moderate toxicity following both acute and repeat dose exposures. It is neither mutagenic nor genotoxic, is not associated with reproductive or developmental toxicity, and is not classified for carcinogenicity. Based on the extremely low levels of dicyclopentadiene present in consumer products exposure to the chemical and subsequent risk is unlikely.

**Worker:** In industrial settings, dicyclopentadiene is manufactured and handled primarily in closed processes which limit exposure. Based on good manufacturing processes and industrial hygiene, the occupational health risk associated with dicyclopentadiene is low.

Environmental Effects

**Environmental Exposures**
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.

**Environmental Hazard Assessment**

<table>
<thead>
<tr>
<th>Effect Assessment</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aquatic Toxicity</td>
<td>High acute toxicity to aquatic organisms</td>
</tr>
<tr>
<td></td>
<td>Moderate chronic toxicity to aquatic organisms</td>
</tr>
<tr>
<td></td>
<td>Toxic to aquatic life with long lasting effects</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fate and behavior</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biodegradation</td>
<td>Not readily biodegradable</td>
</tr>
<tr>
<td>Bioaccumulation potential</td>
<td>Low potential for bioaccumulation (BCF = 55)</td>
</tr>
<tr>
<td>PBT / vPvB conclusion</td>
<td>Not considered to be either PBT or vPvB</td>
</tr>
</tbody>
</table>

**Environmental Safety Assessment**
Dicyclopentadiene is predominantly used in closed industrial processes. Therefore emissions and environmental exposure to dicyclopentadiene are 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:** 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.

**Worker:** 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.

- OSHA PEL TWA 5 ppm (30 mg/m³)
- ACGIH 8 hr Time Weighted Avg (TWA): 5 ppm.
- NIOSH Recommended Exposure Limit: 10 Hr Time-Weighted Avg: 5 ppm (30 mg/m³).

**Regulatory Agency Review**

Dicyclopentadiene is on the following regulatory agency lists:

- ACGIH - Threshold Limit Values (TLVs)
- AIHA - Emergency Response Planning Guidelines (ERPGs)
- Alberta - Occupational Exposure Limits (OELs)
- Argentina - Occupational Exposure Limits (OELs)
- ATSDR - 2015 Priority List of Hazardous Substances - Exposure Points
- ATSDR - 2015 Priority List of Hazardous Substances - Frequency Points
- ATSDR - 2015 Priority List of Hazardous Substances - Rank and Summary
- ATSDR - 2015 Priority List of Hazardous Substances - Source Contribution Points
- ATSDR - 2015 Priority List of Hazardous Substances - Toxicity Points
- ATSDR - Completed Exposure Pathway (CEP) Cumulative Site Count Report
- Australia - Workplace Exposure Standards
- Australian Inventory of Chemical Substances (AICS)
- Austria - Occupational Exposure Limits (OELs)
- Belgium - Occupational Exposure Limits (OELs)
- British Columbia - Occupational Exposure Limits (OELs)
- Bulgaria - Occupational Exposure Limits (OELs)
- Cal/OSHA - Permissible Exposure Limits for Chemical Contaminants
- Cal/OSHA - The Hazardous Substances List
- China - Chemical Inventory of Existing Chemical Substances (IECSC) - CAS Numbers
- Colombia - Occupational Exposure Limits (OELs)
- Denmark - Occupational Exposure Limits (OELs)
- DOE Protective Action Criteria (PAC)
- ECHA - Community Rolling Action Plan (CoRAP) (2016-2018)
- ECHA - List of Pre-registered Substances
- Environment Canada - Chemical Management Plan - Status of Prioritized Substances
- Environment Canada - Domestic Substances List (DSL)
- Environment Canada - Domestic Substances List (DSL) - Human Health Categorization
- Environment Canada - Domestic Substances List (DSL) Categorization of Existing Substances
- Environment Canada - Hazardous Products Act (HPA) - Ingredient Disclosure List (IDL)
- Environment Canada - National Pollutant Release Inventory (NPRI) – 2001-2014/15
- EPA - Chemical Update System (CUS) - 2002
- EPA - EPCRA - Section 313 - Toxic Chemicals
- EPA - Master Testing List
- EPA - Office of Pollution Prevention and Toxics (OPPT) High Production Volume (HPV) Program - 1990
- EPA - Regional Removal Management Levels (RML) - Chemical-specific Parameters Supporting - Density
- EPA - Regional Removal Management Levels (RML) - Chemical-specific Parameters Supporting - Diffusivity
- EPA - Regional Removal Management Levels (RML) - Chemical-specific Parameters Supporting - Henry's Law Constants
- EPA - Regional Removal Management Levels (RML) - Chemical-specific Parameters Supporting - Molecular Weight
- EPA - Regional Removal Management Levels (RML) - Chemical-specific Parameters Supporting - Organic Carbon Partition Coefficient
- EPA - Regional Removal Management Levels (RML) - Chemical-specific Parameters Supporting - Permeability Coefficient
- EPA - Regional Removal Management Levels (RML) - Chemical-specific Parameters Supporting - Water Solubility
EPA - Toxics Release Inventory (TRI) Chemicals
EPA - TSCA - 8(a) - Preliminary Assessment Information Rules (PAIR)
EPA - TSCA - 8D Health and Safety Data Rule (HSDR) (d) - Listed Members of Categories
EPA - TSCA - Inventory
EPA - TSCA - Test Submissions - Mega
EPA - TSCA - Test Submissions - Section 4
EPA - TSCA 4 Tests - Testing of Existing Chemicals
EPA - TSCA 4(a) Test Rules - Procedures Governing Testing Consent Agreements and Test Rules
EPA - TSCA Section 4 Testing Results
EU - European Inventory of Existing Commercial Substances (EINECS)
EU - Table 3.1 of Annex VI to the CLP Regulation
EU - Table 3.2 of Annex VI to the CLP Regulation
FDA - List of Indirect Additives
Finland - Occupational Exposure Limits (OELs)
France - Occupational Exposure Limits (OELs)
Germany - Occupational Exposure Limits (OELs)
Hawaii - Department of Labor and Industrial Relations - Air Contaminants - Permissible Exposure Limits
Iceland - Occupational Exposure Limits (OELs)
Jordan - Occupational Exposure Limits (OELs)
Korea - Occupational Exposure Limits (OELs)
Massachusetts Department of Public Health - Massachusetts Substance List (MSL)
Massachusetts Toxics Use Reduction Act (TURA)
Mexico - National Inventory of Chemical Substances
Mexico - Occupational Exposure Limits (OELs)
Michigan - Exposure Limits for Air Contaminants - Table G-1-A
Minnesota - Department of Labor and Industry - Air Contaminants - Permissible Exposure Limits
Minnesota - List of Hazardous Substances
Minnesota Department of Health - Air Values Table
Minnesota Department of Health - Toxic Free Kids Act - Chemicals of High Concern
National Cancer Institute - SMILES Notations
New Jersey - Right to Know List
New Zealand - Inventory of Chemicals (NZIoC)
New Zealand - Workplace Exposure Standards
NFPA - Hazard Ratings
NIOSH - Pocket Guide - Chemicals Listed
NIOSH - Recommendations for Chemical Protective Clothing
NIOSH - Recommended Exposure Limits (RELs)
Norway - Occupational Exposure Limits (OELs)
OECD - High Production Volume (HPV) Chemicals - 2004
OECD - High Production Volume (HPV) Chemicals - 2007
Ontario - Current Occupational Exposure Limits (OELs)
OSHA - Vacated Permissible Exposure Limits (PELs)
Pennsylvania - Hazardous Substance List
Philippine Inventory of Chemicals and Chemical Substances (PICCS)
Regional Screening Level (RSL) Composite Worker Ambient Air (TR=1E-6, HQ=1) - Toxicity and Chemical-specific Information
Rhode Island - Hazardous Substance List
Russia - Occupational Exposure Limits (OELs)
Singapore - Occupational Exposure Limits (OELs)
Switzerland - Occupational Exposure Limits (OELs)
Taiwan - Toxic Substances Control Act
Technischen Regeln für Gefahrstoffe (TRGS) - TRGS900
The Netherlands - Occupational Exposure Limits (OELs)
United Kingdom - Occupational Exposure Limits (OELs)
United Kingdom - Workplace Exposure Limits (WELs) - 2011
Vermont - Department of Labor - Air Contaminants - Permissible Exposure Limits
Vietnam - Occupational Exposure Limits (OELs)
Washington State - Permissible Exposure Limits (PELs) for Airborne Contaminants
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:

Flammable Liquids, Category 2
Acute toxicity (Oral/Swallowed), Category 4
Skin Irritation, Category 2
Eye Irritation, Category 2
Acute toxicity (Inhaled), Category 4
STOT SE, Category 3
Chronic Aquatic toxicity, Category 2

Hazard Statements:

H225: Highly flammable liquid and vapor.
H302+H332: Harmful if swallowed or if inhaled.
H315: Causes skin irritation.
H313: May be harmful in contact with skin.
H319: Causes serious eye irritation.
H335: May cause respiratory irritation.
H411: Toxic to aquatic life with long lasting effects.

Signal Word: Danger

Precautionary Statements:

P202: Do not handle until all safety precautions have been read and understood.
P240: Ground/bond container and receiving equipment.
P243: Take precautionary measures against static discharge.
P260: Do not breathe dust/fume/gas/mist/vapours/spray.
P210: Keep away from heat/sparks/open flames/hot surfaces. - No smoking
P263: Avoid contact during pregnancy/while nursing.
P271: Use only outdoors or in a well-ventilated area.
P201: Obtain special instructions before use.
P233: Keep container tightly closed.
P241: Use explosion-proof electrical/ventilating/lighting equipment.
P273: Avoid release to the environment.
P264: Wash parts of the body thoroughly after handling.
P280: Wear protective gloves/protective clothing/eye protection/face protection.
P351: Rinse cautiously with water for several minutes.
P352: Wash with plenty of soap and water.
P362: Take off contaminated clothing and wash before reuse.
P332 + P313: If skin irritation occurs: Get medical advice/attention.
P305: IF IN EYES: follow instructions specified by manufacturer/supplier.
P303: If on skin (or hair): remove/take off immediately all contaminated clothing.
P353: Rinse skin with water/shower.
P304: If inhaled: remove victim to fresh air and keep at rest in a position comfortable for breathing.
P370: In case of fire: In case of fire: Use (measures specified by manufacturer/supplier) for extinction.
P391: Collect spillage.
P301 + P310 + P331: IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. Do NOT induce vomiting
P302: If on skin: follow instructions specified by manufacturer/supplier.
P405: Store locked up.

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 raw material or intermediate, direct consumer contact is expected to be low. When handled responsibly, the potential for acute and repeat dose toxicity, and irritation of the skin, eye and respiratory can be minimized, allowing workers to use materials containing dicyclopentadiene safely.

Contact Information with Company

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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.