

Product Stewardship Summary

Effective date: 1 September 2019

Supersedes: 12 December 2018

Hexamethylenediamine

General Statement

Hexamethylenediamine is a colorless solid with extensive uses in the manufacturing of resins. It is used in the production of paper products, water treatment resins, adhesives, and in many other applications. INEOS both purchases and sells this chemical. Although hexamethylenediamine poses a moderate hazard, it is handled under stringent safety conditions to control the risk of exposure to both humans and the environment. Exposure controls in the workplace serve to prevent adverse health effects to workers. Consumers are unlikely to come into contact with harmful levels of hexamethylenediamine as there are no intended uses in consumer products and the substance may be present only in trace quantities in consumer products.

Chemical Identity

Name: Hexamethylenediamine

Brand Names: Kymene™ and Crepetrol™

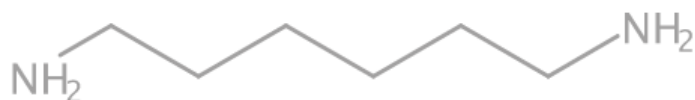
Chemical name (IUPAC): Hexane-1,6-diamine

CAS number(s): 124-09-4

EC number: 204-679-6

Molecular formula: C₆H₁₆N₂

Structure:



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Uses and Applications

Hexamethylenediamine is used mainly for the manufacture of unmodified resins, water treatment resins, resins used in paper manufacture and adhesive resins. The application of hexamethylenediamine is solely industrial product based, and consumers are unlikely to come into contact with it.

Physical/Chemical Properties

Phys/Chem Safety Assessment

Hexamethylenediamine is not classified as possessing physical or chemical hazards.

Property	Value
Form	Crystalline powder
Physical state	Solid
Color	Colorless to White
Odor	Strong amine odor
Density	0.933 g/cm ³ @ 20°C
Melting / boiling point	23-41°C / 205°C
Flammability	Not flammable
Explosive properties	Not explosive
Self-ignition temperature	315°C
Vapor pressure	0.27 hPa @ 20°C
Mol weight	116.20 g/mol
Water solubility	637 g/L @ 20°C, readily soluble
Flash point	71.11 °C
Octanol-water partition coefficient (LogPow)	0.4 @ 25°C

Human Health Effects

Human Exposure Assessment

Consumer: There is no significant exposure of consumers to hexamethylenediamine, as it is used as an intermediate in production of consumer products.

Worker: In industrial settings, hexamethylenediamine is manufactured and handled as much as possible in closed processes which ensure that worker exposure to hexamethylenediamine is minimized. When there is potential for exposure, during loading, unloading, sampling or during maintenance operations, exposure to hexamethylenediamine can be further minimized by the proper use of personal protective equipment.

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Human Hazard Assessment

Hexamethylenediamine does present moderate acute toxicity via oral and dermal routes and has no acute toxicity via the inhalation route. The substance can cause severe skin burns and eye damage. Hexamethylenediamine does not cause allergic skin reactions. Inhalation of the substance causes respiratory irritation. Hexamethylenediamine is neither mutagenic or genotoxic and is not associated with reproductive or developmental toxicity. Hexamethylenediamine is not anticipated to cause cancers in humans. Hexamethylenediamine does not present an aspiration hazard.

Effect Assessment	Result
Acute Toxicity Oral / inhalation / dermal	Moderate acute toxicity if ingested or applied on skin
Irritation / corrosion Skin / eye / respiratory test	Causes severe skin burns and eye damage. Inhalation causes respiratory irritation.
Sensitization	Does not cause allergic skin reactions upon contact with skin
Toxicity after repeated exposure Oral / inhalation / dermal	Not anticipated to cause damage to internal organs or systems through prolonged or repeated exposure to low doses
Genotoxicity / Mutagenicity	Does not affect genetic system
Carcinogenicity	Not considered as a carcinogen
Reproductive/Developmental Toxicity	Not anticipated to cause reproductive toxicity, nor damage to unborn children.
Aspiration hazard	Not anticipated to cause aspiration toxicity if accidentally enters airways.

Human Health Safety Assessment

Consumer: There is no intended use of hexamethylenediamine in consumer products. Therefore, consumer risk of exposure to hexamethylenediamine is negligible.

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

Environmental Effects

Environmental Exposures

Environmental exposure to hexamethylenediamine is possible via the manufacturing process of this substance or when the substance is used as a reaction process regulator in polymerization processes, or

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as an intermediate in industrial settings. In professional settings, its widespread use leading to its inclusion into articles such as inks also presents the potential for environmental exposure.

Environmental Hazard Assessment

Hexamethylenediamine is water soluble and biodegradable and has low potential for bioaccumulation. It also has low potential for volatilization. Based on its physical and chemical properties, if hexamethylenediamine was released into the environment, it would be mainly distributed in water and would not be persistent in the environment.

Effect Assessment	Result
Aquatic Toxicity	Not harmful to aquatic life

Fate and behavior	
Biodegradation	Readily biodegradable
Bioaccumulation potential	Not potentially bioaccumulative (log Kow = 0.4)
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

Hexamethylenediamine is not toxic to aquatic organisms, readily biodegradable and not bio accumulative. Overall, this substance is not considered to be PBT or very persistent and vPvB.

Risk Management Recommendations

Exposure to hexamethylenediamine in the workplace can be controlled with sufficient ventilation, proper handling and storage techniques, and appropriate personal protective equipment as recommended in the SDS. Consumer products are not anticipated to result in appreciable exposures to hexamethylenediamine.

A selection of occupational exposure limits is below:

OEL TLV: 0.5 ppm as TWA
ACGIH TLV: (8h TWA): 0.5 ppm
WEEL: (8h TWA): 5 mg/m³

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Regulatory Agency Review

Hexamethylenediamine is on the following 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)
- Switzerland. New notified substances and declared preparations
- 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 (Dermal) - Category 4

Acute toxicity (Oral) - Category 4

Skin corrosion - Category 1B

Specific target organ toxicity - single exposure - Category 3 (Respiratory irritation)

Hazard Statements:

H302: Harmful if swallowed.

H312: Harmful in contact with skin.

H314: Causes severe skin burns and eye damage.

H335: May cause respiratory irritation.

Signal Word: Danger

Precautionary Statements:

P260: Do not breathe dust or mist.

P261: Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.

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P264: Wash skin thoroughly after handling.

P280: Wear protective gloves/ protective clothing/ eye protection/ face protection.

Hazard Pictograms:



Conclusion

Hexamethylenediamine is a useful chemical in the manufacturing of resins used in the production of paper products, water treatment resins, adhesives, and in many other applications. When handled responsibly, its potential toxicity can be minimized, allowing consumers and workers to use materials containing hexamethylenediamine safely.

Contact Information

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Additional Information

For more information on Product Stewardship at INEOS Composites, visit our website's Safety, Health and Environment (SHE) page: www.ineos.com/composites-she

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.

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purpose, or representation, express or implied, for which INEOS Composites and its affiliates assume legal responsibility.

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 INEOS Composites.

Inclusion on the New Zealand Inventory of Chemicals applies only to the pure substance listed. The importer of record must determine whether their substances comply.