Product Safety Summary
R-M® HDI Polyisocyanate Hardeners

This Product Safety Summary is intended to provide a general overview of the chemical substance. The information on the Summary is basic information and is not intended to provide emergency response information, medical information or treatment information. The summary should not be used to provide in-depth safety and health information. In-depth safety and health information can be found on the Material Safety Data Sheet (MSDS) for the chemical substance.

Chemical Identity

Abbreviation :	HDI
CAS Number :	28182-81-2 HDI Polymers
Common Names:	Hexamethylene Diisocyanate polyisocyanate Hexamethylene Diisocyanate Homopolymer 1,6-Diisocyanato-Hexane Homopolymer Poly(hexamethylene diisocyanate) HDI polyisocyanate Aliphatic Diisocyanate

Product Overview

- Hexamethylene Diisocyanate polyisocyanate, (HDI) is a reactive material. Reactions of the reactive site of HDI (N=C=O) with polyol (-OH) functional materials produce polyurethane compounds.
- BASF's product names for R-M® HDI Polyisocyanate Hardeners are BCH10, BCH2, DH14, DH16, DH18, DH42, DH46, DH47, DH55, DH57, DH59, DH62, DH99, DH100, DH105, PH10, PH12, PH20, PH36, PH60, PH61, PH204, PH210, UH45, UHD100 and UHD200.
- HDI is an important chemical building block in a wide variety of polyurethane applications, these products are mainly used in the application of automotive refinish coatings.
- HDI is also used in the production of adhesives, coatings, sealants and elastomers.
- Like any reactive chemicals, HDI products can create hazards if handled carelessly. All persons associated with the transportation, storage or handling of HDI (or products containing HDI) must understand their hazards. This includes training in the recommended normal and emergency handling procedures.
- The primary hazard with HDI is the inhalation of its vapors. Airborne limits have been established for HDI vapor concentrations in the work environment. See Occupational Health and Safety Administration (OSHA) and American Conference of Governmental Industrial Hygienists (ACGIH) guidelines for these levels. Exposure to HDI may also cause skin irritation or even sensitization from exposure. Animal skin exposure has lead to respiratory sensitization, however it is unknown what the effect is in humans.
- BASF's R-M® HDI Polyisocyanate Hardeners may also contain organic solvents with the HDI polymers. The hazards associated with these solvents will also be inhalation and skin exposure.
- For further safety and health information, the current Material Safety Data Sheet (MSDS) for the individual R-M® product should be referenced. These MSDS will also have the composition of the products if solvents are added to the HDI polymers.

Physical/Chemical Properties

- HDI polymers are liquids which can be clear or slightly yellow in color and have a slight odor.
- The specific gravity of HDI polymers are around 1.2 and are denser than water and will sink to the bottom of water-filled containers.
- HDI reacts with water and can generate heat, avoid temperature above 350°F due to the chance of polymerization. Reactions of HDI polymers can become progressively more vigorous and can be violent. The reaction of HDI with water forms both carbon dioxide (CO_2) and insoluble polyurea compounds.
- HDI will also react with basic materials such as sodium hydroxide, ammonia, primary and secondary amines, acids and alcohols. Reaction with some of these products may be violent, generating heat, which can result in an increased evolution of HDI vapor and the formation of CO_2.

Health Information

Acute Hazards

HDI and products containing unreacted HDI are potentially hazardous materials. A thorough knowledge of potential dangers, with strict adherence to recommended safety practices, is essential before HDI products are handled, stored or used. Workers must be properly instructed and supervised in the handling of HDI. The primary hazard with HDI is the inhalation of its vapors. No limits have been established for HDI polyisocyanate, however limits have been established for HDI monomers (CAS # 822-06-0). The ACGIH limit for HDI monomer is 0.005 ppm as an 8-hour time weighted average (TWA) concentration and as a ceiling concentration limit of 0.02 ppm.

Effects on Respiratory System:
Exposure to HDI above allowable vapor concentrations may cause irritation to the mucous membranes of the upper and lower respiratory tracts. Even very brief exposure to HDI vapors may cause difficult or labored breathing, throat dryness, headaches and chest discomfort. Severe overexposure may result in bronchitis and pulmonary edema.

Effects on Eyes:
Brief exposure to HDI vapors may cause mild irritation and watering. The symptoms of direct contact to HDI liquid or high concentrations of vapors are severe watering, irritation and inflammation of the mucous membranes. Corneal opacity and discharge may result.

Effects on Skin:
Skin contact with HDI may result in irritation and a mild discoloration. Repeated or prolonged contact may cause redness, swelling, blistering or burns. Direct contact may produce skin sensitization, contact dermatitis and eczema from repeated exposures.

Effects on Ingestion:
The effects of ingestion include the irritation and burning of the mouth, esophagus and stomach. The harm that occurs will be a result of this irritation and not of any systemic toxicity.

Chronic Hazards

Exposure above the PEL may result in bronchitis, bronchial spasms and pulmonary edema. Long-term exposure to HDI has been reported to cause lung damage including reduced lung function that may be permanent.

Some individuals may develop a hypersensitivity to HDI vapors and may experience a severe reaction when exposed to HDI vapors at concentrations below established guidelines. Symptoms of hypersensitivity to HDI may include wheezing, shortness of breath and difficulty in breathing (See Sensitization)

In general, HDI is not anticipated to represent a cancer hazard when atmospheric levels are maintained below the recommended exposure guidelines.

Sensitization
Sensitization is an affect whereby a physiological response is caused by re-exposure to a very low concentration of chemical in an individual following higher, initial acute exposure or following chronic exposures. The response may be immediate, delayed or both.

The PEL values and ceiling limits should be sufficiently low to prevent sensitization in most individuals. However, allergic reactions may occur in sensitized individuals at concentrations well below these values. Once sensitized, individuals should be excluded from further exposure. If sensitized individuals continue to work with HDI, the time period between exposure and onset of symptoms may be shortened and the severity of the symptoms may increase.

To determination of what constitutes a significant HDI exposure can be difficult. The minimum concentration of HDI in the atmosphere that will cause subjective symptoms and objective physical findings in any given individual is unknown. Responses in sensitized individuals vary considerably from one individual to another.

Environmental Information

HDI will react with water to form carbon dioxide (CO_2) and insoluble polyurea compounds, which are not biodegradable but chemically inert. Because of this reaction, all unreactive HDI release to the environment would be consumed when exposed to water, water in the air or water in the ground.

Environmental toxicity test data from several animal species shows that HDI is practically nontoxic or not appreciably toxic to animals.

Additional Hazard Information

Because of the reaction of HDI with water, care should be taken to prevent contact with water. The hazard associated with this reaction is the formation of CO_2 and in closed containers this could cause pressure build up or even rupture.

The following safety recommendations must be observed:

- Store HDI in a dry environment.
- Plug and cap all lines leading to and from storage tanks.
- Fittings and line connections should be maintained and stored in a dry environment.
- Do not tightly close any container of HDI that has been, or is suspected of having been, contaminated with water.

Exposure Potential

Exposure to the general public may occur in accidental situations. HDI and products containing HDI are not intended for the general use by the general public.

HDI and products containing HDI are reactive and hazardous chemicals. HDI should only be handled by knowledgeable, well-trained personnel who thoroughly understand the hazards associated with the transportation, storage and use of the chemical.

Workplace exposure should be limited by the use of engineering controls. HDI vapors must be monitored and controlled below applicable regulatory limits. Regulations involving hazardous chemicals are continually evolving and thus exposure guidelines are reviewed regularly and modified whenever new information dictates a change. It is important that all companies handling HDI products are aware of the current legislative requirements.

The guidelines established by OSHA, ACGIH, NIOSH and others, represent current thinking and are believed to be conservative and protective of occupational workers. There is not guarantee of absolute safety.

Risk Management

The potential hazards associated with HDI can be avoided if workers are adequately instructed in supervised on the proper procedures of handling HDI.

Every worker should be trained to realize that exposure to a hazardous chemical requires immediate washing of affected areas using large amounts of soap and water, and that immediate attention may markedly decrease the severity of any health effects. (See First Aid.) Do not wash affected area with solvents.

Protective clothing, gloves, boots and eye protection must be worn whenever there is any possibility of HDI exposure. Protective clothing shall be made of impervious materials. Soiled or contaminated clothing should be laundered or destroyed.

Proper respiratory protective equipment should be readily available and in good working order. Exhaust and ventilating equipment should be inspected and tested regularly to assure HDI vapors/aerosols are being controlled to acceptable levels.

Properly designed emergency showers and eyewash fountains should be placed in convenient locations wherever HDI is used. All employees should know the location and operation of this equipment. All equipment must be frequently inspected to make sure they are in proper working condition.

Federal/Science Findings

U.S. Environmental Protection Agency – Integrated Risk Information System (IRIS)
http://www.epa.gov/iris/subst/0638.htm

U.S Department of Labor – Occupational Safety and Health Administration (OSHA)
http://www.osha.gov/dts/chemicalsampling/data/CH_245198.html
http://www.osha.gov/dts/chemicalsampling/data/CH_245210.html
http://www.osha.gov/dts/chemicalsampling/data/CH_245250.html

American Conference of Governmental Industrial Hygienists (ACGIH)
http://www.acgih.org

National Institute for Occupational Safety and Health (NIOSH)

http://www.cdc.gov/niosh/topics/isocyanates

Contact Information

http://www.basf.com
http://basfrefinish.com

MSDS

http://basfrefinish.com

References

DH46 Normal Hardener MSDS, BASF Corporation, April 2002
Polyurethane Handbook, BASF Corporation, May 2007

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