

March 2005



## Properties, Hazards and Safety Information for HDI\*

Product: HDI (Hexamethylene-1,6-diisocyanate; CAS No. 822-06-0)

### Physical and chemical data

Physical state	liquid
Colour	Colourless to yellowish
Odour	pungent
Melting point/range	approx. -67°C
Boiling point/range	approx. 250-255°C (1013hPa)
Flash point	approx. 135°C
Ignition temperature	approx. 460°C
Lower/upper explosion limit	0.9/9.5% (Vol.)
Vapour pressure	approx. 0.014hPa (25°C)
Density	approx. 1.05 (25°C)
Water solubility	insoluble, reacts with water
Viscosity	approx. 2.5-3mPas (25°C)
Hazardous decomposition products	no dangerous decomposition products if properly stored and handled
Hazardous reactions	with amines, alcohols, acids and alkali; decomposes in water with formation of CO <sub>2</sub> (leading to an increase in pressure in closed containers!)

\*More detailed information should be taken from the suppliers' Material Safety Data Sheets

## Toxicological Information

### Short term exposure

Ingestion	Acute oral toxicity is moderate: LD <sub>50</sub> (rat) = 746 mg/kg. Ingestion may irritate the gastro-intestinal tract.
Skin contact	HDI is strongly irritant to corrosive upon skin contact and is a skin sensitizer.
Eye contact	HDI is strongly irritant to corrosive to the mucous membranes of the eyes.
Inhalation	HDI is toxic by inhalation of aerosols (LC50, rat = 0.12-0.35 mg/l/4h). Vapour and aerosols are severely irritating to the respiratory tract. High exposure can result in inflammation of lung tissue and fluid in the lungs. In sensitised people very low concentrations may lead to asthmatic symptoms, the onset of which may be delayed for 24 hours.

### Repeated exposure

Skin contact	HDI was found to induce dermal sensitization in animals.
Inhalation	In long term inhalation studies primarily the upper respiratory tract (the nasal cavity) was the target of HDI. Life-time inhalation exposure to rats, as a consequence of non-specific irritation, revealed a progression of non-neoplastic respiratory tract lesions, primarily in the nasal cavity. HDI does not pose a neurotoxic hazard. HDI may cause sensitization by inhalation as demonstrated in a Guinea pig bioassay.
Carcinogenicity	In a combined chronic toxicity/oncogenicity study no evidence of HDI related oncogenicity was found.
Reproductive toxicity	In inhalation studies, HDI had no adverse effect on the reproduction of rats nor did it reveal any signs of developmental toxicity.

## Exposure controls/Personal protection equipment

General	Workers with a hypersensitivity of the respiratory tract and/or the skin (e.g. asthmatics or those suffering from chronic bronchitis or chronic skin complaint) should not be exposed to this chemical.
OELs	In many countries occupational exposure limits for HDI have been set up. These can be found under →OELs HDI (see website under Links – Regulatory Information)
Respiratory protection	Respiratory protection is required in insufficiently ventilated work areas and during spraying. An air-fed mask, or for short periods of work, a combination of charcoal filter and particulate filter is recommended.
Hand protection	Chemical resistant protective gloves should be worn, e.g. <ul style="list-style-type: none"> <li>- butyl rubber with a thickness <math>\geq 0.5</math> mm (breakthrough time <math>\geq 480</math> min)</li> <li>- fluorinated rubber with a thickness <math>\geq 0.4</math> mm (breakthrough time <math>\geq 480</math> min)</li> </ul> Contaminated gloves should be disposed of.
Body protection	Body protection should be chosen based on activity and possible exposure, e.g. apron, protecting boots, chemical-protection suit.
Eye protection	Face protection/close-fitting protective goggles should be worn.

## First aid measures

General	Contaminated clothing must be taken off immediately.
Skin contact	Wipe off mechanically and wash affected areas thoroughly with soap and water for at least 15 minutes. Dispose of contaminated clothing or wash thoroughly before reuse. For severe exposures, the affected person should get under a safety shower, using the flushing action of the water to remove the bulk of the chemical, then remove contaminated clothing and wash skin with soap and water. Seek medical attention. For lesser exposures, the individual should seek medical attention if irritation develops or persists after the area is washed.
Inhalation	The person should move to an area free from risk of further exposure. Oxygen or artificial respiration should be administered as needed. Asthmatic-type symptoms may develop and may be immediate or delayed up to 24 hours. Treatment is essentially symptomatic. A physician should be consulted.
Eye contact	Flush with large amounts of lukewarm water for at least 15 minutes, holding eyelids open all the time. Refer the affected individual to an eye specialist or other physician for immediate follow-up.
Ingestion	Vomiting should not be induced and nothing should be given orally to an unconscious or convulsing person. A physician should be consulted.

## Ecological information

Biodegradability	HDI is not readily biodegradable. It reacts with water forming solid insoluble polyurea, hexamethylene diamine (HDA) and CO <sub>2</sub> . HDA is inherently biodegradable, while polyurea is more or less inert and – due to its molecular size – not bioavailable.
Bioaccumulation	Due to hydrolysis in water bioaccumulation of HDI is not expected. Bioaccumulation of the hydrolysis product HDA is also not expected due to its high solubility and its low Kow.
Acute toxicity to aquatic organisms	HDI offers a low level of aquatic toxicity. It is not toxic to aquatic organisms up to its limit of solubility in water <ul style="list-style-type: none"> <li>- LC0 (fish, Brachydanio rerio, 96h) ≥ 82.8mg/l</li> <li>- EC50 (bacteria) = 842mg/l</li> <li>- EC0 (Daphnia magna, 48 h) ≥ 89.1mg/l</li> <li>- EC50 (algae, Scenedesmus subspicatus, 72h) ≥ 77.4mg/l</li> </ul>

## EU Classification and Labeling

Symbols	T	Toxic
Risk phrases	R23 R36/37/38 R42/43	Toxic by inhalation Irritating to eyes, respiratory system and skin May cause sensitization by inhalation and skin contact
Safety phrases	S26 S28 S38 S45	In case of contact with eyes, rinse immediately with plenty of water and seek medical advice After contact with skin, wash immediately with plenty of soap and water. In case of insufficient ventilation, wear suitable respiratory equipment. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).