



TOSOH

TOSOH CORPORATION

3-8-2, Shiba, Minato-ku, Tokyo 105-8623, Japan

Phone: +81-3-5427-6340 Fax: +81-3-5427-5378

SAFETY DATA SHEET

Date of printing:	January 14, 2015
Version:	No. T1
Date of revision:	January 14, 2015
Date of issue:	December 14, 2012

Product name: HDI

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product name	HDI
General description	Hexamethylene diisocyanate (HDI)
Company Identification	
Company name	TOSOH CORPORATION
Department	Functional Urethanes Department / Urethane Division
Address	3-8-2, Shiba, Minato-ku, Tokyo 105-8623, Japan
Telephone (Emergency telephone)	+81-3-5427-5393
	(Monday ~ Friday, Japan standard time 9:00 a.m. ~ 6:00 p.m.)

2. HAZARDS IDENTIFICATION

GHS classification of the substance or mixture

Physical Hazards

- **Flammable liquids** Not classified
- **Flammable solids** Not applicable

Health Hazards

- **Acute toxicity (oral)** **Category 4**
- **Acute toxicity (skin)** **Category 3**
- **Acute toxicity (inhalation: gas)** Not applicable
- **Acute toxicity (inhalation: vapour)** **Category 1**
- **Acute toxicity (inhalation: dust, mist)** Classification not possible
- **Skin corrosion/irritation** **Category 1**
- **Serious eye damages/eye irritation** **Category 1**
- **Respiratory sensitization** **Category 1**
- **Skin sensitization** **Category 1**
- **Germ cell mutagenicity** Not classified
- **Carcinogenicity** Classification not possible
- **Reproductive toxicity** Not classified
- **Specific target organ toxicity; single exposure** **Category 1 (Respiratory system)**
- **Specific target organ toxicity; repeated exposure** **Category 1 (Respiratory system)**
- **Aspiration hazard** Classification not possible

Environmental Hazards

- **Aquatic toxicity (acute)** Not classified



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- **Aquatic toxicity (chronic)** Not classified

Section is not listed, it can not be excluded from 'Not applicable' or 'Classification not possible'

GHS label elements including precautionary statements

Symbol :



Signal word : **Danger**

Hazard statement :

- **Harmful if swallowed**
- **Toxic in contact with skin**
- **Fatal if inhaled**
- **Causes severe skin burns and eye damage**
- **Causes serious eye damage**
- **May cause allergy or asthma symptoms or breathing difficulties if inhaled**
- **May cause an allergic skin reaction**
- **Causes damage to Respiratory system**
- **Causes damage to Respiratory system through prolonged or repeated exposure**

Precautionary Statements

Prevention

- Obtain special instructions before use.
- Do not handle until all precautions have been read and understood.
- Keep container tightly closed.
(There is a danger of explosion if the carbon dioxide generated when water enters.)
- Not to treat an allergic reaction to a person.
- Use only outdoors or in a well-ventilated area.
- Do not eat, drink or smoke when using this product.
- Do not breathe dust/ fume/ gas/ mist/ vapour/ spray.



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- Wear protective gloves, protective goggles, face protection, protective clothing.(Regulatory authorities, manufacturer or supplier specified.)
- In case of inadequate ventilation, wear respiratory protection.
- Contaminated work clothing should not be allowed out of the workplace.
- Wash hands thoroughly after handling.

Response

- In case of fire: Use dry chemical powder, carbon dioxide, foam, large volume of water spray.
- If swallowed: Rinse mouth with water. Do not induce vomiting. To contact a doctor immediately.
- If inhaled: Remove victim to fresh air and keep at rest in a position comfortable for breathing. To contact a doctor immediately.
- If on eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. To contact a doctor immediately.
- If on skin (or hair): Remove/take off immediately all contaminated clothing. Rinse skin with water/shower. To contact a doctor immediately.
- If on skin: Wash with plenty of soap and water.
- Seek medical advice/attention if you feel unwell or if skin irritation or rash occurs.
- If you have a concern or exposure or exposure : To contact a doctor immediately.
- If you want to reuse contaminated clothing, wash it.
- If spilled: Sprayed with a neutralizing agent to neutralize. Removed by adsorption sand, earth, sawdust, etc.

Storage

- Store container in cool place/ well-ventilated place.

Disposal

- Dispose of contents/container to waste in accordance with local / regional / national / international regulations (to be specified).

3. COMPOSITION / INFORMATION ON INGREDIENTS

Substance / Mixture

Substance

Chemical name

Hexamethylene diisocyanate (HDI)



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Contents > 99 %

CAS No. 822-06-0

[HAZARDOUS INGREDIENT(S)]

Chemical name Hexamethylene diisocyanate (HDI)

Contents > 99 %

CAS No. 822-06-0

4. FIRST AID MEASURES

If inhaled

Remove victim to fresh air and keep at rest in a position comfortable for breathing.

Get medical advice/attention immediately.

If on skin

Remove / Take off immediately contaminated clothing and shoes etc. Rinse the part that touches the product, by washing with water or lukewarm water flow. Wash with soap and water. Seek medical advice or attention, if there are change in the appearance or pain persists.

If on eyes

Even if very small contact, rinse with clean water for at least 15 minutes, and seek ophthalmologist's advice/attention. During the eyewash, open the eyelid well with your fingers, then wash well the eyeball and the eyelid with water.

If swallowed

Rinse mouth well. Spit it in person voluntarily if possible, to vomit.

Seek medical advice/attention immediately.

5. FIRE FIGHTING MEASURES

Suitable extinguishing media :

Dry chemical powder, carbon dioxide, foam, large volume of water spray.

Unsuitable extinguishing media : Water jet

Specific hazards during fire: There is a risk of generating a hazard gas in a fire.

Specific extinction method :

Wear self-contained breathing apparatus and protective gloves, because cracked gas and steam are generated in the case of fire. Water is drained off to the drum, container etc. that have not ignited, and it tries to prevent fire spreading, overheating, and explosion of containers. After the fire is extinguished, neutralize the spilled material with decontaminant. Do not let outsiders enter the place fire.

Special protective for fire-fighters :



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In the extinction work, wear self-contained breathing apparatus and protective gloves, because cracked gas and steam are generated.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions :

Wear safety glasses, rubber gloves, a gas mask for organic gas. Restrict entry of unauthorized personnel. To work from the windward. Evacuate people downwind. Better ventilation of the place spilled. Temporary leak repair parts, stop the leak.

Environmental precautions :

Do not flow directly into rivers and sewage spill. Adhered and collected waste material should be promptly disposed of, in accordance with appropriate laws and regulations.

Methods and materials for containment and cleaning up :

(Small spill)

Sprayed with a neutralizing agent to neutralize. Remove adsorbed sand, earth, sawdust, etc. If wiping rags, waste paper, etc., remove and store in a container with a lid.

(Large spill)

As spilled liquid can not spread, enclosed sand, earth, sawdust, etc. Recovered in the liquid container as much as possible. Collection container must not be sealed. Which could not be recovered sprayed with a neutralizing agent to neutralize or Removed by the above method. Wash the spillage area clean with water.

Measures to prevent secondary disasters :

Promptly except near sources of ignition and prepare a fire extinguishing agent.
Using a safety tool that does not generate a spark.

7. HANDLING AND STORAGE

Handling

The operator should be trained in handling this product.

Technical measure

Wear appropriate protective goggles, rubber gloves, a gas mask for organic gas.
Handling is performed in a well ventilated place.

Notes

Those who show allergenic and sensitizing effects should not be in charge.

Safety treatment notes

When the drum is pressurized, unscrew the bung slowly to release the pressure before taking it off. Pay attention to avoid contact with water or substance which react with this product. Working space is a non smoking. Forbid to use the open flame heating element, high-temperature heating elements. Local exhaust ventilation should be provided for indoors use. Restrict entry of unauthorized personnel. Avoid the contact with water, amine, alcohol, or other chemicals containing active hydrogen.



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Storage

Appropriate safekeeping condition

Store the container in a dry area. Once a container is opened, the container should be sealed with nitrogen or dry air (dew point < -30°C) and be closed tightly. If stored outdoors, the containers should be covered with waterproof canvas sheet to avoid being exposed in the rain. The use of fire is strictly prohibited in the storage area.

Packaging materials

Excellent corrosion resistance in a suitable material, use containers with airtight packaging. Containers which are prescribed in Fire and Disaster Management Act and UN transport regulations.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Facility and equipment measures

Facilities in where this material is handled should be structured with the perfectly closed system. Make available emergency safety shower and eye wash in the work area.

Control limit : Not established

Occupational exposure limits

For Hexamethylene diisocyanate (HDI)

Japan Society of Occupational Health (TLV-TWA) : 0.005 ppm (2007)

ACGIH (TLV-TWA) : 0.005 ppm (2007)

DFG MAK (TLV-TWA) : 0.005 ppm (2007)

Personal protective equipment

Respiratory protection	Respiratory air : JIS T 8155, Gas mask : JIS T 8152, Air-supplied respirator : JIS T 8153
Hand protection	Safety gloves made from rubbers or plastics (impermeable)
Eye protection	Safety glasses with side version or protection goggles
Skin and body protection	Long sleeve protective work clothes and safety work shoes

Hygiene measures

Contaminated protective clothing, protective equipment should be replaced as soon as possible.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	Liquid
Color	Pale yellow



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Odor	Irritating odor
PH	—
Boiling point	255 °C
Freezing point	- 67 °C
Flash point	138 °C Cleveland Open Cup
Explosion limit	454 °C
Vapour pressure	1.64 Pa at 25°C
Vapour density	—
Specific gravity	1.048×10^3 (kg/m ³) at 23°C
Solubility (water)	Insoluble
Solubility (other)	Soluble in toluene, ethyl acetate or acetone
Octanol /water partition coefficient	—
Viscosity	2 mm ² /s at 23°C

10. STABILITY AND REACTIVITY

Stability	Flammability	some
	Ignition quality	na
	Oxidizing	na
	Self-reactive, Explosiveness	na
	Explosive dust	na
	Other	na

Reactivity

Exothermic react with water forming CO₂. Exothermic react with active-hydrogen compound (alcohols, amine and so on). The polymerization reaction with an alkaline substance, a tertiary amine and so on.

11. TOXICOLOGICAL INFORMATION

For Hexamethylene diisocyanate (HDI)

Acute Toxicity

Oral (rat) : Category 4 : LD50 = 747mg/kg (calculated value)

based on CERI Hazard data 2000-50, 2001 (738, 960) and SIDS, 2004 (746, 959)

Skin (rabbit) : Category 3 : LD50 = 593mg/kg (adopt low value)

based on CERI Hazard data 2000-50, 2001 (593), and SIDS, 2004 (599)

Inhalation (gas) : Not applicable : Liquid (GHS definition)

Inhalation (vapour) (rat) : Category 1 [Vapour = mist is not mixed almost]

: LC50 = 20ppm/4hr (calculated value)

based on ATSDR,1998 (0.31mg/L), Ministry of the Environment Risk Assessment Vol.2, 2003 (0.06mg/L) and SIDS, 2004 (0.124 mg/L, 0.31 mg/L, 0.15mg/L)



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: 'Vapour that dose not contain most of the mist.' (90% or less of the saturated vapour pressure concentration : 70ppm (CERI hazard data 2000-50 (2001)) At the saturated vapour pressure 0.007kPa at 25°C)

Skin corrosion /irritation

(rabbit) Substance is corrosive to the skin. (SIDS, 2004) : Category 1A - 1C

Serious eye damage/ eye irritation

(rabbit) Substance is corrosive to the eyes. (SIDS, 2004) : Category 1
(Test results compliant with OECD Test Guideline 405)

Respiratory/skin sensitization

respiratory sensitization : Category 1 [There is a respiratory sensitization.]

(man) Induce allergic asthma, hypersensitivity pneumonitis, contact hypersensitivity.
CERI Hazard data 2000-50 (2001), Ministry of the Environment Risk Assessment Vol.2 (2003), AGCIH (7TH, 2001)

skin sensitization : Category 1 [There is a skin sensitization.]

(guinea pig) Skin sensitization test results were positive. (SIDS, 2004)
'There is a skin sensitization.' : Japanese Society of Occupational and Environmental Allergy / Special committee

Germ cell mutagenicity: Not classified

No data heritable mutagenicity test. No data Germ cell IN VIVO mutagenicity test.
Somatic cell IN VIVO mutagenicity tests (micronucleus test) is negative. (SIDS, 2004)

Carcinogenicity

There was no existing classification and no information. : Classification not possible

Reproductive toxicity

There was no impact on the occurrence of the next generation of parent animals and breeding performance. (SIDS, 2004)

Specific target organ toxicity-single exposure

Category 1 (Respiratory system)
(rat) Inhalation exposure, pulmonary edema and pneumonia were seen. (ATSDR, 1998)
(Experimental animal) There are effects in guidance value range of Category 1.

Specific target organ toxicity-repeated exposure

Category 1 (Respiratory system) : CERI Hazard data 2000-50 (2001)
(man) Irritation of the eyes, nose and throat, and discomfort of cough and chest.
(rat) There are inflammation of the windpipe and there are necrosis of the epithelium of the nasal turbinates, and squamous metaplasia of the nasal turbinates. In the lung, there are epithelial formation and interstitial pneumonia. In the nasal cavity, there are degeneration of the olfactory epithelium, and hyperkeratosis and ulceration or erosion.
(Experimental animal) There are effects in guidance value range of Category 1.

Aspiration hazard : No available



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12. ECOLOGICAL INFORMATION

For Hexamethylene diisocyanate (HDI)

Aquatic Toxicity

(Acute) Crustacean (Daphnia magna) $EC_{50} \geq 89.1 \text{ mg/L/48hr}$ (SIDS, 2004) : Not classified

(Chronic) Not poor water solubility, Acute toxicity is low : Not classified

(Aqueous solubility = 117mg/L (PHYSPROP DATABASE, 2005))

13. DISPOSAL CONSIDERATIONS

The remainder waste (Disposal of this product)

Dispose of contents/container to waste treatment company having the official approval of laws and regulation. Disposed of as a solid form by reacting a polyol. Stirring the liquid neutralizing agent, was added dropwise and allowed to stand for 2 days this product, detoxified changed to urea compound. Incinerated in appropriate facilities.

Pollution container and packing

Empty container filled with water and allowed to stand for 2 days (Should not be sealed), then, disconnect the water. Neutralizing agent to put the container, and processes to be washed after neutralizing. Used container should be punctured and scrapped, so that it is not used for any other purpose.

14. TRANSPORT INFORMATION

International Regulations

Land : Transport in accordance with your country and regions regulations.

(RID, ADR, DOT etc.)

Sea : Transport in accordance with IMO Code.

Air : Transport in accordance with ICAO-TI/ IATA-DGR.

UN number:	2281
Proper shipping name:	Hexamethylene diisocyanate (HDI)
Hazard class:	6.1 (Toxic substance)
Packing group:	II
Marine Pollutant:	Not applicable
IMDG class:	6.1 (Toxic substance)

Follow all the regulations in your country. Be sure that the container is tightly sealed, that no leakage is found and that all the necessary indications are specified. Filling, loading and extracting operations should be performed under the supervision of an authorized operator. Nitrogen gas or dry air should be charged into the container for transportation after filling or



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extracting.

Ship hazardous materials transportation and storage regulations based on the Ship Safety Act: It corresponds to "poison" hazardous materials, if you want to maritime transport, and transport you necessity to take measures in accordance with the law Ship Safety.

15. REGULATORY INFORMATION

Regulatory information with regard to this substance in your country should be examined by your own responsibility.

16. OTHER INFORMATION

This SDS was prepared sincerely on the basis of the information we could obtained, however, any warranty shall not be given regarding the data contained and the assessment of hazards and toxicity. Prior to use, please investigate not only the hazards and toxicity information but also the laws and regulations of the organization, area and country where the products are to be used, which shall be given the first priority, products are supposed to be used promptly after purchase in consideration of safety.

Some new information or amendments may be added afterwards. If the products are to be used far behind the expected time of use or you have any questions, please feel free to contact us. The stated cautions are for normal handling only. In case of special handling, sufficient care should be taken, in addition to the safety measures suitable for the situation. All chemical products should be treated with the recognition of "having unknown hazards and toxicity", which differ greatly depending on the conditions and handling when in use and/or the conditions and duration of storage.

The products must be handled only by those who are familiar with specialized knowledge and have experience or under the guidance of those specialists throughout use from opening to storage and disposal. Safe conditions of use shall be set up on each user's own responsibility.