1 Identification

・Product identifier
  ・Product name: Hexamethylene Diisocyanate (HDI)
  ・Chemical name : Hexamethylene-di-isocyanate
  ・CAS Number: 822-06-0
  ・EC number: 212-485-8

・Relevant identified uses of the substance or mixture and uses advised against
  Relevant identified uses :
  Chemical intermediate
  Uses advised against:
  For further information, refer to section 16.

・Application of the substance / the mixture
  For further information, refer to the product technical data sheet.

・Details of the supplier of the safety data sheet
  ・Manufacturer/Supplier:
    Vencorex US, Inc.
    6213 Highway 322 E
    Freeport TX 77541
    USA
    Tel.: +1 979 238 8660
    Fax: +1 979 233 3218
    www.vencorex.com
  ・Information department: productinfo@vencorex.com
  ・Emergency telephone number:
    FOR EMERGENCIES INVOLVING A SPILL, LEAK, FIRE, EXPOSURE OR ACCIDENT CONTACT:
    CHEMTREC 800-424-9300 within the United States or 703-527-3887 for international collect calls.
    Vencorex Chemtrec Customer Number: CCN227304

2 Hazard(s) identification

・Classification of the substance or mixture
  Acute Tox. 1  H330 Fatal if inhaled.
  Resp. Sens. 1  H334 May cause allergy or asthma symptoms or breathing difficulties if inhaled.
  Skin Corr. 1C  H314 Causes severe skin burns and eye damage.
  Acute Tox. 4  H302 Harmful if swallowed.
  Skin Sens. 1  H317 May cause an allergic skin reaction.

・Label elements
  ・GHS label elements
    The substance is classified and labeled according to the Globally Harmonized System (GHS).
  ・Hazard pictograms

  GHS05  GHS06  GHS08

・Signal word Danger

・Hazard-determining components of labeling:
  hexamethylene-di-isocyanate

・Hazard statements
  H302 Harmful if swallowed.
  H330 Fatal if inhaled.
  H314 Causes severe skin burns and eye damage.
  H334 May cause allergy or asthma symptoms or breathing difficulties if inhaled.
  H317 May cause an allergic skin reaction.

(Contd. on page 2)
Product name: Hexamethylene Diisocyanate (HDI)

Precautionary statements:

P260 Do not breathe dust/fume/gas/mist/vapours/spray.
P284 In case of inadequate ventilation wear respiratory protection.
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P301+P310 IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.
P304+P340 IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P309+P311 IF exposed or if you feel unwell: Call a POISON CENTER or doctor/physician.
P305+P351+P338 IF IN SKIN: Gently wash with plenty of soap and water.
P403+P233 Store in a well-ventilated place. Keep container tightly closed.

Hazard description:

DANGER! TOXIC IF INHALED. HARMFUL IF SWALLOWED OR ABSORBED THROUGH SKIN. SENSITIZER. SEVERE EYE, SKIN AND RESPIRATORY TRACT IRRITANT. REACTS WITH COMMON MATERIALS INCLUDING WATER, ALCOHOLS, BASES AND AMINES RELEASING LARGE AMOUNTS OF CARBON DIOXIDE.

Classification system:

NFPA ratings (scale 0 - 4)

<table>
<thead>
<tr>
<th>Health</th>
<th>Fire</th>
<th>Reactivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

HMIS-ratings (scale 0 - 4)

<table>
<thead>
<tr>
<th>Health</th>
<th>Fire</th>
<th>Reactivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Other hazards

Combustible liquid.
On contact with water or humidity: carbon dioxide is released.
Hazardous reactions occur on contact with many common products. (Refer to the list of incompatible materials section 10: “Stability-Reactivity”).

Results of PBT and vPvB assessment

- PBT: No.
- vPvB: No.

Composition/information on ingredients

Chemical characterization: Substances
- Identification number(s)
- EC number: 212-485-8

Chemical components:

<table>
<thead>
<tr>
<th>CAS: 822-06-0</th>
<th>hexamethylene-di-isocyanate</th>
</tr>
</thead>
<tbody>
<tr>
<td>EINECS: 212-485-8</td>
<td>&gt; 99.5%</td>
</tr>
</tbody>
</table>

First-aid measures

Description of first aid measures
General information:
Use appropriate protective equipment when treating a contaminated person.
Immediately remove any clothing soiled by the product.
Place contaminated clothing in a sealed bag for disposal.
Product name: **Hexamethylene Diisocyanate (HDI)**

(Contd. of page 2)

Remove breathing apparatus only after contaminated clothing have been completely removed.

- **After inhalation:**
  
  Quickly move the person away from the contaminated area.
  
  Make the affected person rest.
  
  Always obtain medical attention immediately.
  
  Show this sheet to the doctor.

- **After skin contact:**
  
  Wash with soap and water.
  
  Wash immediately and thoroughly for a prolonged period (at least 15 minutes).
  
  In case of inflammation (redness, irritation, ...) obtain medical attention.
  
  Show this sheet to the doctor.

- **After eye contact:**
  
  Immediately rinse with plenty of running water for a prolonged period, (at least 15 minutes) while keeping the eyes wide open.
  
  Always obtain medical advice immediately, even if there are no symptoms.
  
  Show this sheet to the doctor.

- **After swallowing:**
  
  NEVER attempt to induce vomiting. Rinse mouth out with water.
  
  Do not give anything to drink.
  
  Always obtain medical attention immediately.
  
  Show this sheet to the doctor.

- **Most important symptoms and effects, both acute and delayed**
  
  No further relevant information available.

- **Danger**
  
  Skin contact may aggravate existing skin disease. Inhalation of product may aggravate existing chronic respiratory problems such as asthma, emphysema or bronchitis.

- **Indication of any immediate medical attention and special treatment needed**
  
  All treatments should be based on observed signs and symptoms of distress in the patient.
  
  Consideration should be given to the possibility that overexposure to materials other than this product may have occurred.
  
  Treat symptomatically. No specific antidote available.

---

**5 Fire-fighting measures**

- **Extinguishing media**
  
- **Suitable extinguishing agents:**
    
    Multi-purpose powders
    
    Alcohol resistant foam
    
    Carbon dioxide
  
- **For safety reasons unsuitable extinguishing agents: Water**

- **Special hazards arising from the substance or mixture**
  
  Combustible liquid.
  
  During combustion toxic vapors are released.

- **Advice for firefighters**

- **Protective equipment:**
  
  Firefighters should wear NIOSH/MSHA approved self-contained breathing apparatus and full protective clothing.

- **Additional information**

  Stay upwind.
  
  Evacuate the personnel away from the fumes.

  In case of fire close by:
  
  Cool down the containers/equipment exposed to heat with a water spray. Ensure that there is NO direct contact between the water and the product.
  
  Do not breathe fumes.
  
  Do NOT attempt to fight the fire without suitable protective equipment.
  
  If there is a fire close by and if packaging has not been damaged:

(Contd. on page 4)
Product name: Hexamethylene Diisocyanate (HDI)

6 Accidental release measures

- Personal precautions, protective equipment and emergency procedures
  - Avoid contact with the eyes and skin.
  - Do not breathe vapours.
  - Do NOT approach from DOWNWIND.
  - Do NOT attempt to take action WITHOUT suitable protective equipment.
  - Self-contained breathing apparatus.
  - Full impermeable protective clothing and equipment.
  - Mark out the contaminated area with signs and prevent access to unauthorized personnel.
  - Keep people at a distance and stay upwind.

- Environmental precautions:
  - Do not allow to enter sewers/ surface or ground water.
  - Contain the spilled material by binding.

- Methods and material for containment and cleaning up:
  - Do NOT spray water into packaging which has been damaged or overturned.
  - Pump up the product into a spare container suitably labelled.
  - Recover the cleaning water for subsequent disposal.

- Large spill:
  - Absorb non-recoverable liquid with inert absorbent material.
  - Wash contaminated area with large amounts of water.

- Small spill:
  - Cover with:
    - slaked lime (calcium hydroxide).

7 Handling and storage

- Precautions for safe handling
  - Ensure good ventilation/aspiration at the workplace.
  - Closed system.
  - Avoid contact with water or humidity.
  - Avoid the formation or spread of mists in the atmosphere.
  - Avoid any direct contact with the product.
  - Comply with instructions for use (refer to technical sheet).
  - NEVER pour water onto this product.

- Conditions for safe storage, including any incompatibilities
  - Storage:
    - The floor of the depot should be impermeable and designed to form a water-tight basin.
    - Store receptacle in a well ventilated area.
    - Store in cool, dry conditions in well sealed receptacles.
    - Store away from incompatible materials.

- Requirements to be met by storerooms and receptacles:
  - Store only in the original receptacle.
  - Watertight packaging.
  - Stainless steel container under dry inert gas.
  - Packaging materials recommended:
    - Stainless steel.
    - Coated steels.
  - Unsuitable material for receptacle:
    - Materials other than those recommended.
8 Exposure controls/personal protection

* Control parameters
  * Components with limit values that require monitoring at the workplace:
    Exposure limits represent regulated or recommended worker breathing zone concentrations measured by validated sampling and analytical methods, meeting the regulatory requirements. The following limits apply to this material, where, if indicated, S=skin and C=ceiling limit:
    The recommended limits SHOULDN'T be exceeded.

<table>
<thead>
<tr>
<th>822-06-0 hexamethylene-di-isocyanate</th>
</tr>
</thead>
<tbody>
<tr>
<td>REL Short-term value: C 0.14* mg/m³, C 0.02* ppm</td>
</tr>
<tr>
<td>Long-term value: 0.035 mg/m³, 0.005 ppm</td>
</tr>
<tr>
<td>*10-min</td>
</tr>
<tr>
<td>TLV 0.034 mg/m³, 0.005 ppm</td>
</tr>
</tbody>
</table>

* TLV (Threshold Limit Value established by ACGIH)
  822-06-0 hexamethylene-di-isocyanate 0.005 ppm

* NIOSH-Ca (National Institute for Occupational Safety and Health)
  822-06-0 hexamethylene-di-isocyanate

* Exposure controls
  * Personal protective equipment:
    Extraction to remove vapours at their source.
    Only process in a closed system.
    Ensure good ventilation of the work station.
    Special medical surveillance.
    Compulsory atmospheric monitoring.
    Personal protective equipment available close by in case of emergency.
    Safety shower.
    Eye wash.
    Keep away from foodstuffs, beverages and feed.
    Immediately remove all soiled and contaminated clothing.
    Wash hands before breaks and at the end of work.
    Store protective clothing separately.

* Breathing equipment:
  Wear respiratory device with filter in case of insufficient ventilation.
  When respirators are required, select NIOSH/MSHA approved equipment based on actual or potential airborne concentrations and in accordance with the appropriate regulatory standards and/or industrial recommendations.

* Protection of hands:
  Protective gloves
  The glove material has to be impermeable and resistant to the product/ the substance/ the preparation.
  Selection of the glove material on consideration of the penetration times, rates of diffusion and the degradation
  * Material of gloves PVC gloves
  * Eye protection:
**Product name:** Hexamethylene Diisocyanate (HDI)

Eye and face protection requirements will vary dependent upon work environment conditions and material handling practices. Appropriate ANSI Z87 approved equipment should be selected for the particular use intended for this material. Eye contact should be prevented through use of chemical safety glasses with side shields or splash proof goggles. An emergency eye wash must be readily accessible to the work area.

- **Body protection:**
  - Protective clothing with elasticated cuffs and closed neck.
  - Boots made of PVC.

### 9 Physical and chemical properties

- **Information on basic physical and chemical properties**
  - **General Information**
    - **Appearance:**
      - Form: Liquid
      - Color: Colorless
    - Odor: Pungent
  - **pH-value:** Not applicable (reacts with water).
  - **Change in condition**
    - Melting point/Melting range: -67 °C (-89 °F)
    - Boiling point/Boiling range: 255 °C (491 °F) (1013 hPa)
  - **Flash point:** 130 °C (266 °F) (DIN 51758)
  - **Ignition temperature:** 454 °C (849 °F)
  - **Danger of explosion:** Product does not present an explosion hazard.
  - **Explosion limits:**
    - Lower: 0.9 Vol %
    - Upper: 9.5 Vol %
  - **Oxidizing properties**
    - Not oxidizing.
  - **Vapor pressure at 20 °C (68 °F):** 0.007 hPa
  - **Density at 20 °C (68 °F):** 1.047 g/cm³ (8.737 lbs/gal)
  - **Solubility in / Miscibility with**
    - **Water:** Reacts.
    - **Ketones:** Soluble.
    - **aromatic hydrocarbons:** Soluble.
    - **chlorinated hydrocarbons:** Soluble.
    - **esters:** Soluble.
  - **Segregation coefficient (n-octanol/water):** Not applicable (reacts with water and/or octanol).
  - **Viscosity:**
    - Dynamic at 25 °C (77 °F): 2.5 mPa.s
  - **Other information**
    - No further relevant information available.
10 Stability and reactivity

- Reactivity
- Chemical stability
- Thermal decomposition / conditions to be avoided:
  Stable at ambient temperature.
  On contact with humidity, carbon dioxide (CO2) is released, which may cause a pressure build-up if the container is hermetically sealed.
- Possibility of hazardous reactions
  Reacts with:
  - acids.
  - alcohols.
  - amines.
  - bases.
  - water and aqueous solutions.
  - protic solvents.
  with a great release of CO2, and hence a risk of a pressure build-up in confined areas, and forms an insoluble solid precipitate.
- Conditions to avoid
  extreme heat
  open flame
  moisture
  ignition sources
- Incompatible materials: No further relevant information available.
- Hazardous decomposition products:
  On thermal decomposition (pyrolysis) releases:
  Toxic gases.
  Carbon monoxide (CO)
  Carbon dioxide (CO2)
  Nitrogen oxides (NOx)

11 Toxicological information

- Information on toxicological effects
- Acute toxicity:
- LD/LC50 values:
  Fatal if inhaled.
  Harmful if swallowed.
  Not harmful by skin contact.
  Unpublished reports.

<table>
<thead>
<tr>
<th>Route</th>
<th>LD50/LC50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral</td>
<td>LD50 746 mg/kg (rat) (OECD 401)</td>
</tr>
<tr>
<td>Dermal</td>
<td>LD50 &gt; 7000 mg/kg (rat) (OECD 402)</td>
</tr>
<tr>
<td>Inhalative</td>
<td>LC50/4h 0.124 mg/l (rat) (OECD 403)</td>
</tr>
</tbody>
</table>

- Primary irritant effect:
  - on the skin:
    Causes severe burns.
    (OECD 404)
    Unpublished reports.
  - on the eye:
    Causes serious eye damage.
    (OECD 405)
    Unpublished reports.
  - Inhalation:
    May cause respiratory irritation.
    Unpublished reports.
Other information (about experimental toxicology):
This product does not contain any substances that are considered by OSHA, NTP, IARC or ACGIH to be "probable" or "suspected" human carcinogens.

Additional toxicological information:

Carcinogenic categories

OSHA-Ca (Occupational Safety & Health Administration)
Substance is not listed.

Sensitization
May cause sensitisation by inhalation and skin contact.
(OECD 406) (Guinea-pig)
Unpublished reports.
Human data available.
May cause sensitisation by inhalation and skin contact.

Carcinogenicity:
Not considered to be carcinogen.
Unpublished reports.

822-06-0 hexamethylene-di-isocyanate
Inhalative NOAEC Carc 0.164 ppm (rat) (OECD 453)

Mutagenicity:
Is not considered genotoxic.
Unpublished reports.

Reproductive toxicity:
Is not considered hazardous to the reproduction.
Unpublished reports.

822-06-0 hexamethylene-di-isocyanate
Inhalative NOAEC Dvl/Tera Tox 0.3 ppm (rat) (OECD 414)
NOAEC Mat Tox 0.005 ppm (rat) (OECD 414)
NOEC Fert 0.3 ppm (rat) (OECD 422)

Toxicity
Aquatic toxicity:
The product does not have any known adverse effects on the aquatic organisms tested.
Unpublished reports.

822-06-0 hexamethylene-di-isocyanate
EC0/48h (static) ≥ 89.1 mg/l (Daphnia magna) (EU C.2)
ErC50(0-72h) (static) > 77.4 mg/l (Desmodesmus subspicatus) (EU C.3)
LC0/96h (static) ≥ 82.8 mg/l (Brachydanio rerio) (EU C.1)
NOEC/72h (static) 11.7 mg/l (Desmodesmus subspicatus) (EU C.3)

Persistence and degradability
The product is not readily biodegradable.

822-06-0 hexamethylene-di-isocyanate
BOD28 42 % (bacteria) (EU C.4-D)
DT50 25 °C, 48.44 h (Photolysis) (AOPWIN v1.92)
23 °C, 0.23 h (Hydrolysis) (ASTM D4666)

Behavior in environmental systems:
Components: No data available.
Bioaccumulative potential
Not bioaccumulative.

(Contd. on page 9)
**Product name:** Hexamethylene Diisocyanate (HDI)

<table>
<thead>
<tr>
<th>822-06-0 hexamethylene-di-isocyanate</th>
<th>BCF 58 (fish) (BCFWIN v.2.17)</th>
</tr>
</thead>
</table>

**Mobility in soil**

<table>
<thead>
<tr>
<th>822-06-0 hexamethylene-di-isocyanate</th>
<th>Log Koc 5861 (...) (PCKOC v1.66)</th>
</tr>
</thead>
</table>

- **Other information:**
  - Formation of insoluble polyurea and/or amine derivative.
  - Degradation product: Hexamethylenediamin (CAS n°124-09-4)
  - Not classified as Dangerous for the Environment.

- **Ecotoxic effects:**
  - **Remark:** No data available.

- **Behavior in sewage processing plants:**

<table>
<thead>
<tr>
<th>822-06-0 hexamethylene-di-isocyanate</th>
<th>EC50/3h (static) 842 mg/l (bacteria) (OECD 209)</th>
</tr>
</thead>
</table>

**Results of PBT and vPvB assessment**

- **PBT:** No.
- **vPvB:** No.
- **Other adverse effects No further relevant information available.**

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**13 Disposal considerations**

- **Waste treatment methods**
  - **Recommendation:** Discharging waste into rivers and drains is forbidden. Incinerate at a licensed installation. Disposal must be made according to federal, state and local regulations.

- **Uncleaned packagings:**
  - **Recommendation:** Allow it to drain thoroughly. Thoroughly emptied and clean packagings may be recycled. Disposal must be made according to official regulations.

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**14 Transport information**

- **UN Number**
  - DOT, ADR, IMDG, IATA UN2281

- **Proper shipping name (Technical Name)**
  - DOT, ADR, IMDG, IATA HEXAMETHYLENE DIISOCYANATE

- **Transport hazard class(es)**
  - **DOT**
  - **Class** 6.1 Toxic substances
Product name: Hexamethylene Diisocyanate (HDI)

- **Label**: 6.1
- **ADR, IMDG, IATA**
- **Class**: 6.1 Toxic substances
- **Label**: 6.1
- **Packing group**: DOT, ADR, IMDG, IATA II
- **Environmental hazards**: Marine pollutant (environmentally hazardous mark): No
- **Special precautions for user**: Warning: Toxic substances
- **Hazard identification number**: 60
- **EMS Number**: F-A,S-A
- **Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code**: Not applicable.
- **Transport/Additional information**: The above regulatory prescriptions are those valid on the date of publication of this sheet. However, given the possible evolution of transport regulations for hazardous materials and in the event of the SDS in your possession dating back more than 12 months, it is advisable to check their validity with your sales office.
- **Passenger aircraft**: Packing instruction: 654 - Maximum net quantity per package: 5 L
- **Cargo aircraft**: Packing instruction: 662 - Maximum net quantity per package: 60 L

**15 Regulatory Information**

- **National legislation**
- **Safety, health and environmental regulations/legislation specific for the substance or mixture**
  - **Sara Section 312**
    - Fire Hazard - NO
    - Reactive Hazard - YES
    - Release of Pressure - NO
    - Acute Health Hazard - YES
    - Chronic Health Hazard - YES
- **Section 355 (extremely hazardous substances)**: Substance is not listed.
- **Section 313 (Specific toxic chemical listings)**: CERCLA RQ 100 lbs for 822-06-0
  - 822-06-0 hexamethylene-di-isocyanate
- **Carcinogenic categories**
- **EPA (Environmental Protection Agency)**: Substance is not listed.
Product name: **Hexamethylene Diisocyanate (HDI)**

<table>
<thead>
<tr>
<th>39.4.0.1</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>· <strong>IARC</strong> (International Agency for Research on Cancer)</td>
<td>Substance is not listed.</td>
</tr>
<tr>
<td>· <strong>NTP</strong> (National Toxicology Program)</td>
<td>Substance is not listed.</td>
</tr>
<tr>
<td></td>
<td><strong>Inventory status:</strong></td>
</tr>
<tr>
<td>· <strong>Australian Inventory of Chemical Substances (AICS)</strong></td>
<td>Substance is listed.</td>
</tr>
<tr>
<td>· <strong>Canadian Domestic Substance List (DSL)</strong></td>
<td>Substance is listed.</td>
</tr>
<tr>
<td>· <strong>Canadian Non Domestic Substance List (NDSL)</strong></td>
<td>Substance is not listed.</td>
</tr>
<tr>
<td>· <strong>Chinese Chemical Inventory of Existing Chemical Substances (CIECS)</strong></td>
<td>Substance is listed.</td>
</tr>
<tr>
<td>· <strong>European EINECS/ELINCS Listing</strong></td>
<td>Substance is listed.</td>
</tr>
<tr>
<td>· <strong>Japan Existing and New chemical Substance List (ENCS)</strong></td>
<td>Substance is listed.</td>
</tr>
<tr>
<td>· <strong>Korea Existing Chemical Inventory (KECI)</strong></td>
<td>Substance is listed.</td>
</tr>
<tr>
<td>· <strong>Philippines Inventory of Chemicals and Chemical Substances (PICCS)</strong></td>
<td>Substance is listed.</td>
</tr>
<tr>
<td>· <strong>TSCA listing</strong></td>
<td>Substance is listed.</td>
</tr>
<tr>
<td>· <strong>Other regulations, limitations and prohibitive regulations</strong></td>
<td>TSCA Section 8(c) Calls for Records of Significant Adverse Reactions</td>
</tr>
<tr>
<td></td>
<td>TSCA Section 8(d) Health &amp; Safety Data Reporting (40 CFR 716, Subpt. B)</td>
</tr>
<tr>
<td></td>
<td>Clean Air Act Section 112, Hazardous Air Pollutants, as amended by 40 CFR 63 (December 19, 2005)</td>
</tr>
<tr>
<td></td>
<td>CERCLA Hazardous Substances [other than radionuclides] (40 CFR 302.4) (as amended by 75 FR 78918, Dec. 17, 2010)</td>
</tr>
<tr>
<td>· <strong>State of California, Proposition 65:</strong></td>
<td></td>
</tr>
<tr>
<td>· <strong>Chemicals known to cause cancer:</strong></td>
<td>Substance is not listed.</td>
</tr>
<tr>
<td>· <strong>Chemicals known to cause reproductive toxicity for females:</strong></td>
<td>Substance is not listed.</td>
</tr>
<tr>
<td>· <strong>Chemicals known to cause reproductive toxicity for males:</strong></td>
<td>Substance is not listed.</td>
</tr>
<tr>
<td>· <strong>Chemicals known to cause developmental toxicity:</strong></td>
<td>Substance is not listed.</td>
</tr>
</tbody>
</table>

**16 Other information**

This information is based on our present knowledge. However, this shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

* Department issuing SDS: Service HSE Vencorex  
* Date of preparation / last revision 01/23/2015 / 4  
* * Data compared to the previous version altered.