1. Product Information

**Product Name:** Cross Linker  
**Chemical Family:** Aliphatic Polyisocyanate  
**Chemical Name:** 1,6-Hexamethylene Disocyanate Based Polyisocyanate  
**Product Code:** S000

2. Composition/Information on Ingredients

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS Number</th>
<th>Weight %</th>
<th>OSHA/PEL</th>
<th>ACGIH/TLV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aliphatic Polyisocyanates</td>
<td>(Specific chemical identity is withheld as a trade secret)</td>
<td>&lt; 0.2</td>
<td>N/E</td>
<td>N/E</td>
</tr>
<tr>
<td>Hexamethylene Disocyanate</td>
<td>822-06-0</td>
<td>15-25</td>
<td>N/E</td>
<td>N/E</td>
</tr>
<tr>
<td>HDI based Polyisocyanate</td>
<td>75-85</td>
<td>N/E</td>
<td>.005 ppm TWA</td>
<td>N/E</td>
</tr>
</tbody>
</table>

3. Hazards Identification

WARNING: Color: Clear/Pale Yellow; Form: Liquid; Odor: Slight; May cause eye, skin, and respiratory tract irritation; May cause allergic respiratory reaction; Harmful if inhaled; May cause allergic skin reaction; May cause lung damage; Closed container may explode under extreme heat or when contaminated with water; Toxic gases/fumes are given off during burning or thermal decomposition.  

Routes of entry: Inhalation, skin contact, eye contact.  

Acute Inhalation: HDI vapors or mist at concentrations above the TLV can irritate (burning sensation) the mucous membranes in the respiratory tract (nose, throat, lungs) causing runny nose, sore throat, coughing, chest discomfort, shortness of breath and reduced lung function (breathing obstruction). Persons with a preexisting, nonspecific bronchial hyper reactivity can respond to concentrations below the TLV with similar symptoms as well as an asthma attack. Exposure well above the TLV may lead to bronchitis, bronchial spasm and pulmonary edema (fluid in lungs). These effects are usually reversible. Chemical or hypersensitive pneumonitis, with flu-like symptoms (e.g., fever, chills) has also been reported.  

Chronic Inhalation: As a result of previous repeated over exposures or a single large dose, certain individuals will develop isocyanate sensitization (chemical asthma) which will cause them to react to a later exposure to isocyanate at levels well below the TLV. These symptoms, which include: chest tightness, wheezing, cough, shortness of breath or asthmatic attack, could be immediate or delayed up to several hours after exposure.  

Similar to many non-specific asthmatic responses, there are reports that once sensitized an individual can experience these symptoms upon exposure to dust, cold air or other irritants. This increased lung sensitivity can persist for weeks and in severe cases for several years. Chronic overexposure to isocyanates has also been reported to cause lung damage, including decrease in lung function, which may be permanent.  

Sensitization may be either temporary or permanent.  

Acute skin contact: Isocyanates react with skin protein and moisture and can cause irritation. Symptoms of skin irritation may be reddening, swelling, rash, scaling or blistering. Some persons may develop skin sensitization from skin contact. Cured material is difficult to remove.  

Chronic skin contact: Prolonged contact with the isocyanate can cause reddening, swelling, rash, scaling or blistering. In those who have developed a skin sensitization, these symptoms can develop as a result of contact with very small amounts of liquid material or even as a result of vapor-only exposure.  

Acute eye contact: Liquid, aerosols or vapors of this product (isocyanate) are irritating and can cause tearing, reddening and swelling accompanied by a stinging sensation and maybe a feeling like that of fine dust in the eyes. Chronic eye contact: May result in corneal opacity (clouding of the eye surface). Acute ingestion: Can result in irritation and possible corrosive action in the mouth, stomach tissue and digestive tract. Chronic ingestion: None found.  

Carcinogenicity: NTP - Not listed IARC - Not listed OSHA - Not regulated  

Medical conditions aggravated by exposure: Asthma and any other respiratory disorders (bronchitis, emphysema, hyperactivity), skin allergies, eczema. Exposure limits: Not established for this product as a whole, refer to Section II for exposure limits of hazardous constituents.

4. First Aid Measures

First aid for eyes: Flush with clean, lukewarm water (low pressure) for at least 15 minutes while lifting eyelids. Refer individual to physician or ophthalmologist for immediate follow-up. First aid for skin: Remove contaminated clothing immediately. Wash affected areas thoroughly with soap (green tincture soap is recommended) and water. Wash contaminated clothing thoroughly before reuse. For severe exposures, get under safety shower after removing clothing, then get medical attention. For lesser exposures, seek medical attention if irritation develops or persists. First aid for inhalation: Move to an area free from risk of further exposure. Administer oxygen or artificial respiration as needed. Obtain medical attention. Asthmatic-type symptoms may develop and may be immediate or delayed up to several hours. Treatment is essentially symptomatic. Consult physician. First aid for ingestion: DO NOT INDUCE VOMITING. Give 1 to 2 cups of milk or water to drink. DO NOT GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS OR CONVULSING PERSON. Consult physician.  

NOTE TO PHYSICIAN: Eyes: stain for evidence of corneal injury. If cornea is burned, instill antibiotic/steroid preparation frequently. First aid for skin: Remove contaminated clothing immediately. Wash affected areas thoroughly with soap and water. Wash contaminated clothi ng thoroughly before reuse. For severe exposures, get under safety shower after removing clothing, then get medical attention. For lesser exposures, seek medical attention if irritation develops or persists.  

5. Fire Fighting Measures

Flash point: Greater than 200°F (93.3°C) Pensky-Martens Closed Cup  
Extinguishing media: Dry chemical; carbon dioxide, foam, water spray for large fires.  
Special fire fighting procedures: Full emergency equipment with self-contained breathing apparatus and full protective clothing should be worn by fire fighters. During a fire, HDI vapors and other irritating, highly toxic gases may be generated by thermal decomposition or combustion (see Reactivity Data Section).  
Unusual fire/explosion hazards: Closed container may explode when exposed to extreme heat or burst when contaminated with water (CO2 evolved).  

6. Accidental Release Measures

Spill or leak procedures: Evacuate nonessential personnel. Remove all sources of ignition and ventilate the area. Dike or impound spilled material and control further spillage if feasible. Notify appropriate authorities if necessary. Cover the spill with sawdust, vermiculite, Fuller’s earth or other absorbent material. Pour decontamination solution over spill area and allow to react for at least 10 minutes. Collect material in open containers and add further amounts of decontamination solution. Remove containers to a safe place, cover loosely, and allow to stand for 24 to 48 hours. Wash down spill area with decontamination solutions. Decontamination solutions: nonionic surfactant Union Carbide’s Tergitol TMN-10 (20%) and water (80%); concentrated ammonia (3-5%); detergent (2%) and water (90-95%). Respiratory protection is recommended during spill cleanup (See Respiratory Protection recommendations).

7. Handling and Storage

Storage temperature (min/max): -30°F (36°C)/122°F (50°C)  
Shelf life: 12 months  
Special sensitivity: If container is exposed to high heat, it can be pressurized and possibly rupture explosively. HDI reacts slowly with water to form C)2 gas. This gas can cause

MATERIAL SAFETY DATA SHEET
sealed containers to expand and possibly rupture explosively. Handling/storage precautions: Keep away from heat, sparks and open flame. Ground containers during storage and transfer operations. Store in tightly closed containers to prevent moisture contamination. Do not reseal if contamination is suspected. At maximum storage temperatures noted, material may slowly polymerize without hazard. Ideal storage temperature range for ease of handling is 50-81°F (10-27°C). Avoid contact with skin and eyes. Employee education and training in the safe use and handling of this compound are required under the OSHA Hazard Communication Standard.

Other: When working with a two-component waterborne polyurethane system, take precautions to assure that containers of mixed material are well vented. Polyisocyanates will react with the water in the system to form CO2 gas which can be released by venting the container. It is recommended to occasionally agitate the coating system when in use to prevent potential overflow. The formation of CO2 will generate pressure in a sealed container causing the container to expand and possibly rupture explosively. When working with a pressure pot, insure that pressure release valves are clean and in proper working condition.

8. Personal Protection
Required work/hygiene procedures: Precautions must be taken so that persons handling this product do not allow contact with the eyes or skin. In spray operations, protection must be afforded to exposure to both vapor and spray mist. Skin protection requirements: Permeation resistant gloves. Cover as much of the exposed skin area as possible with appropriate clothing. If skin creams are used, keep the area protected only by the cream to a minimum.

Ventilation requirements: Good industrial hygiene practice dictates that worker protection should be achieved through engineering controls, such as ventilation, whenever feasible. When such controls are not feasible to achieve full protection, the use of respirators and other personal protective equipment is mandated (See Respirator requirements below). Exhaust air may need to be cleaned by scrubbers or filters to reduce environmental contamination. Curing ovens must be ventilated to prevent emissions into the workplace. If oven off-gases are not vented properly (i.e. they are released into the work area), it is possible to be exposed to airborne monomeric HDI.

Respirator requirements: A respirator that is recommended or approved for use in isocyanate-containing environments (air-purifying or fresh air-supplied) may be necessary for spray applications or other situations such as high temperature use which may produce inhalation exposures. A supplied-air respirator (either positive pressure or continuous flow-type) is recommended. Before an air-purifying respirator can be used, air monitoring must be performed to measure airborne concentrations of HDI monomer and HDI polyisocyanate. Specific conditions under which air-purifying respirators can be used are outlined in the following sections. Observe OSHA regulations for respirator use (29 CFR 1910.143).

Spray application: A. Good industrial hygiene practice dictates that when isocyanate-based coatings are spray applied, some form of respiratory protection should be worn. During the spray application of coatings containing this product, the use of a supplied-air (either positive pressure or continuous flow-type) respirator is mandatory when ONE OR MORE of the following conditions exists: a) the airborne isocyanate concentrations are not known; or b) the airborne isocyanate monomer concentrations exceed 0.05 ppm averaged over eight (8) hours (10 times the 8 hour TWA exposure limit); or c) the airborne isocyanate polymeric (polymeric, oligomeric) concentrations exceed 5 mg/m3 averaged over 8 hours or 10 mg/m3 averaged over 15 minutes (10 times the 8 hour TWA or the 15 minute STEL exposure limits); or d) operations are performed in a confined space (See OSHA Confined Space Standard, 29 CFR 1910.146).

A properly fitted air-purifying (combination organic vapor and particulate) respirator, proven by test to be effective in isocyanate-containing spray paint environments, and used in accordance with all recommendations made by the manufacturer, can be used when ALL of the following conditions are met: a) the airborne isocyanate monomer concentrations are known to be below 0.05 ppm averaged over eight (8) hours (10 times 8 hour TWA exposure limit); and b) the airborne isocyanate polymeric (polymeric, oligomeric) concentrations are known to be below 5 mg/m3 averaged over 8 hours or 10 mg/m3 averaged over 15 minutes (10 times the 8 hour TWA or the 15 minute STEL exposure limits); and c) a NIOSH-certified End of Service Life Indicator or a change schedule based upon objective information or data is used to ensure that cartridges are replaced before the end of their service life. In addition, prefilters should be changed whenever breathing resistance increases due to particulate buildup.

Non-Spray Operations: A. During non-spray operations such as mixing, batch-making, brush or roller application, etc., at elevated temperatures (for example, heating of material or application to a hot substrate), it is possible to be exposed to airborne isocyanate vapors. Therefore, when the coatings system will be applied in a non-spray manner, a supplied-air (either positive pressure or continuous flow-type) respirator is mandatory when ONE OR MORE of the following conditions exist: a) the airborne isocyanate concentrations are not known; or b) the airborne isocyanate monomer concentrations exceed 0.05 ppm averaged over eight (8) hours (10 times the 8 hour TWA exposure limit); or c) the airborne polycyanate (polymeric, oligomeric) concentrations exceed 5 mg/m3 averaged over 8 hours or 10 mg/m3 averaged over 15 minutes (10 times the 8 hour TWA or the 15 minute STEL exposure limits); or d) operations are performed in a confined space (See OSHA Confined Space Standard, 29 CFR 1910.146).

A properly fitted air-purifying (combination organic vapor and particulate) respirator, proven by test to be effective in isocyanate-containing paint environments, and used in accordance with all recommendations made by the manufacturer, can be used when ALL of the following conditions are met: a) the airborne isocyanate monomer concentrations are known to be below 0.05 ppm averaged over eight (8) hours (10 times 8 hour TWA exposure limit); and b) the airborne isocyanate polymeric (polymeric, oligomeric) concentrations are known to be below 5 mg/m3 averaged over 8 hours or 10 mg/m3 averaged over 15 minutes (10 times the 8 hour TWA or the 15 minute STEL exposure limits); or c) operations are performed in a confined space (See OSHA Confined Space Standard, 29 CFR 1910.146).

9. Physical and Chemical Properties
Physical Form: Liquid
Color: Clear/Pale Yellow
Odor: Slight
Boiling Point: Not established
Melting/freezing Point: Not established
Solubility in Water: Resin is insoluble - reacts slowly with water to liberate CO2 gas
Specific Gravity: 1.16
Bulk Density: Not established
% Volatility by Weight: Negligible
Vapor Pressure: HDI Polyisocyanate: 4.7 x 10^-7 mm Hg @ 20°C (68°F)

10. Stability and Reactivity
Stability: Stable under normal conditions
Hazardous Polymerization: May occur; contact with moisture or other materials which react with isocyanates or temperatures over 400°F (204°C) may cause polymerization.
Incompatibilities: Water, amines, strong bases, alcohols, metal compounds and surface active materials

MATERIAL SAFETY DATA SHEET (continued)
11. Toxicological Information

Toxicity Data for: For HDI homopolymer materials except where indicated.

Acute Toxicity: Oral LD50 - Estimated to be greater than 10000 mg/kg (rats). (Based on the results of actual tests conducted using specific HDI-homopolymer products.) Dermal LD50 - Estimated to be greater than 5000 mg/kg (rabbits). (Based on the results of actual tests conducted using specific HDI-homopolymer products.) Inhalation LC50 - Lower respiratory (pulmonary) irritant. LC50 values range from 137-1150 mg/m³ were obtained in rats exposed to aerosols. (4H exp.) Eye effects - Severe irritant capable of inducing corneal injury (rabbit); maximum primary eye irritation score: 54.6/110 for a 24 hour exposure. Skin effects - Moderate irritant; primary dermal irritation score: 3.4/8.0 (rabbit).

Sensitization - Pulmonary and dermal sensitizer in animals and humans. Evidence exists that cross-sensitization between HDI and other isocyanates, particularly hydrogenated MDI and TDI, can occur. Other acute effects - Ames Test: Negative for Desmodur N-100 (100% solids material). Subchronic toxicity: Rats exposed to a HDI homopolymer (isocyanurate type, specifically, the solvent-free Desmodur N-3300), at 4.3, 14.7 and 89.8 mg/m³ for three weeks (6 hrs/day, 5 days/wk) exhibited respiratory distress and inflammation of the nasal passages at 14.7 mg/m³ and above. At the 89.8 mg/m³ level, inflammatory lesions at many sites of the lungs were also observed. The No Observable Effect Level (NOEL) was 4.3 mg/m³. Rats were also exposed to an HDI homopolymer (isocyanurate type, specifically, the solvent-free product Desmodur N-3300), for 13 weeks (6 hrs/day, 5 days/wk) at aerosol concentrations of 0.5, 3.3 and 26.4 mg/m³. Body weight gain of male rats of the 26.4 mg/m³ group were slightly reduced toward the end of the study. The lung weight to body weight ratio was significantly increased in the male and female rats of the 26.4 mg/m³ group. Histopathologic diagnosis of these animals revealed inflammatory changes a nd formation of fibrous tissue at the point of injury in the respiratory tract. In addition, the lung function tests at the end of the study provided evidence of a chronic obstructive lung disorder in rats of the 26.4 mg/m³ group. The No Observable Effect Level (NOEL) in this study is considered to be 3.3 mg/m³.

Other toxicity data: Mice were exposed to a liquid aerosol of an HDI homopolymer (isocyanurate type, specifically, the solvent-free product Desmodur –3300), mixed with acetone for three hours. The irritation potential expressed as the RD50 (the concentration which is predicted to reduce the respiratory rate 50%) was 20.8 mg/m³ (95% confidence interval = 18.3 to 23.9 mg/m³). Pulmonary (lung) irritation was observed first, followed by sensory (eye, nose, and throat) irritation.

12. Disposal Considerations

Waste disposal method: Waste must be disposed of in accordance with federal, state and local environmental control regulations. Incineration is the preferred method. Empty containers must be handled with care due to product residue. Decontaminate containers prior to disposal. DO NOT HEAT OR CUT EMPTY CONTAINER WITH ELECTRIC OR GAS TORCH (see Fire and Explosion Data and Reactivity Data Sections).

13. Transportation Information

Technical Shipping Name: Polyisocyanate
Freight Class Bulk: Isocyanate
Freight Class Package: Chemicals NIO (Isocyanate) NMFC 60000
Product Label: Cross Linker
Hazard Class or Division: DOT (Domestic surface): non-regulated
Hazard Class Division Number: IMO/IMDG Code (Ocean): Non-Regulated
Hazard Class Division Number: ICAO/IATAA (air): Non-Regulated

14. Regulatory Information

OSHA Status: This product is hazardous under the criteria of the Federal OSHA Hazard Communication Standard 29 CFR 1910.1200.
TSCA Status: On TSCA Inventory
CERCLA Reportable Quantity: None
SARA TITLE III: Section 302 Extremely Hazardous Substances: None
Section 313 Toxic Chemicals: None
RCRA Status: If discarded in its purchased form, this product would not be a hazardous waste either by listing or by characteristic. However, under RCRA, it is the responsibility of the product user to determine at the time of disposal, whether a material containing the product or derived from the product should be classified as a hazardous waste. (40 CFR 261.20-24)

The following chemicals are specifically listed by individual states; other product specific health and safety data in other sections of the MSDS may also be applicable for state requirements. For details on your regulatory requirements you should contact the appropriate agency in your state.

<table>
<thead>
<tr>
<th>Component Name/ CAS Number</th>
<th>Concentration</th>
<th>State Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aliphatic Polyisocyanates NJTSRN (31765300002) - 7684P</td>
<td>15-25%</td>
<td>PA3, NJ4</td>
</tr>
<tr>
<td>Hexamethylene Diisocyanate (HDI) 822-06-0</td>
<td>&lt; 0.05%</td>
<td>PA1, MA, NJ1</td>
</tr>
<tr>
<td>HDI based Polyisocyanate NJTSRN (31765300002) - 7683P</td>
<td>75-85%</td>
<td>PA3, NJ4</td>
</tr>
<tr>
<td>MA = Massachusetts Hazardous Substance List</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NJ1 = New Jersey Hazardous Substance List</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NJ4 = New Jersey Other - included in 5 predominant ingredients &gt; 1%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NJTSRN = New Jersey Trade Secret Registry Number</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PA1 = Pennsylvania Hazardous Substance List</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PA3 = Pennsylvania Non-hazardous present at 3% or greater.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

15. Other Information

HMIS Ratings: Health: 2, Flammability: 1, Reactivity: 1