

MATERIAL SAFETY DATA SHEET

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DATE PREPARED: 2/2/90
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I. PRODUCT IDENTIFICATION

PRODUCT NAME: Hyperthane Catalyst
CHEMICAL FAMILY: Aliphatic Polyisocyanate
CHEMICAL NAME: 1,6-Hexamethylene Diisocyanate Based Polyisocyanate
SYNONYMS: Polymeric Hexamethylene Diisocyanate
FORMULA: Not Applicable

II. HAZARDOUS INGREDIENTS

<u>INGREDIENT NAME</u> <u>/CAS NUMBER</u>	<u>EXPOSURE LIMITS</u>	<u>CONCENTRATION (%)</u>
Homopolymer of HDI 28182-81-2	OSHA: Not Established ACGIH: Not Established 1 mg/m3 recommended Mobay Guideline Level (MGL)	60%
Hexamethylene Diisocyanate (HDI) 822-06-0	OSHA: Not Established ACGIH: .005 ppm TWA	* %
*Residual monomer content less than 0.7% based on resin solids at the time of manufacture. However, after 3-6 months storage, the free monomer content may rise to a maximum of 1.6. Mobay also recommends a ceiling level of 0.02 ppm (Mobay Guideline Level MGL).		
Xylene 1330-20-7	OSHA: 100.000 ppm TWA 150.000 ppm STEL ACGIH: 100.000 ppm TWA 150.000 ppm STEL	26%
PM Acetate 108-65-6	OSHA: 100.000 ppm TWA	13%
n-Butyl Acetate 123-86-4	OSHA: 150.000 ppm TWA 200.000 ppm STEL ACGIH: 150.000 ppm TWA 200.000 ppm STEL	12.5%

III. PHYSICAL PROPERTIES

PHYSICAL FORM: Liquid
COLOR: Clear/Pale Yellow
ODOR: Of Solvent
MOLECULAR WEIGHT: Approximately 500 (Polyisocyanate)
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: 1.06 @ 68 F (20 C)
BULK DENSITY: 8.60 lbs/gal.
% VOLATILE BY VOLUME: Approximately 45
VAPOR PRESSURE: Polyisocyanate: Approximately 7.5 x 10⁻⁵ mm Hg @ 20 C
Butyl Acetate: Xylene: 9 mm Hg @ 20 C

IV. FIRE AND EXPLOSION DATA

FLASH POINT: 91.0 F (32.7 C) Pensky-Martens Closed Cup (ASTM D-93)

FLAMMABLE LIMITS:
UPPER EXPLOSIVE LIMIT (UEL)(%): 7.0 Xylene
LOWER EXPLOSIVE LIMIT (LEL)(%): 1.0 Xylene
UPPER EXPLOSIVE LIMIT (UEL)(%): 7.60 n-Butyl Acetate
LOWER EXPLOSIVE LIMIT (LEL)(%): 1.38 n-Butyl Acetate

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 Section VIII). Isolate from heat, electrical equipment, sparks and open flame. Closed container may explode when exposed to extreme heat or burst when contaminated with water (CO₂ evolved). Solvent vapors may be heavier than air. Stagnant air may cause vapors to accumulate and travel along the ground to an ignition source which may result in a flash back to the source of the vapors.

V. HUMAN HEALTH DATA

ROUTE(S) OF ENTRY: Inhalation; Skin Contact; Eye Contact

HUMAN EFFECTS AND SYMPTOMS OF OVEREXPOSURE:

ACUTE INHALATION: HDI vapors or mist at concentrations above the TLV or MGL 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 hyperreactivity can respond to concentrations below the TLV or MGL with similar symptoms as well as an asthma attack. Exposure well above the TLV or MGL 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. Solvent vapors may be irritating to the eyes, nose and throat. Symptoms of irritation may include: redness, burning, and itching of the eyes, dryness of the throat and tightness of the chest. Other possible symptoms of overexposure include: headache, nausea, narcosis, fatigue and loss of appetite. A concentration of 200 ppm BA can

V. HUMAN HEALTH DATA - Continued

cause eye, nose, and throat irritation. At 300 ppm these effects can become severe. Persons exposed to 200 ppm of xylene experienced eye, nose and throat irritation. Concentrations of 10,000 ppm of xylene can be immediately dangerous to life and health.

CHRONIC INHALATION: As a result of previous repeated overexposures 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 or MGL. 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. Chronic exposure to organic solvents has been associated with various neurotoxic effects including permanent brain and nervous system damage. Symptoms include: loss of memory, loss of intellectual ability and loss of coordination.

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. Repeated or prolonged skin contact with solvents can result in dry, defatted and cracked skin causing increased susceptibility to infection. In addition, skin irritation (i.e. redness, swelling), which may develop into dermatitis, may occur from skin contact. Solvents can penetrate the skin and may cause systemic effects similar to those identified under acute inhalation symptoms.

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. Chronic skin exposure to solvents may cause effects similar to those identified under chronic inhalation effects.

ACUTE EYE CONTACT: Liquid, aerosols and vapors of this product (isocyanate and solvents) are irritating and can cause tearing, reddening and swelling accompanied by a stinging sensation and/or a feeling like that of fine dust in the eyes.

CHRONIC EYE CONTACT: None Found.

ACUTE INGESTIONS: Can result in irritation and possible corrosive action in the mouth, stomach tissue and digestive tract. Vomiting may cause aspiration of the solvent resulting in chemical pneumonitis.

CHRONIC INGESTION: None Found.

VII. EMPLOYEE PROTECTION RECOMMENDATIONS

REQUIRED WORK/HYGIENE PROCEDURES: Precautions must be taken so that persons handling Hyperthane Catalyst do not breathe the vapors or have it contact the eyes or skin. In spray operations, protection must be afforded against exposure to both vapor and spray mist.

EYE PROTECTION REQUIREMENTS: Safety glasses, splash goggles or face shield. Contact lenses should not be worn.

SKIN PROTECTION REQUIREMENTS: Chemical 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.

RESPIRATOR REQUIREMENTS: A respirator that is recommended or approved for use in isocyanate containing environments (air purifying or fresh air supplied) may be necessary. Consider type of application and environmental concentrations. Observe OSHA regulations for respirator use (29 CFR 1910.134).

NOTE ON ODOR WARNING PROPERTIES: Pure isocyanate materials have odor thresholds that are higher than the TLV, PEL or MGL. Thus, if a vapor/particulate air-purifying respirator has exceeded its service life, breakthrough of the filter can result in exposure over the allowable limit without the wearer being able to smell the isocyanate. However, when a polyurethane coating system contains organic solvents, the wearer of a vapor particulate respirator will be warned of filter breakthrough by the odor of solvents before being exposed to isocyanates because:

- 1) organic solvents have low odor thresholds, and
- 2) testing has demonstrated that solvents break through filters before isocyanates do.

SPRAY APPLICATION:

Good industrial hygiene practice dictates that when isocyanate based coatings are spray applied, some form of respiratory protections should be worn. During the spray application of organic solvent containing coatings systems, the use of a positive pressure supplied air respirator is mandatory when:

- the airborne isocyanate concentrations are not known, or
- the airborne isocyanate monomer concentrations exceed 0.05 ppm (10 times the TLV) or the polyisocyanate (polymeric, oligomeric) concentrations exceed 10 mg/m³ (10 times the MGL) or
- spraying is performed in a confined space or in an area with limited ventilation.

A properly fitted air-purifying (combination organic vapor and particulate) respirator, proven by test to be effective in isocyanate-containing spray paint environments, will provide adequate protections when:

- the airborne isocyanate monomer concentrations are known to be below 0.05 ppm (10 times the TLV), and
- the polyisocyanate (polymeric, oligomeric) concentrations are known to be below 10 mg/m³ (10 times the MGL).

NON-SPRAY OPERATION:

Even during non-spray operations such as mixing, brush or roller application, etc., depending on the conditions (for example, heating of material of application to a hot substrate), it is possible to be exposed to airborne isocyanate vapors.

Therefore, when the coatings system contains solvents and will be applied in a non-spray manner, a positive pressure supplied air respirator must be worn when:

- the airborne concentrations are unknown; or

V. HUMAN HEALTH DATA - Continued

CARCINOGENICITY

NTP: Not Listed
IARC: Not Listed
OSHA: Not Regulated

MEDICAL CONDITIONS

AGGRAVATED BY EXPOSURE: Asthma and other respiratory disorders (bronchitis, emphysema, hyperreactivity), skin allergies, exzema.

EXPOSURE LIMITS: Not established for product as a whole. Refer to Section II for exposure limits of hazardous constituents. The Mobay Guideline Level of 1 mg/m³ for the Homopolymer of HDI and 0.02 ppm ceiling for HDI monomer are internal guides based on limited data; they are provided as guides pending the review of future data..

VI. EMERGENCY AND FIRST AID PROCEDURES

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 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. Workplace vapors could produce reversible corneal epithelial edema impairing vision.

SKIN: This product is a known skin sensitizer. Treat symptomatically as for contact dermatitis or thermal burn.

INGESTION: Treat symptomatically. There is no specific antidote. Inducing vomiting is contraindicated because of the irritating nature of the product.

INHALATION: This product is a known pulmonary sensitizer. Treatment is essentially symptomatic. An individual having a dermal or pulmonary sensitization reaction to this material must be removed from any further exposure to any isocyanate.

IX. SPILL AND LEAK PROCEDURES - Continued

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 and flammable solvent vapor. Decontaminate containers prior to disposal. DO NOT HEAT OR CUT EMPTY CONTAINER WITH ELECTRIC OR GAS TORCH. (See Section IV and VIII).

X. SPECIAL PRECAUTIONS & STORAGE DATA

STORAGE TEMPERATURE(MIN/MAX): -30 F (-34 C)/122 F (50 C)

SHELF LIFE: 6 months at 77 F (25 C) after receipt of material by customer.

SPECIAL SENSITIVITY: If container is exposed to high heat, it can be pressurized and possibly rupture explosively. HDI reacts slowly with water to form CO₂ gas. This gas can cause 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 product are required under the OSHA Hazard Communication Standard.

XI. SHIPPING INFORMATION

D.O.T. SHIPPING NAME: Flammable Liquid N.O.S.
TECHNICAL SHIPPING NAME: Polyisocyanate, contains xylene and butyl acetate
D.O.T. HAZARD CLASS: Flammable Liquid
U.N./N.A. NUMBER: UN1993
D.O.T. LABEL: Flammable Liquid
D.O.T. PLACARD: Flammable
FREIGHT CLASS BULK: Isocyanate
FREIGHT CLASS PACKAGE: Chemicals, NOI (Isocyanate), NMFC 60000
PRODUCT LABEL: Hyperthane Catalyst

XII. ANIMAL TOXICITY DATA

TOXICITY DATA FOR: HDI homopolymer materials except where indicated.

ACUTE TOXICITY

ORAL LD50: Estimated to be greater than 10,000 mg/kg (Rats).
(Based on the results of actual tests conducted using specific HDI-homopolymer products).

INHALATION LC50: Lower respiratory (pulmonary) irritant. LC50 values ranging from 137-1150 mg/m³ were obtained in rats exposed to aerosols.

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)

VII. EMPLOYEE PROTECTION RECOMMENDATIONS - Continued

- the airborne concentrations exceed 0.05 ppm (10 times the TLV), or
- the airborne concentrations of the polyisocyanate (polymeric, oligomeric) exceed 10 mg/m³ (10 times the MGL), or
- operations are performed in a confined space or in an area with limited ventilation

At least an air purifying (organic vapor) respirator is required when:

- the airborne concentrations of the isocyanate monomer exceed the TLV of 0.005 ppm but are below 0.05 ppm (10 times the TLV), or
- the airborne concentrations of the polyisocyanate (polymeric, oligomeric) exceed the MGL of 1 mg/m³ but are below 10 mg/m³ (10 times the MGL).

MONITORING: Refer to Patty's Industrial Hygiene and Toxicology-Volume 1 (3rd edition) Chapter 17, and Volume III (1st edition) Chapter 3 - for guidance concerning appropriate air sampling strategy to determine airborne concentrations.

ADDITIONAL PROTECTIVE MEASURES: Safety showers and eyewash stations should be available. Educate and train employees in safe use of product. Follow all label instructions. For additional information, see Mobay's "Health and Safety Information for Hexamethylene Diisocyanate Based Polyisocyanates" (April 1984, HDI 84A).

VIII. REACTIVITY DATA

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.

INSTABILITY CONDITIONS: None known.

DECOMPOSITION PRODUCTS: By high heat and fire: carbon dioxide, carbon monoxide, oxides of nitrogen, HCN, HDI.

IX. SPILL AND LEAK PROCEDURES

SPILL OR LEAK PROCEDURES: Evacuate nonessential personnel. Remove all sources of ignition and ventilate the area. Notify appropriate authorities if necessary. Put on personal protective equipment (See Section VII). Dike or impound spilled material and control further spillage if feasible. 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 (3-8%), detergent (2%) and water (90-95%).

XII. ANIMAL TOXICITY DATA - Continued

SENSITIZATION: Pulmonary and dermal sensitizer in animals and humans. Evidence exists that cross-sensitization between HDI and other isocyanates, particularly hydrogenated NDI and TDI, can occur.

OTHER ACUTE EFFECTS: AMES TEST: Negative for Desmodur N-100 (100% solids material).

SUBCHRONIC TOXICITY: Rats exposed to an HDI homopolymer (biuret type, specifically, the solvent-free product Desmodur N-3200), at 3.7, 17.5 and 76.6 mg/m³ for three weeks (6 hrs/day, 5 days/wk) exhibited respiratory distress and multifocal inflammatory lesions (inflammatory lesions at many sites) in the lungs and upper respiratory tract when exposed to 17.5 mg/m³ and above. The NOEL was 3.7 mg/m³.

Rats exposed for three months (6 hrs/day, 5 days/wk) to an HDI homopolymer (biuret type, specifically, the solvent-free product Desmodur N-3200), at aerosol concentrations of 0.4, 3.4 and 21 mg/m³ exhibited lung weight increases at the highest dose. Histopathologic diagnosis of the test animals revealed proliferative reaction (swelling and thickening) in the lower respiratory tract as well as bronchio-alveolar hyperplasia (thickening of the bronchio-alveolar areas of the lung) and thickening of the septum in the 21 mg/m³ animals. There were no effects noted in the upper and central respiratory tract. The NOEL in this study is considered to be 3.4 mg/m³.

OTHER TOXICITY DATA: Mice were exposed to a liquid aerosol of an HDI homopolymer (isocyanate type, specifically, the solvent-free product Desmodur N-3300), mixed with acetone for three hours. The irritation potential expressed as the RD50 (the concentration which is predicted to reduce the respiratory rate by 50%) was 20.8 mg/m³ (85% confidence interval = 18.3 to 23.9 mg/m³). Pulmonary (lung) irritation was observed first, followed by sensory (eye, nose, and throat) irritation.

TOXICITY DATA FOR: Butyl Acetate

ACUTE TOXICITY

ORAL LD50: 14,000 mg/kg (Rat)
INHALATION LC50: 2000 ppm (Rat)
EYE EFFECTS: Severe irritant, 20 mg (Rabbit)
SKIN EFFECTS: Moderate irritant, 500 mg/24H (Rabbit)

TOXICITY DATA FOR: Xylene

ACUTE TOXICITY

ORAL LD50: 4,300 mg/kg (Rat)
DERMAL LD50: Greater than 1,700 mg/kg (Rabbit)
INHALATION LC50: 5,000 ppm (Rat, 4H exp)
EYE EFFECTS: Mild to severe irritation (Rabbit)
SKIN EFFECTS: Moderate irritation (Rabbit)