

MATERIAL SAFETY DATA SHEET

ITWC, Inc.
P.O. Box 247
106 South Main Street
Malcom, IA 50157

(641)-528-3000
Fax: (641)-528-5403
Toll Free: (888)-489-2462
www.itwcinc.com

1. PRODUCT IDENTIFICATION

PRODUCT NAME: **IS-20721A**
CHEMICAL FAMILY: Aromatic Isocyanate Prepolymer.
CHEMICAL NAME: Modified Diphenylmethane Diisocyanate (MDI)

2. COMPOSITION / INFORMATION ON INGREDIENTS

INGREDIENT NAME	CAS NUMBER	%	EXPOSURE LIMITS		
			OSHA PEL	ACGIH TLV	
Diphenylmethane Diisocyanate (MDI)	101-68-8	54-64	0.02 ppm Ceiling 0.2(mg/m3-Ceiling)	0.005 ppm TWA	(0.055 mg/m3-TWA)
Polymeric MDI	9016-87-9		Not Established	Not Established	
MDI Mixed Isomer	26447-70-5		Not Established	Not Established	

3. HEALTH HAZARD DATA

Note: Data has not been established for this product. Data is listed for MDI.

ROUTES OF ENTRY:

INHALATION? Yes. Although MDI is low in volatility, an inhalation hazard can exist from MDI aerosols or vapors formed during heating, foaming, spraying, or otherwise aerosolizing the material in an inadequately ventilated environment.

SKIN CONTACT? Yes.

EYE CONTACT? Yes.

INGESTION? Yes.

ACUTE HEALTH HAZARDS:

INHALATION- MDI vapors or mist at concentrations above 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 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. These symptoms can be delayed up to several hours after exposure.

SKIN- Isocyanates react with skin protein and moisture and can cause irritation, which may include the following symptoms: reddening, swelling, rash, scaling, or blistering. Cured material is difficult to remove. Hot material can cause thermal burns.

EYE- Liquid, aerosols or vapors are irritating and can cause tearing, reddening, and swelling. If left untreated, corneal damage can occur and injury is slow to heal. However, damage is usually reversible.

INGESTION- Can result in irritation and corrosive action in the mouth, stomach tissue, and digestive tract. Symptoms can include sore throat, abdominal pain, nausea, vomiting, and diarrhea.

CHRONIC HEALTH HAZARDS:

INHALATION- As a result of previous repeated overexposures or a single large dose, certain individuals 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 can include chest tightness, wheezing, cough, shortness of breath or asthma 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. Overexposure to isocyanates has also been reported to cause lung damage (including decrease in lung function), which may be permanent. Sensitization can either be temporary or permanent.

SKIN- Prolonged contact can cause reddening, swelling, rash, scaling, blistering, and in some cases, skin sensitization. Individuals who have skin sensitization can develop these symptoms from contact with liquid or vapors. Animal tests have indicated that respiratory sensitization can result from skin contact with MDI. This data reinforces the need to prevent direct skin contact with MDI.

EYE- None Found.

INGESTION- None Found.

CARCINOGENICITY: Neither MDI nor polymeric MDI are listed by the NTP, IARC, or regulated by OSHA as carcinogens. NTP (National Toxicology Program)? No. IARC (International Agency for Research on Cancer)? No. OSHA REGULATED? No.

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE: Asthma, other respiratory disorders (bronchitis, emphysema, bronchial hyperreactivity), skin allergies, eczema.

4. EMERGENCY & FIRST AID PROCEDURES:

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. Consult physician should this occur.

SKIN- Remove contaminated clothing. Wash affected skin 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 after the area is washed.

EYE- Flush with copious amount of water, preferably, lukewarm water for at least 15 minutes, holding eyelids open all the time to ensure that the eyes are being irrigated. Refer individual to physician or ophthalmologist for immediate follow-up.

INGESTION- DO NOT INDUCE VOMITING. Wash mouth out with water. DO NOT GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON. Consult physician.

NOTE TO PHYSICIAN:

INHALATION / RESPIRATORY- This compound is a known pulmonary sensitizer. Treatment is essentially symptomatic. An individual having a pulmonary sensitization reaction to this material should be removed from exposure to any isocyanate.

SKIN- This compound is a known skin sensitizer. Treat symptomatically as for contact dermatitis or thermal burns. If burned, treat as thermal burn. An individual having a skin sensitization reaction to this material should be removed from exposure to any isocyanate.

EYE - Stain for evidence for corneal injury. If cornea is burned, instill antibiotic steroid preparation frequently. Workplace vapors have produced reversible corneal epithelial edema impairing vision.

INGESTION- Treat symptomatically. MDI has a very low oral toxicity. There is no specific antidote. Inducing vomiting is contraindicated because of the irritating nature of this compound.

5. FIRE & EXPLOSION HAZARD DATA

FLASH POINT (Method Used): 390° F (198.9° C) Pensky-Martens Closed Cup (for MDI)

FLAMMABLE LIMITS:

LEL (Lower Explosion Limit)= Not Available.
UEL (Upper Explosion Limit)= Not Available.

EXTINGUISHING MEDIA: Carbon dioxide (CO₂), dry chemical or foam. Water spray for large fires. The reaction between water and hot product may be vigorous.

SPECIAL FIRE FIGHTING PROCEDURES: Full emergency equipment with self-contained breathing apparatus and full protective clothing should be worn by firefighters.

UNUSUAL FIRE & EXPLOSION HAZARDS: During a fire, MDI vapors and other irritating, highly toxic gases may be generated by thermal decomposition or combustion. (See Section V – Reactivity Data). At temperatures greater than 400° F (204° C), polymeric MDI can polymerize and decompose which can cause pressure build-up in closed containers. Explosive rupture is possible. Therefore, use cold water to cool fire-exposed containers.

6. ACCIDENTAL RELEASE MEASURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED:

- Identify the material.
- Evacuate “immediate” spill area and keep nonessential or unprotected personnel away.
- Remove any ignition sources.
- Contact your supervisor.
- Ventilate spill area.
- Equip clean-up personnel with full protective equipment (recommend eye & face protection, permeation-resistant gloves, permeation-resistant suit, permeation-resistant boots, & respirator.)
- Control the source by stopping the spill, leak, or other flow of product.
- Contain or dike the spilled product, creating a barrier around the spill and the inlet to any sewers or drains.
- Prevent spilled material from entering soil, sewers, surface water, ground water, streams, or any other bodies of water.
- If temporary control of isocyanate vapor is required, a blanket of protein foam (available at most fire departments) may be placed over the spill.
- Retain any contaminated water for removal and treatment.
- Absorb small spills with inert absorbent material (e.g. vermiculite, saw dust, clay earth, sweeping compound, sand, etc.).
- Large spills may be pumped or vacuumed into a closed, but not sealed container for disposal and then finished off with dry absorbent, followed by neutralizing solution.
- Apply neutralizing solution (see below) over spill area & absorbent.

- Scoop up absorbed material and remaining absorbent/decontaminant mixture and place in a metal drum or other approved chemical waste container (a closed, but not sealed container).
- Transport container to well-ventilated area (outside, etc.)
- Apply neutralizing solution to the absorbed material in the waste container to ensure adequate decontamination. Lid should remain loose but not sealed or tightened as dangerous pressures may result from the neutralization process.
- Monitor the drum frequently for the next 48-72 hours in case over pressurization results from continued reaction and while carbon dioxide escapes.
- Decontaminate receiving surface (floor, etc.) with neutralizing solution and let it stand for at least 15 minutes.
- Decontaminate tools & protective equipment.
- Remove protective equipment.
- Properly dispose of isocyanate contaminated materials & equipment that cannot be decontaminated. (Incineration is the preferred method.)
- NOTE: Acceptable neutralizing solutions (ie. decontamination solutions) are:
 - 80% water + 20% non-ionic surfactant such as Dow/Union Carbide Tergitol TMN-10 (or other non-ionic surfactant which is liquid & mixes well with water)
 - OR 90% water + 3-8% concentrated ammonia + 2-7% detergent.
- Recommended ratio for thorough decontamination is 1 part of spilled material to 10 parts of neutralizing solution.
- Report spill per regulatory requirements.

7. HANDLING AND STORAGE

PRECAUTIONS TO BE TAKEN IN HANDLING & STORING: Store in tightly closed containers to prevent moisture contamination. Do not reseal if contamination is suspected. Avoid contact with skin and eyes. Do not breathe aerosols or vapors. Warning properties (irritation of the eyes, nose and throat or odor) are not adequate to prevent chronic overexposure from inhalation. This material can produce asthmatic sensitization upon either single inhalation exposure to a relatively high

concentration or upon repeated inhalation exposure to lower concentrations. Exposure to vapors of heated MDI can be extremely dangerous. Employee education and training in the safe use and handling of this compound are required under the OSHA Hazard Communication Standard.

SPECIAL SENSITIVITY (HEAT, LIGHT, MOISTURE): If container is exposed to high heat, 400° F (204° C) it can be pressurized and possibly rupture. MDI reacts slowly with water to form CO₂ gas. This gas can cause sealed containers to expand and possibly rupture.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

VENTILATION: Local exhaust should be used to maintain levels below the TLV whenever MDI or MDI-containing products are heated, sprayed, aerosolized, or processed. Standard reference sources regarding industrial ventilation (ie., ACGIH Industrial Ventilation) should be consulted for guidance about adequate ventilation.

RESPIRATORY PROTECTION: Airborne MDI concentrations greater than the ACGIH TLV-TWA (TLV) or OSHA PEL-C (PEL) can occur in inadequately ventilated environments when MDI or MDI-containing products are sprayed, aerosolized, or heated. In such cases, respiratory protection must be worn. The type of respiratory protection selected must comply with the requirements set forth in OSHA's Respiratory Protection Standard (29 CFR 1910.134). The type of respiratory protection available includes:

- (1) an atmosphere-supplying respirator such as a self-contained breathing apparatus (SCBA) or a supplied-air respirator (SAR) in the positive pressure or continuous flow mode, or
 - (2) an air-purifying respirator (APR). The recommended APR cartridge is an organic vapor/HEPA combination cartridge (OV/P100). If an APR is selected, the following conditions must be met:
 - (a.1) the cartridge must be equipped with an end-of-service-life indicator (ESLI) certified by NIOSH, OR
 - (a.2) a change out schedule, based on objective information or data that will ensure that the cartridges are changed out before the end of their service life, must be developed and implemented. The basis for change out schedule must be described in the written respirator program,
- AND
- (b) the airborne MDI concentration must be no greater than 10 times the TLV or PEL.

SKIN PROTECTION: Permeation resistant gloves (butyl rubber, nitrile rubber, polyvinyl alcohol). However, please note that PVA degrades in water. Cover as much of the exposed skin area as possible with appropriate clothing. If skin creams are used, keep the area covered by the cream to a minimum.

EYE PROTECTION: Chemical goggles should be used in a splash hazard environment. For additional protection, chemical goggles should be used in combination with a full face shield. Contact lenses should not be worn when working with chemicals.

MONITORING: Airborne MDI concentrations should be measured when the potential for overexposure exists (e.g., when the product is sprayed, aerosolized, or heated). Monitoring of airborne isocyanates in the breathing zone of individuals should become part of the overall employee exposure characterization program. Sampling and analytical methods have been developed by NIOSH, OSHA, and others. For guidance, see Volume 1 (Chapter 17) and Volume 3 (Chapter 3) in Patty's Industrial Hygiene and Toxicology for sampling strategy.

MEDICAL SURVEILLANCE: Medical supervision of all employees who handle or come in contact with isocyanates is recommended. This should include pre-employment and periodic medical examinations. The pre-employment exam should include a respiratory health history, a clinical examination, and baseline pulmonary function testing (FEV₁, FVC as a minimum). History of adult asthma, respiratory allergies (such as hay fever), eczema, history of prior isocyanate sensitization, or lack of smell (anosmia) are possible reasons for medical exclusion from isocyanate areas. Once a person is accurately diagnosed as sensitized to an isocyanate, no further exposure can be permitted.

OTHER PROTECTIVE CLOTHING OR EQUIPMENT: Safety showers and eyewash stations should be available.

WORK/HYGIENIC PRACTICES: Wash hands, forearms, and face thoroughly after handling compounds and before eating, smoking, using lavatory, and at the end of the day. Educate and train employees in safe use of product. Follow all label instructions.

9. PHYSICAL / CHEMICAL CHARACTERISTICS

<i>APPEARANCE (physical form, color, texture, etc.)</i>	MDI is white to yellowish solid at temperatures below 99° F (37° C); MDI is liquid at temperatures over 99° F (37° C).
<i>ODOR:</i>	Slightly musty odor.
<i>MELTING POINT:</i>	99° F (37° C) for MDI; Not Established for product.
<i>FREEZE POINT:</i>	Not Established.

<i>BOILING POINT:</i>	597° F (313.9° C) for MDI; Not Established for product.
<i>VAPOR PRESSURE (mm Hg):</i>	Less than 10 ⁻⁵ mm Hg @ 77° F (25° C) for MDI; Not Established for product.
<i>VAPOR DENSITY (Air = 1)</i>	8.5 for MDI; Not Established for product.
<i>SPECIFIC GRAVITY (H₂O = 1):</i>	1.2 @ 77° F (25° C) for MDI; Not Established for product.
<i>EVAPORATION RATE (Butyl Acetate = 1):</i>	Not Established.
<i>SOLUBILITY IN WATER:</i>	Reacts slowly with water to liberate CO ₂ gas for MDI; Not Established for product.
<i>BULK DENSITY:</i>	10 lbs/gal for MDI; Not Established for product.
<i>MOLECULAR WEIGHT:</i>	250.3 for MDI; Not Established for product.
<i>% VOLATILE BY VOLUME:</i>	Negligible.

10. STABILITY AND REACTIVITY

STABILITY: Stable under normal conditions.
CONDITIONS TO AVOID (if unstable): Contamination with water.

INCOMPATIBILITY (MATERIALS TO AVOID): Water, amines, strong bases, alcohols. Will cause some corrosion to copper alloys and aluminum.

HAZARDOUS DECOMPOSITION OR BYPRODUCTS: By high heat and fire: carbon monoxide (CO), oxides of nitrogen, traces of HCN, MDI vapors or aerosols.

HAZARDOUS POLYMERIZATION: May occur.
CONDITIONS TO AVOID (if polymerization may occur): Contact with moisture, other materials which react with isocyanates, or temperatures above 400° F (204° C).

11. TOXICOLOGICAL INFORMATION

Toxicity data based on polymeric MDI.

ORAL: Acute Toxicity LD50:>2,000 mg/kg (rat, male/ female)

INHALATION: Acute toxicity LC50: 490mg/m³, vapor, 4h (rat)

SKIN: The LD50 for skin absorption in rabbits is >10,000 mg/kg

INGESTION: The oral LD50 for rats is >10,000 mg/kg

REPEATED DOSE TOXICITY: 90 Days, inhalation: NOAEL: 1 mg/m³, (rat, male/female, 6hrs/day 5 days/week.)

Results: Irritation to lungs and nasal cavity.

2 Years, inhalation: NOEAL: 0.2mg/m³, (rat, male/female, 6hrs/day 5 day/week)

Results: Irritation to lungs and nasal cavity.

MUTAGENICITY: (EFFECTS ON GENETIC MATERIAL): Genetic toxicity data on MDI are inconclusive. MDI was weakly positive in some in-vitro studies; other in-vitro studies were negative. Animal genetic toxicity studies were predominantly negative.

4,4-Diphenylmethane Diisocyanate (MDI)

Acute Inhalation Toxicity

LC50: 369 mg/m³, 4 hrs (rat, male/female)

LC50:>2240 mg/m³, aerosol, 1 hr (rat).

Acute Dermal Toxicity

LD50:>10,000 mg/kg (rabbit)

Skin Irritation

Rabbit, Draize test, slightly irritation

Sensitization

Dermal: sensitizer (guinea pig, Maximisation Test (GPMT))

Inhalation: sensitizer (guinea pig)

Repeated Dose Toxicity

90 days, inhalation: NOAEL: 0.3 mg/m³, (rat, male/female, 18 hrs/day, 5 days/week)

Irritation to lungs and nasal cavity.

Mutagenicity

Genetic Toxicity in Vitro:

Ames: (salmonella typhimurium, Metabolic Activation: with/without)

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Positive and negative results were reported. The use of certain solvents which rapidly hydrolyze diisocyanates is suspected of producing the positive mutagenicity results.

Genetic Toxicity in Vivo:

Micronucleus Assay: negative(mouse)

Carcinogenicity

Rat, female, inhalation, 2 years, 17hrs/day, 5 days/week

Results: negative

12. ECOLOGICAL INFORMATION

Ecotoxicity data based on polymeric MDI

Bioaccumulation

Rainbow trout, exposure time: 112d, <1BCF

Does not bioaccumulate.

Acute and Prolonged Toxicity to Fish

LC0:>1,000mg/l (Zebra fish (*Brachydanio rerio*), 96 hrs)

LC0:>3,000mg/l (Killifish (*oryzias latipes*), 96 h)

Acute Toxicity to Aquatic Invertebrates

EC50:>1,000 mg/l (water flea (*Daphnia magna*), 24 hrs)

Toxicity to Aquatic Plants

NOEC: 1,640mg/l, End Point: growth (Green algae (*Scenedesmus subspicatus*), 72 hrs)

Toxicity to Microorganisms

EC50:>100mg/l, (Activated sludge microorganisms, 3 hrs)

Ecological Data for 4,4'-Diphenylmethane Diisocyanate (MDI)

Acute and Prolonged Toxicity to fish

LC50:>500mg/l (Zebra fish (*Brachydanio rerio*), 24 hrs)

Acute Toxicity to Aquatic Invertebrates

EC50:>500mg/l (Water flea (*Daphnia magna*), 24 hrs)

13. 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 CONTAINER PRECAUTIONS: Empty containers must be handled with care due to product residue. Decontaminate containers prior to disposal. Acceptable neutralizing solutions (ie. decontamination solutions) are:

80% water + 20% non-ionic surfactant such as Dow/Union Carbide Tergitol TMN-10 (or other non-ionic surfactant which is liquid & mixes well with water)

OR 90% water + 3-8% concentrated ammonia + 2-7% detergent.

Empty decontaminated containers should be crushed to prevent reuse. **Do not heat or cut empty container with electric or gas torch.** (See Sections 5-Fire & Explosion Hazard Data and Section 10-Stability and Reactivity). Vapors and gases may be highly toxic.

14. TRANSPORTATION INFORMATION

DOT Classification: Technical Shipping Name: Methylene Diphenyl Diisocyanate

Freight class bulk: Methylene Diphenyl Diisocyanate

Freight class Package: Chemicals, NOI (Isocyanate) , NMFC 6000

Product Label: Product label established

DOT (Domestic surface)

Proper shipping Name: Other Regulated Substances, Liquid, N.O.S.

HAZARD CLASS OR DIVISION: 9

UN/NA NUMBER NA3082

PACKAGING GROUP PG III

HAZARDOUS SUBSTANCE MDI, (Methylene diphenyl diisocyanate)

DOT PRODUCT RQ lbs (kgs) 35714 lbs (16199.9 kgs)

HAZARD LABEL(s) Class 9

HAZARD PLACARD(s) Class 9

IMDG (Sea Transportation):

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ICA/IATA (Air Transportation):

15. REGULATORY INFORMATION

OSHA HAZARD COMMUNICATION STATUS: This product is considered hazardous as defined under the criteria of the Federal OSHA Hazard Communication Standard 29 CFR 1910.1200.

RCRA STATUS: MDI is not listed as a hazardous waste. To the best of our knowledge, MDI does not meet the criteria of a hazardous waste if discarded in its purchased form. However, under RCRA, it is the responsibility of the user of products to determine, at the time of disposal, whether a product meets any of the criteria for a hazardous waste. This is because product uses, transformations, mixtures, processes, etc., may render the resulting material hazardous, under the criteria of ignitability, corrosivity, reactivity, and EP toxicity (40 CFR 261.20-24).

US INVENTORY (TSCA): The ingredients of this product are listed on the TSCA inventory or are not required to be listed on the TSCA inventory.

SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT (SARA), TITLE III:

Sections 301-303 – Emergency Planning - Extremely Hazardous Substances:

None.

Section 304 – Emergency Release Notification – Reportable Substances:

Methylene diphenyl diisocyanate (MDI) (CAS# 101-68-8)

Section 311/312 – Community Right-to-Know Reporting Requirements - Emergency Hazard Categories:

Immediate health hazard.

Delayed health hazard.

Section 313 – Toxic Chemical Notification & Release Inventory Reporting – Listed Substances:

Methylenebis (phenylisocyanate) (MDI) (CAS# 101-68-8)

This information must be included in all MSDSs that are copied and distributed for this material.

16. OTHER INFORMATION

HMIS RATINGS:

HEALTH	3	FLAMMABILITY	1	REACTIVITY	1
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(0=Minimal; 1=Slight; 2=Moderate; 3=Serious; 4=Severe; *=Chronic)

PPE – B (safety glasses, gloves; assuming a non-splash work environment with adequate ventilation.) See Section 8- (Exposure controls / personal protection) for more information.

PREPARED BY: ITWC, Inc. compliance department

Approved BY: ITWC Director of Technical Service. (sf)

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