MATERIAL SAFETY DATA SHEET

Revision Date: 2015-8-5

Section 1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Chemical Name: Isophorone Diisocyanate, 3-isocyanatomethyl-3,5,5-rimethylcyclohexyl isocyanate, IPDI

Product Name: Wannate® IPDI

Company Name: Wanhua Chemical Group Co., LTD

Address: No.17 Tianshan Road, Yantai, Shandong, China

Telephone: 0086-535-3388160
Fax: 0086-535-6875138

Emergencies Telephone:
WANHUA +86 535-8203123
China +86 532-83889090
EU +31 20 20 65132/65130; +44 780 183 7343
NA 800-424-9300; +1-703-527-3887

Recommended uses:
Material for a Polyurethane System

Section 2. HAZARDS IDENTIFICATION

Important Hazards
Toxic by inhalation. Irritating to eyes, respiratory system and skin. May cause sensitisation by inhalation and skin contact. Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

GHS Classification
Acute Tox: - Category 3 H331,
Eye Irrit. - Category 2 H319,
STOT SE - Category 3 H335,
Skin Irrit. - Category 2 H315,
Resp. Sens. - Category 1 H334,
Skin Sens. - Category 1 H317
Aquatic Chronic - Category 2 H441

**GHS-Labelling**

![GHS symbols]

**Signal Words**

Danger

**Hazard Statements**

Toxic by inhalation. Irritating to eyes, respiratory system and skin. May cause sensitisation by inhalation and skin contact. Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

**Precautionary Statements**

**◆ Prevention**

Avoid release to the environment. Wear protective gloves/protective clothing/eye protection/face protection. In case of inadequate ventilation wear respiratory protection. Use only outdoors or in a well-ventilated area.

**◆ Response**

**Inhalation**

If inhaled, remove to fresh area. If coughing or hard breathing, get medical attention immediately.

**Eye Contact**

In case of eye contact, immediately rinse eyes with water for a sufficiently long period of time (at least 15 minutes). Get medical attention immediately.

**Skin Contact**

Immediately take off contaminated clothing and shoes. Rinse skin with soap and water. Get medical attention if irritation develops and persists.

**Ingestion**

Do not induce vomiting. Wash mouth out with water. Do not give anything by mouth to an unconscious person. Get medical attention.
Suitable extinguishing media
Carbon dioxide, foam or dry powder. Water spray may be used if no other available and then in copious quantities

Storage
Store in a dry, cool and well-ventilated area, away from heat, sources of ignition and incompatible materials. Keep containers tightly closed.

Disposal
Dispose of contents / container to an approved waste disposal plant. Seal and label product waste and contaminated empty containers and provide for suitable disposal in accordance with relevant national control provisions.

### Section 3. COMPOSITION / INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>Substance / mixture: Substance</th>
<th>NAME</th>
<th>CAS RN</th>
<th>Weight %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isophorone Diisocyanate</td>
<td>4098-71-9</td>
<td>≥ 99.5%</td>
<td></td>
</tr>
</tbody>
</table>

### Section 4. FIRST AID MEASURES

General advice
Soiled, soaked clothing and shoes must be immediately removed, decontaminated and disposed of.

Inhalation
Move victims into fresh air and keep him warm. If the casualty is not breathing : Perform mouth-to-mouth rescuscitation, notify emergency physician immediately.

Eye Contact
With eye held open, thoroughly rinse immediately with plenty of water ofr at least 10 minutes. Consult a physician immediately.

Skin Contact
Wash off affected area immediately with plenty of water. Continue decontamination with polyethylene glycol 400 after initial rinsing with water and then wash with water and soap. If symptoms persist, call a physician.

Ingestion
Do not induce vomiting. Get medical attention immediately.
Section 5. FIRE FIGHTING MEASURES

Hazards Characteristic
Combustible. During combustion: toxic vapours are released.

Harmful Combustion
Carbon dioxide (CO\textsubscript{2}), carbon monoxide (CO), oxides of nitrogen (NO\textsubscript{x}), isocyanate-containing vapours. Under certain fire conditions, traces of other toxic products may occur.

Suitable Extinguishing Media
Carbon dioxide (CO\textsubscript{2}), foam, extinguishing powder, water spray for large fires. Firefighters should wear professional fire fighting protective equipment, including self-contained breathing apparatus, helmet, hood, boots and gloves. Avoid contact with product. During a fire, isocyanate vapours and other irritating, highly toxic gases may be generated by thermal decomposition or combustion. Exposure to heated diisocyanate can be extremely dangerous.

Section 6. ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTION PROCEDURES TO BE FOLLOWED IN CASE OF LEAK OR SPILL
Evacuate area.

PROCEDURE(S) OF PERSONAL PRECAUTION(S)
Wear self-contained breathing apparatus, rubber boots, and heavy rubber gloves.

METHODS FOR CLEANING UP
Cover with dry-lime, sand, or soda ash. Place in covered containers using non-sparking tools and transport outdoors. Ventilate area and wash spill site after material pickup is complete.

Section 7. HANDLING AND STORAGE

Handling
Provide sufficient air exchange and/or exhaust in work rooms. Exhaust ventilation necessary if product is sprayed. In all areas where isocyanate aerosols and/or vapor concentrations are produced in elevated concentrations, exhaust ventilation must be provided in such a way that the workplace exposure limits (WEL) is not exceeded. The air should be drawn away from the personnel handling the product.
protective measures described in Chapter 8 must be observed. The precautions required in the handling of isocyanates must be taken. Avoid contact with skin and eyes and the inhalation of vapor.

**Storage Precautions**

Keep tightly closed containers. Precautions must be taken to avoid contamination by moisture and air. Processability of this material can be adversely affected by contamination. Water or moisture in the air reacts with the product to generate pressure.

**Special Requirements**

Moisture sensitive.

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### Section 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

**Isophorone diisocyanate (4098-71-9)**

US. ACGIH Threshold Limit Values

<table>
<thead>
<tr>
<th>Time Weighted Average (TWA)</th>
<th>0.005 ppm</th>
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</thead>
</table>

Germany Exposure Limit

<table>
<thead>
<tr>
<th>Ceiling Limit Value</th>
<th>0.02 ppm</th>
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</table>

**Industrial Hygiene / Ventilation Measures**

Local exhaust should be used to maintain levels below the exposure limits or guidelines whenever diisocyanate is handled, processed, or spray-applied. At normal room temperature (70°F) IPDI levels quickly exceed the exposure limits or guidelines unless properly ventilated. Standard reference sources regarding industrial ventilation (e.g., ACGIH Industrial Ventilation Manual) should be consulted for guidance about adequate ventilation. To ensure that exposure limits or guidelines have not been exceeded, monitoring for airborne diisocyanates should become part of the overall employee exposure characterization program. NIOSH, OSHA, Bayer, and others have developed sampling and analytical methods. Bayer methods can be made available, upon request.

**Respiratory Protection**

At normal room temperatures, airborne IPDI can exceed the appropriate standard/guideline; therefore, in inadequately ventilated environments 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). If an APR is selected, the following conditions must be met: (1) (a) the cartridge must be equipped with an end-of-service life indicator (ESLI) certified by NIOSH, or (1) (b) 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 the change out schedule must be described in the written respirator program. (2) the airborne IPDI concentration must be no greater than 10 times the appropriate standard/guideline. An organic vapor (OV) cartridge is recommended for APR use.

**Hand Protection**

Gloves should be worn. Nitrile rubber showed excellent resistance. Butyl rubber, neoprene, and PVC are also effective.

**Eye Protection**

When directly handling liquid product, eye protection is required. Examples of eye protection include a chemical safety goggle, or chemical safety goggle in combination with a full face shield when there is a greater risk of splash.

**Skin and body protection**

Avoid all skin contact. Depending on the conditions of use, cover as much of the exposed skin area as possible with appropriate clothing to prevent skin contact.

**Medical Surveillance**

All applicants who are assigned to an isocyanate work area should undergo a pre-placement medical evaluation. A history of eczema or respiratory allergies such as hay fever, are possible reasons for medical exclusion from isocyanate areas. Applicants who have a history of adult asthma should be restricted from work with isocyanates. Applicants with a history of prior isocyanate sensitization should be excluded from further work with isocyanates. A comprehensive annual medical surveillance program should be instituted for all employees who are potentially exposed to diisocyanates. Once a worker has been diagnosed as sensitized to any isocyanate, no further exposure can be permitted. Refer to the Bayer pamphlet (Medical Surveillance Program for Isocyanate Workers) for additional guidance.

**Additional Protective Measures**

Emergency showers and eye wash stations should be available. Educate and train employees in the safe use and handling of this product. Follow all label instructions.
Section 9. PHYSICAL AND CHEMICAL PROPERTIES

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
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<tbody>
<tr>
<td>Appearance</td>
<td>Colourless clear liquid</td>
</tr>
<tr>
<td>Odour Bulk</td>
<td>Pungent, tear exciting</td>
</tr>
<tr>
<td>Density at 25°C</td>
<td>1062 kg/m³</td>
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<tr>
<td>Temperature of crystallization</td>
<td>ca. -60°C</td>
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<tr>
<td>Boiling point under 1.33 KPa</td>
<td>ca. 158°C</td>
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<tr>
<td>Vapour pressure at 20°C</td>
<td>0.0009 hPa</td>
</tr>
<tr>
<td>Self-ignition temperature</td>
<td>430°C</td>
</tr>
<tr>
<td>Flash point (closed cup)</td>
<td>ca. 155°C</td>
</tr>
<tr>
<td>Water solubility</td>
<td>15mg/L(23°C)</td>
</tr>
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</table>

Section 10. CHEMICAL STABILITY AND REACTIVITY INFORMATION

Hazardous Reactions
Contact with moisture, other materials that react with isocyanates, or temperatures above 200 oC, may cause polymerization.

Materials to avoid
Water, Amines, Strong bases, Alcohols, copper alloys

Hazardous decomposition products
By Fire and High Heat: Carbon dioxide (CO₂), carbon monoxide (CO), oxides of nitrogen (NOx), dense black smoke, Hydrogen cyanide, Isocyanate, Isocyanic Acid, Other undetermined compounds

Section 11. TOXICOLOGICAL INFORMATION

Toxicity Data for Isophorone diisocyanate
Acute Oral Toxicity
LD50: 4814 mg/kg (Rat)

Acute Inhalation Toxicity
LC50: 0.031mg/L, Aerosol, 4 hrs (rat)

Acute dermal toxicity
LD50: >7000mg/kg (rabbit)

Skin Irritation
Rabbit, Corrosive, subcategory 1C

Eye Irritation
Rabbit, Risk of serious damage to eyes

Sensitization
Dermal: sensitizer (guinea pig, Maximisation Test (GPMT))
Other isocyanates have been shown to produce dermal and respiratory sensitization in
several species (guinea pigs, mice, rabbits, dogs). In addition, there is some evidence to suggest that cross-sensitization between different types of diisocyanates may occur. 

dermal: sensitizer (Human, Case Report) inhalation: sensitizer (guinea pig)

Repeated Dose Toxicity
13 weeks, Inhalation: NOAEL: < 0.01 ppm (0.07 mg/m3), LOAEL: 0.01 ppm (0.07 mg/m³), (Rat, Male/Female, 6 hrs/day 5 days/week)
Irritation to lungs and nasal cavity.
2 years, inhalation: NOAEL: < 0.005 ppm, LOAEL: 0.005 ppm, (rat, Male/Female, 6 hrs/day 5 days/week)
Irritation to lungs and nasal cavity.

Mutagenicity
Genetic Toxicity in Vitro:
Ames: negative (Salmonella typhimurium, Metabolic Activation: with/without)
HGPRT Assay: negative (Chinese hamster ovary (CHO) cells, Metabolic Activation: with/without)
Genetic Toxicity in Vivo:
Micronucleus Assay: negative (mouse)

Carcinogenicity
Rat, Male/Female, inhalation, 2 yrs, 6 hrs/day 5 days/week
Did not show carcinogenic effects in animal experiments.

Toxicity to Reproduction/Fertility
One generation study, inhalation, daily, (rat, Male/Female) NOAEL (parental): < 0.3 ppm, NOAEL (F2): 0.3 ppm
No effects on Reproductive parameters observed at doses tested.

Developmental Toxicity/Teratogenicity
Rat, female, inhalation, gestation days 0 - 19, daily, NOAEL (teratogenicity): >0.3 ppm, NOAEL (maternal): < 0.3 ppm
No Teratogenic effects observed at doses tested. No fetotoxicity observed at doses tested.

Neurological Effects
Rats exposed by inhalation, 6 hours/day, for approximately 3 weeks, to concentrations as high as 0.3 ppm showed no neurobehavioral effects or damage to nerve tissues.

Section 12. ECOLOGICAL INFORMATION

Ecological Data for Hexamethylene-1, 6-Diisocyanate
Biodegradation
Aerobic, 42%, Exposure time: 28 Days, Not readily biodegradable.

**Acute and Prolonged Toxicity to Fish**

$LC_{50}$: > 82.8 mg/L (Zebra fish (Brachydanio rerio), 96 h)

**Acute Toxicity to Aquatic Invertebrates**

$EC_{50}$: > 89.1 mg/L (Water flea (Daphnia magna), 48 h)

**Toxicity to Aquatic Plants**

$EC_{50}$: > 77.4 mg/L, (Green algae (Scenedesmus subspicatus), 72 h)

**Toxicity to Microorganisms**

$EC_{50}$: 84.2 mg/L, (Activated sludge microorganisms)

### Section 13. DISPOSAL CONSIDERATIONS

**Waste Disposal Method**

Waste disposal should be in accordance with existing federal, state and local environmental control laws. Incineration is the preferred method.

**Empty Container Precautions**

Empty containers retain product residue; observe all precautions for product. Do not heat or cut empty container with electric or gas torch because highly toxic vapours and gases are formed. Do not reuse without thorough commercial cleaning and reconditioning. If container is to be disposed, ensure all product residues are removed prior to disposal.

### Section 14. TRANSPORTATION INFORMATION

**Land transport (DOT)**

Proper Shipping Name: ISOPHORONE DIISOCYANATE

Hazard Class or Division: 6.1

UN/NA Number: UN2290

Packaging Group: III

Hazard Label(s): Toxic

**RSPA/DOT Regulated Components**

ISOPHORONE DIISOCYANATE

**Sea transport (IMDG)**

Proper Shipping Name: ISOPHORONE DIISOCYANATE

Hazard Class or Division: 6.1

UN-No: UN2290
Packaging Group: III
Hazard Label(s): Toxic

**Air transport (ICAO/IATA)**
Proper Shipping Name: ISOPHORONE DIISOCYANATE
Hazard Class or Division: 6.1
UN-No: UN2290
Packaging Group: III
Hazard Label(s): Toxic

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**Section 15. REGULATORY INFORMATION**

**Regulatory Information**
The product is classified and labeled according to Regulation (EC) No. 1272/2008 (GHS/CLP).
Contains isocyanates. See information supplied by the manufacturer.

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**Section 16. OTHER INFORMATION**

**Disclaimer:** This information is furnished without warranty, express or implied. This information is believed to be accurate to the best knowledge of Wanhua Polyurethanes Co., Ltd. The information in this MSDS relates only to the specific material designated herein. Wanhua Chemical Group Co., Ltd. assumes no legal responsibility for use of or reliance upon the information in this MSDS.