**SAFETY DATA SHEET**

**WANNATE® HT-75B**

**WANHUA CHEMICAL GROUP Co., LTD.**

**Chemwatch Hazard Alert Code:** 2

**Version No:** 2.3

**Issue Date:** 12/09/2017

**Print Date:** 12/09/2017

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## SECTION 1 IDENTIFICATION OF THE SUBSTANCE / MIXTURE AND OF THE COMPANY / UNDERTAKING

<table>
<thead>
<tr>
<th>Product Identifier</th>
<th>Product name</th>
<th>WANNATE® HT-75B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Synonyms</td>
<td>Solution of 1, 6-Hexamethylene Diisocyanate Based Polyisocyanate</td>
<td></td>
</tr>
<tr>
<td>Proper shipping name</td>
<td>RESIN SOLUTION, flammable</td>
<td></td>
</tr>
<tr>
<td>Other means of identification</td>
<td>Not Available</td>
<td></td>
</tr>
</tbody>
</table>

### Relevant identified uses of the substance or mixture and uses advised against

**Relevant identified uses:** Binding agents, intermediates; other: isocyanate component for polyurethanes.

### Details of the supplier of the safety data sheet

<table>
<thead>
<tr>
<th>Registered company name</th>
<th>WANHUA CHEMICAL GROUP Co., LTD.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address</td>
<td>No.17 Tianshan Road, Yantai, Shandong,</td>
</tr>
<tr>
<td>Telephone</td>
<td>0535-3031150</td>
</tr>
<tr>
<td>Fax</td>
<td>0535-338222-1150</td>
</tr>
<tr>
<td>Website</td>
<td><a href="https://www.whchem.com">https://www.whchem.com</a></td>
</tr>
<tr>
<td>Email</td>
<td><a href="mailto:whsds@whchem.com">whsds@whchem.com</a></td>
</tr>
</tbody>
</table>

**Emergency telephone number**

<table>
<thead>
<tr>
<th>Association / Organisation</th>
<th>Not Available</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emergency telephone numbers</td>
<td>+86 532-83889090</td>
</tr>
<tr>
<td>Other emergency telephone numbers</td>
<td>+86 535-8203123</td>
</tr>
</tbody>
</table>

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## SECTION 2 HAZARDS IDENTIFICATION

### Classification of the substance or mixture

**SUMMARY OF HAZARD IN AN EMERGENCY SITUATION**

- Liquid.
- Does not mix with water. Flammable.
- Harmful by inhalation.
- May cause SENSITISATION by inhalation.
- May cause SENSITISATION by skin contact.
- Vapours may cause drowsiness and dizziness.
- Repeated exposure may cause skin dryness and cracking.

**Classification**[^1]

- Skin Corrosion/Irritation Category 3
- Eye Irritation Category 2B
- Acute Toxicity (Oral) Category 5
- Acute Toxicity (Dermal) Category 5
- Acute Toxicity (Inhalation) Category 4
- Skin Sensitizer Category 1
- Respiratory Sensitizer Category 1
- Specific target organ toxicity - single exposure Category 3 (narcotic effects)
- Flammable Liquid Category 3

**Legend:**


### Label elements

**Hazard pictogram(s)**

![Hazard Pictograms]

**SIGNAL WORD**

DANGER

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[^1]: Classification [1] Skin Corrosion/Irritation Category 3, Eye Irritation Category 2B, Acute Toxicity (Oral) Category 5, Acute Toxicity (Dermal) Category 5, Acute Toxicity (Inhalation) Category 4, Skin Sensitizer Category 1, Respiratory Sensitizer Category 1, Specific target organ toxicity - single exposure Category 3 (narcotic effects), Flammable Liquid Category 3
Hazard statement(s)

- **H316** Causes mild skin irritation.
- **H320** Causes eye irritation.
- **H303** May be harmful if swallowed.
- **H313** May be harmful in contact with skin.
- **H322** Harmful if inhaled.
- **H317** May cause an allergic skin reaction.
- **H332** May cause harm to the eyes.
- **H334** May cause allergy or asthma symptoms or breathing difficulties if inhaled.
- **H336** May cause drowsiness or dizziness.
- **H326** Flammable liquid and vapour.

Precautionary statement(s) Prevention

- **P210** Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
- **P261** Avoid breathing mist/vapours/spray.
- **P271** Use only outdoors or in a well-ventilated area.
- **P280** Wear protective gloves/protective clothing/eye protection/face protection.
- **P284** [In case of inadequate ventilation] wear respiratory protection.
- **P240** Ground/bond container and receiving equipment.
- **P241** Use explosion-proof electrical/ventilating/lighting/intrinsically safe equipment.
- **P242** Use only non-sparking tools.
- **P243** Take precautionary measures against static discharge.
- **P272** Contaminated work clothing should not be allowed out of the workplace.

Precautionary statement(s) Response

- **P304+P340** IF INHALED: Remove person to fresh air and keep comfortable for breathing.
- **P312** Call a POISON CENTER/doctor/physician/first aider if you feel unwell.
- **P342+P311** IF INHALED: Call a POISON CENTER/doctor/physician/first aider.
- **P370+P378** In case of fire: Use alcohol resistant foam or normal protein foam to extinguish.
- **P305+P351+P338** IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
- **P333+P313** IF SKIN irritation or rash occurs: Get medical advice/attention.
- **P337+P313** IF eye irritation persists: Get medical advice/attention.
- **P362+P364** Take off contaminated clothing and wash it before reuse.
- **P303+P361+P353** IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.

Precautionary statement(s) Storage

- **P403+P235** Store in a well-ventilated place. Keep cool.
- **P405** Store locked up.

Precautionary statement(s) Disposal

- **P501** Dispose of contents/container in accordance with local regulations.

Physical and Chemical Hazard

**Liquid.**
- Does not mix with water.
- Flammable.
- Toxic smoke/fumes in a fire.
- Reacts with water.

Health Hazards

**Inhaled**
- Inhalation of vapours or aerosols (mists, fumes), generated by the material during the course of normal handling, may be harmful.
- The material is not thought to produce respiratory irritation (as classified by EC Directives using animal models). Nevertheless inhalation of vapours, fumes or aerosols, especially for prolonged periods, may produce respiratory discomfort and occasionally, distress.
- Inhalation of vapours may cause drowsiness and dizziness. This may be accompanied by narcosis, reduced alertness, loss of reflexes, lack of coordination and vertigo.
- The vapour/mist may be highly irritating to the upper respiratory tract and lungs; the response may be severe enough to produce bronchitis and pulmonary oedema. Possible neurological symptoms arising from isocyanate exposure include headache, insomnia, euphoria, ataxia, anxiety neurosis, depression and paranoiac. Gastrointestinal disturbances are characterised by nausea and vomiting. Pulmonary sensitisation may produce asthmatic reactions ranging from minor breathing difficulties to severe allergic attack; this may occur following a single acute exposure or may develop without warning for several hours after exposure. Sensitized people can react to very low doses, and should not be allowed to work in situations allowing exposure to this material. Continued exposure of sensitised persons may lead to possible long term respiratory impairment.
- Inhalation hazard is increased at higher temperatures.

**Ingestion**
- Accidental ingestion of the material may be harmful; animal experiments indicate that ingestion of less than 150 gram may be fatal or may produce serious damage to the health of the individual.
SECTION 3 COMPOSITION / INFORMATION ON INGREDIENTS

Substances
See section below for composition of Mixtures

Mixtures

<table>
<thead>
<tr>
<th>CAS No</th>
<th>% [weight]</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>822-06-0</td>
<td>≤ 0.20</td>
<td>hexamethylene disocyanate</td>
</tr>
<tr>
<td>123-86-4</td>
<td>~ 25</td>
<td>n-butyl acetate</td>
</tr>
<tr>
<td>28182-81-2</td>
<td>~ 75</td>
<td>hexamethylene disocyanate polymer</td>
</tr>
</tbody>
</table>

SECTION 4 FIRST AID MEASURES

Continued...
### Description of first aid measures

<table>
<thead>
<tr>
<th>Eye Contact</th>
<th>If this product comes in contact with the eyes:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Wash out immediately with fresh running water.</td>
</tr>
<tr>
<td></td>
<td>Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids.</td>
</tr>
<tr>
<td></td>
<td>Seek medical attention without delay; if pain persists or recurs seek medical attention.</td>
</tr>
<tr>
<td></td>
<td>Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Skin Contact</th>
<th>If skin contact occurs:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Immediately remove all contaminated clothing, including footwear.</td>
</tr>
<tr>
<td></td>
<td>Flush skin and hair with running water (and soap if available).</td>
</tr>
<tr>
<td></td>
<td>Seek medical attention in event of irritation.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Inhalation</th>
<th>If fumes or combustion products are inhaled remove from contaminated area.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lay patient down. Keep warm and rested.</td>
</tr>
<tr>
<td></td>
<td>Prostheses such as false teeth, which may block airway, should be removed, where possible, prior to initiating first aid procedures.</td>
</tr>
<tr>
<td></td>
<td>Apply artificial respiration if not breathing, preferably with a demand valve resuscitator, bag-valve mask-device, or pocket mask as trained. Perform CPR if necessary.</td>
</tr>
<tr>
<td></td>
<td>Transport to hospital, or doctor.</td>
</tr>
<tr>
<td></td>
<td>Following uptake by inhalation, move person to an area free from risk of further exposure. Oxygen or artificial respiration should be administered as needed. Asthmatic-type symptoms may develop and may be immediate or delayed up to several hours. Treatment is essentially symptomatic. A physician should be consulted.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ingestion</th>
<th>If swallowed do NOT induce vomiting.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration.</td>
</tr>
<tr>
<td></td>
<td>Observe the patient carefully.</td>
</tr>
<tr>
<td></td>
<td>Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious.</td>
</tr>
<tr>
<td></td>
<td>Give water to rinse out mouth, then provide liquid slowly and as much as casualty can comfortably drink.</td>
</tr>
<tr>
<td></td>
<td>Seek medical advice.</td>
</tr>
</tbody>
</table>

### Advise for rescue team (PPE requirement for rescue personnel)

### Indication of any immediate medical attention and special treatment needed
Any material aspirated during vomiting may produce lung injury. Therefore emesis should not be induced mechanically or pharmacologically. Mechanical means should be used if it is considered necessary to evacuate the stomach contents; these include gastric lavage after endotracheal intubation. If spontaneous vomiting has occurred after ingestion, the patient should be monitored for difficult breathing, as adverse effects of aspiration into the lungs may be delayed up to 48 hours.

for simple esters:

BASIC TREATMENT

- Establish a patent airway with suction where necessary.
- Watch for signs of respiratory insufficiency and assist ventilation as necessary.
- Administer oxygen by non-rebreather mask at 10 to 15 L/min.
- Monitor and treat, where necessary, for pulmonary oedema.
- Monitor and treat, where necessary, for shock.

DO NOT use emetics. Where ingestion is suspected rinse mouth and give up to 200 ml water (5 ml/kg recommended) for dilution where patient is able to swallow, has a strong gag reflex and does not drool.
- Give activated charcoal.

ADVANCED TREATMENT

- Consider endotracheal or nasotracheal intubation for airway control in unconscious patient or where respiratory arrest has occurred.
- Positive pressure ventilation using a bag-valve mask might be of use.
- Start an IV D5W TKO. If signs of hypovolaemia are present use lactated Ringers solution. Fluid overload might create complications.
- Drug therapy should be considered for pulmonary oedema.
- Hypotension with signs of hypovolaemia requires the cautious administration of fluids. Fluid overload might create complications.
- Treat seizures with diazepam.
- Proparacaine hydrochloride should be used to assist eye irrigation.

EMERGENCY DEPARTMENT

- Laboratory analysis of complete blood count, serum electrolytes, BUN, creatinine, glucose, urinalysis, baseline for serum aminotransferases (ALT and AST), calcium, phosphorus and magnesium, may assist in establishing a treatment regime. Other useful analyses include anion and osmolar gaps, arterial blood gases (ABGs), chest radiographs and electrocardiograph.
- Positive end-expiratory pressure (PEEP)-assisted ventilation may be required for acute parenchymal injury or adult respiratory distress syndrome.
- Consult a toxicologist as necessary.

BRONSTEIN, A.C. and CURRANCE, P.L. EMERGENCY CARE FOR HAZARDOUS MATERIALS EXPOSURE: 2nd Ed. 1994

For sub-chronic and chronic exposures to isocyanates:

- This material may be a potent pulmonary sensitizer which causes bronchospasm even in patients without prior airway hyperreactivity.
- Clinical symptoms of exposure involve mucosal irritation of respiratory and gastrointestinal tracts.
- Conjunctival irritation, skin inflammation (erythema, pain vesiculation) and gastrointestinal disturbances occur soon after exposure.
- Pulmonary symptoms include cough, burning, substernal pain and dyspnoea.
- Some cross-sensitivity occurs between different isocyanates.
- Noncardiogenic pulmonary oedema and bronchospasm are the most serious consequences of exposure. Markedly symptomatic patients should receive oxygen, ventilatory support and an intravenous line.
- Treatment for asthma includes inhaled sympathomimetics (epinephrine [adrenaline], terbutaline) and steroids.
- Activated charcoal (1 g/kg) and a cathartic (sorbitol, magnesium citrate) may be useful for ingestion.
- Mydriatics, systemic analgesics and topical antibiotics (Sulamyd) may be used for corneal abrasions.
- There is no effective therapy for sensitised workers.

NOTE: Isocyanates cause airway restriction in naive individuals with the degree of response dependant on the concentration and duration of exposure. They induce smooth muscle contraction which leads to bronchoconstrictive episodes. Acute changes in lung function, such as decreased FEV1, may not represent sensitivity.

[Karol & Jin, Frontiers in Molecular Toxicology, pp 56-61, 1992]

Personnel who work with isocyanates, isocyanate prepolymers or polyisocyanates should have a pre-placement medical examination and periodic examinations thereafter, including a pulmonary function test. Anyone with a medical history of chronic respiratory disease, asthmatic or bronchial attacks, indications of allergic responses, recurrent eczema or sensitisation conditions of the skin should not handle or work with isocyanates. Anyone who develops chronic respiratory distress when working with isocyanates should be removed from exposure and examined by a physician.

Further exposure must be avoided if a sensitivity to isocyanates or polyisocyanates has developed.

SECTION 5 FIREFIGHTING MEASURES

Extinguishing media

- Small quantities of water in contact with hot liquid may react violently with generation of a large volume of rapidly expanding hot sticky semi-solid foam.
- Presents additional hazard when fire fighting in a confined space.
- Cooling with flooding quantities of water reduces this risk.
- Water spray or fog may cause frothing and should be used in large quantities.
- Dry chemical powder.
- BCF (where regulations permit).
- Carbon dioxide.

Special hazards arising from the substrate or mixture

Fire Incompatibility

- Avoid contamination with oxidising agents i.e. nitrates, oxidising acids, chlorine bleaches, pool chlorine etc. as ignition may result.

Advice for firefighters

Fire Fighting

- Liquid and vapour are flammable.
- Moderate fire hazard when exposed to heat or flame.
- Vapour forms an explosive mixture with air.
- Moderate explosion hazard when exposed to heat or flame.
- Vapour may travel a considerable distance to source of ignition.
- Heating may cause expansion or decomposition leading to violent eruption of containers.
- On combustion, may emit toxic fumes of carbon monoxide (CO).

Combustion products include:
- carbon dioxide (CO2)
- carbon monoxide (CO)
- isocyanates

Fire/Explosion Hazard
SECTION 6 ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

See section 8

Measures for Preventing Secondary Contamination

Refer to section above

Environmental precautions

See section 12

Methods and material for containment and cleaning up

Minor Spills

- Remove all ignition sources.
- Clean up all spills immediately.
- Avoid breathing vapours and contact with skin and eyes.
- Control personal contact with the substance, by using protective equipments.
- Contain and absorb small quantities with vermiculite or other absorbent material.
- Wipe up.
- Collect residues in a flammable waste container.

- Clear area of personnel and move upwind.
- Alert Fire Brigade and tell them location and nature of hazard.
- Wear breathing apparatus plus protective gloves.
- Prevent, by any means available, spillage from entering drains or water course.
- Stop leak if safe to do so.
- Contain spill with sand, earth or vermiculite.
- Collect recoverable product into labelled containers for recycling.
- Neutralise/decontaminate residue (see Section 13 for specific agent).
- Collect solid residues and seal in labelled drums for disposal.
- Wash area and prevent runoff into drains.
- If contamination of drains or waterways occurs, advise emergency services.

Major Spills

For release onto land: recommended sorbents listed in order of priority.

<table>
<thead>
<tr>
<th>SORBENT TYPE</th>
<th>RANK</th>
<th>APPLICATION</th>
<th>COLLECTION</th>
<th>LIMITATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAND SPILL - SMALL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>cross-linked polymer - particulate</td>
<td>1</td>
<td>shovel</td>
<td>shovel</td>
<td>R, W, SS</td>
</tr>
<tr>
<td>cross-linked polymer - pillow</td>
<td>1</td>
<td>throw</td>
<td>pitchfork</td>
<td>R, DGC, RT</td>
</tr>
<tr>
<td>sorbent clay - particulate</td>
<td>2</td>
<td>shovel</td>
<td>shovel</td>
<td>R, I, P</td>
</tr>
<tr>
<td>wood fiber - particulate</td>
<td>3</td>
<td>shovel</td>
<td>shovel</td>
<td>R, W, P, DGC</td>
</tr>
<tr>
<td>wood fiber - pillow</td>
<td>3</td>
<td>throw</td>
<td>pitchfork</td>
<td>R, P, DGC, RT</td>
</tr>
<tr>
<td>treated wood fiber - pillow</td>
<td>3</td>
<td>throw</td>
<td>pitchfork</td>
<td>DGC, RT</td>
</tr>
</tbody>
</table>

Legend

DGC: Not effective where ground cover is dense
R: Not reusable
I: Not incinerable
P: Effectiveness reduced when rainy
RT: Not effective where terrain is rugged
SS: Not for use within environmentally sensitive sites
W: Effectiveness reduced when windy

Reference: Sorbents for Liquid Hazardous Substance Cleanup and Control; R.W Melvold et al: Pollution Technology Review No. 150: Noyes Data Corporation 1988

- Liquid isocyanates and high isocyanate vapour concentrations will penetrate seals on self contained breathing apparatus - SCBA should be used inside encapsulating suit where this exposure may occur.
For isocyanate spills of less than 40 litres (2 m²):

- Evacuate area from everybody not dealing with the emergency, keep them upwind and prevent further access, remove ignition sources and, if inside building, ventilate area as well as possible.
- Notify supervision and others as necessary.
- Put on personal protective equipment (suitable respiratory protection, face and eye protection, protective suit, gloves and impermeable boots).
- Control source of leakage (where applicable).
- Dike the spill to prevent spreading and to contain additions of decontaminating solution.
- Prevent the material from entering drains.
- Estimate spill pool volume or area.
- Absorb and decontaminate. - Completely cover the spill with wet sand, wet earth, vermiculite or other similar absorbent. - Add neutraliser (for suitable formulations: see below) to the absorbent materials (equal to that of estimated spill pool volume). Intensively contact between spill, absorbent and neutraliser by carefully mixing with a rake and allow to react for 15 minutes.
- Shovel absorbent/decontaminant solution mixture into a steel drum.
- Decontaminate surface. - Pour an equal amount of neutraliser solution over contaminated surface. - Scrape skin with a stiff bristle brush, using moderate pressure. - Completely cover decontaminant with vermiculite or other similar absorbent. - After 5 minutes, shovel absorbent/decontamination solution mixture into the same steel drum used above.
- Monitor for residual isocyanate. If surface is decontaminated, proceed to next step. If contamination persists, repeat decontamination procedure immediately above.
- Place tightly covered drum (release of carbon dioxide) outside for at least 72 hours. Label waste-containing drum appropriately. Remove waste materials for incineration.
- Decontaminate and remove personal protective equipment.
- Return to normal operation.
- Conduct accident investigation and consider measures to prevent reoccurrence.

Decontamination:
Treat isocyanate spills with sufficient amounts of isocyanate decontaminant preparation (“neutralising fluid”). Isocyanates and polycyanates are generally not miscible with water. Liquid surfactants are necessary to allow better dispersion of isocyanate and neutralising fluids/ preparations. Alkaline neutralisers react faster than water/surfactant mixtures alone. Typically, such a preparation may consist of:

- Sawdust: 20 parts by weight Kieselguhr 40 parts by weight plus a mixture of (ammonia (s.g. 0.880) 8% v/v non-ionic surfactant 2% v/v water 90% v/v). Let stand for 24 hours
- Three commonly used neutralising fluids each exhibit advantages in different situations.
  - Formulation A:
    - liquid surfactant: 0.2-2%
    - sodium carbonate: 5-10%
    - water: 100%
  - Formulation B:
    - liquid surfactant: 0.2-2%
    - concentrated ammonia: 3-8%
    - water: 100%
  - Formulation C:
    - ethanol, isopropanol or butanol: 50%
    - concentrated ammonia: 5%
    - water: 100%

After application of any of these formulae, let stand for 24 hours.

Formulation B reacts faster than Formulation A. However, ammonia-based neutralisers should be used only under well-ventilated conditions to avoid overexposure to ammonia or if members of the emergency team wear suitable respiratory protection. Formulation C is especially suitable for cleaning of equipment from unreacted isocyanate and neutralizing under freezing conditions. Regard has to be taken to the flammability of the alcoholic solution.

- Avoid contamination with water, alkalis and detergent solutions.
- Material reacts with water and generates gas, pressurises containers with even drum rupture resulting.
- **DO NOT** reseal container if contamination is suspected.
- **DO** keep containers properly closed.

Personal Protective Equipment advice is contained in Section 8 of the SDS.

### SECTION 7 HANDLING AND STORAGE

**Precautions for safe handling**

- Containers, even those that have been emptied, may contain explosive vapours.
- **DO NOT** cut, drill, grind, weld or perform similar operations on or near containers.
- Avoid all personal contact, including inhalation.
- Wear protective clothing when risk of overexposure occurs.
- Use in a well-ventilated area.
- Prevent concentration in hollows and sumps.
- **DO NOT** enter confined spaces until atmosphere has been checked.
- Avoid smoking, naked lights or ignition sources.
- Avoid generation of static electricity.
- **DO NOT** use plastic buckets.
- Earth all lines and equipment.
- Use spark-free tools when handling.
- Avoid contact with incompatible materials.
- When handling, **DO NOT** eat, drink or smoke.
- Keep containers securely sealed when not in use.
- Avoid physical damage to containers.
- Always wash hands with soap and water after handling.
- Work clothes should be laundered separately.
- Use good occupational work practice.
- Observe manufacturer's storage and handling recommendations contained within this SDS.
- Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions.
- **DO NOT** allow clothing wet with material to stay in contact with skin

**Safe handling**

- Store in original containers in approved flammable liquid storage area.
- Store away from incompatible materials in a cool, dry, well-ventilated area.
- **DO NOT** store in pits, depressions, basements or areas where vapours may be trapped.
No smoking, naked lights, heat or ignition sources.
Storage areas should be clearly identified, well illuminated, clear of obstruction and accessible only to trained and authorised personnel - adequate security must be provided so that unauthorised personnel do not have access.
Store according to applicable regulations for flammable materials for storage tanks, containers, piping, buildings, rooms, cabinets, allowable quantities and minimum storage distances.
Use non-sparking ventilation systems, approved explosion proof equipment and intrinsically safe electrical systems.
Have appropriate extinguishing capability in storage area (e.g. portable fire extinguishers - dry chemical, foam or carbon dioxide) and flammable gas detectors.
Keep adsorbs for leaks and spills readily available.
Protect containers against physical damage and check regularly for leaks.
Observe manufacturer's storage and handling recommendations contained within this SDS.
In addition, for tank storages (where appropriate):
Store in grounded, properly designed and approved vessels and away from incompatible materials.
For bulk storages, consider use of floating roof or nitrogen blanketed vessels; where venting to atmosphere is possible, equip storage tank vents with flame arrestors; inspect tank vents during winter conditions for freeze-out / ice build-up.
Storage tanks should be above ground and aild to hold entire contents.
for commercial quantities of isocyanates:
Isocyanates should be stored in adequately bunded areas. Nothing else should be kept within the same bunding. Pre-polymers need not be segregated.
Drums of isocyanates should be stored under cover, out of direct sunlight, protected from rain, protected from physical damage and well away from moisture, acids and alkalis.
Where isocyanates are stored at elevated temperatures to prevent solidifying, adequate controls should be installed to prevent the high temperatures and precautions against fire should be taken.
Reacts violently in tanks, the more reactive isocyanates should be blanketed with a non-reactive gas such as nitrogen and equipped with absorptive type breather valve (to prevent vapour emissions).
Transfer systems for isocyanates in bulk storage should be fully enclosed and use pump or vacuum systems. Warning signs, in appropriate languages, should be posted where necessary.
Areas in which polyurethane foam products are stored should be supplied with good general ventilation. Residual amounts of unreacted isocyanate may be present in the finished foam, resulting in hazardous atmospheric concentrations.

**Conditions for safe storage, including any incompatibilities**

<table>
<thead>
<tr>
<th>Suitable container</th>
</tr>
</thead>
<tbody>
<tr>
<td>Packing as supplied by manufacturer.</td>
</tr>
<tr>
<td>Plastic containers may only be used if approved for flammable liquid.</td>
</tr>
<tr>
<td>Check that containers are clearly labelled and free from leaks.</td>
</tr>
<tr>
<td>For low viscous materials (i) : Drums and Jerry cans must be of the non-removable head type. (ii) : Where a can is to be used as an inner package, the can must have a screwed enclosure.</td>
</tr>
<tr>
<td>For materials with a viscosity of at least 2680 cSt. (23 deg. C):</td>
</tr>
<tr>
<td>For manufactured product having a viscosity of at least 250 cSt. (23 deg. C):</td>
</tr>
<tr>
<td>Manufactured product that requires stirring before use and having a viscosity of at least 20 cSt (25 deg. C):</td>
</tr>
<tr>
<td>Removable head packaging; (ii) Cans with friction closures and (iii) low pressure tubes and cartridges may be used.</td>
</tr>
<tr>
<td>Where combination packages are used, and the inner packages are of glass, there must be sufficient inert cushioning material in contact with inner and outer packages.</td>
</tr>
<tr>
<td>In addition, where inner packagings are glass and contain liquids of packing group I there must be sufficient inert absorbent to absorb any spillage, unless the outer packaging is a close fitting moulded plastic box and the substances are not incompatible with the plastic.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>n-Butyl acetate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reacts with water on standing to form acetic acid and n-butyl alcohol</td>
</tr>
<tr>
<td>Reacts violently with strong oxidisers and potassium tert-butoxide</td>
</tr>
<tr>
<td>Is incompatible with caustics, strong acids and nitrates</td>
</tr>
<tr>
<td>Dissolves rubber, many plastics, resins and some coatings</td>
</tr>
<tr>
<td>Avoid cross contamination between the two liquid parts of product (kit).</td>
</tr>
<tr>
<td>If two part products are mixed or allowed to mix in proportions other than manufacturer's recommendation, polymerisation with gelation and evolution of heat (exotherm) may occur.</td>
</tr>
<tr>
<td>This excess heat may generate toxic vapour</td>
</tr>
<tr>
<td>Esters react with alcohols to liberate heat along with alcohols and acids.</td>
</tr>
<tr>
<td>Strong oxidising acids may cause a vigorous reaction with esters that is sufficiently exothermic to ignite the reaction products.</td>
</tr>
<tr>
<td>Heat is also generated by the interaction of esters with caustic solutions.</td>
</tr>
<tr>
<td>Flammable hydrogen is generated by mixing esters with alkali metals and hydrides.</td>
</tr>
<tr>
<td>Esters may be incompatible with aliphatic amines and nitrates.</td>
</tr>
<tr>
<td>Avoid strong acids, bases.</td>
</tr>
<tr>
<td>Avoid reaction with water, alcohols and detergent solutions.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Storage incompatibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isocyanates and thiocyanocyanates are incompatible with many classes of compounds, reacting exothermically to release toxic gases. Reactions with amines, strong bases, alkalies, alcohols, alkali metals, ketones, mercaptans, strong oxidisers, hydrides, phenols, and peroxides can cause vigorous releases of heat. Acids and bases initiate polymerisation reactions in these materials.</td>
</tr>
<tr>
<td>Isocyanates easily form adducts with carbodiimides, isothiocyanates, ketones, or with substrates containing activated CC or CN bonds.</td>
</tr>
<tr>
<td>Some isocyanates react with water to form amines and liberate carbon dioxide. This reaction may also generate large volumes of foam and heat. Foaming in confined spaces may produce pressure in confined spaces or containers. Gas generation may pressurise drums to the point of rupture.</td>
</tr>
<tr>
<td>Do NOT reseal container if contamination is expected</td>
</tr>
<tr>
<td>Open all containers with care</td>
</tr>
<tr>
<td>Base-catalysed reactions of isocyanates with alcohols should be carried out in inert solvents. Such reactions in the absence of solvents often occur with explosive violence</td>
</tr>
<tr>
<td>Isocyanates will attack and embrittle some plastics and rubbers.</td>
</tr>
<tr>
<td>A range of exothermic decomposition energies for isocyanates is given as 20-30 kJ/mol.</td>
</tr>
<tr>
<td>The relationship between energy of decomposition and processing hazards has been the subject of discussion; it is suggested that values of energy released per unit of mass, rather than on a molar basis (J/g) be used in the assessment.</td>
</tr>
<tr>
<td>For example, in “open vessel processes” (with man-hole size openings, in an industrial setting), substances with exothermic decomposition energies below 500 J/g are unlikely to present a danger, whilst those in “closed vessel processes” (opening is a safety valve or bursting disk) present some danger where the decomposition energy exceeds 150 J/g.</td>
</tr>
</tbody>
</table>

**SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION**

**Control parameters**

| OCCUPATIONAL EXPOSURE LIMITS (OEL) | INGREDIENT DATA |

Continued...
Exposure controls

Engineering controls are used to remove a hazard or place a barrier between the worker and the hazard. Well-designed engineering controls can be highly effective in protecting workers and will typically be independent of worker interactions to provide this high level of protection.

The basic types of engineering controls are:
- Process controls which involve changing the way a job activity or process is done to reduce the risk.
- Enclosure and/or isolation of emission source which keeps a selected hazard “physically” away from the worker and ventilation that strategically “adds” and “removes” air in the work environment. Ventilation can remove or dilute an air contaminant if designed properly. The design of a ventilation system must match the particular process and chemical or contaminant in use.
- Employers may need to use multiple types of controls to prevent employee overexposure.

For flammable liquids and flammable gases, local exhaust ventilation or a process enclosure ventilation system may be required. Ventilation equipment should be explosion resistant.

Spraying of material or material in admixture with other components must be carried out in conditions conforming to local state regulations. Local exhaust ventilation with full face air supplied breathing apparatus (hood or helmet type) is normally required. Unprotected personnel must vacate spraying area.

**NOTE:** Isocyanate vapours will not be adequately absorbed by organic vapour respirators. Air contaminants generated in the workplace possess varying “escape” velocities which, in turn, determine the “capture velocities” of fresh circulating air required to effectively remove the contaminant.

<table>
<thead>
<tr>
<th>Type of Contaminant:</th>
<th>Air Speed:</th>
</tr>
</thead>
<tbody>
<tr>
<td>direct spray, spray painting in shallow booths, drum filling, conveyor loading, crusher dusts, gas discharge (active generation into zone of rapid air motion)</td>
<td>1-2.5 m/s (200-500 f/min.)</td>
</tr>
</tbody>
</table>

Within each range the appropriate value depends on:

1. Room air currents minimal or favourable to capture
2. Contaminants of low toxicity or of nuisance value only
3. Intermittent, low production.
4. Large hood or large air mass in motion

Simple theory shows that air velocity falls rapidly with distance away from the opening of a simple extraction pipe. Velocity generally decreases with the square of distance from the extraction point should be adjusted, accordingly, after reference from the contaminating source. The air velocity at the extraction fan, for example, should be a minimum of 4-10 m/s (800-2000 f/min.) for extraction of solvents generated by spraying at a point 2 meters distant from the extraction point. Other mechanical considerations, producing performance deficits within the extraction apparatus, make it essential that theoretical air velocities are multiplied by factors of 10 or more when extraction systems are installed or used.
All processes in which isocyanates are used should be enclosed wherever possible.

- Total enclosure, accompanied by good general ventilation, should be used to keep atmospheric concentrations below the relevant exposure standards.
- If total enclosure of the process is not feasible, local exhaust ventilation may be necessary. Local exhaust ventilation is essential where lower molecular weight isocyanates (such as TDI or HDI) is used or where isocyanate or polyurethane is sprayed.
- Where other isocyanates or pre-polymers are used and aerosol formation cannot occur, local exhaust ventilation may not be necessary if the atmospheric concentration can be kept below the relevant exposure standards.
- Where local exhaust ventilation is installed, exhaust vapours should not be vented to the exterior in such a manner as to create a hazard.

### Personal protection

- Safety glasses with side shields.
- Chemical goggles.
- Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lenses or restrictions on use, should be created for each workplace or task. This should include a review of lens absorption and adhesion for the class of chemicals in use and an account of injury experience. Medical and first-aid personnel should be trained in their removal and suitable equipment should be readily available. In the event of chemical exposure, begin eye irrigation immediately and remove contact lens as soon as practicable. Lens should be removed at the first signs of eye redness or irritation - lens should be removed in a clean environment only after workers have washed hands thoroughly. [CDC NIOSH Current Intelligence Bulletin 59, AS/NZS 1306 or national equivalent]

### Hands/feet protection

- Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturiser is recommended.
- It should be emphasised that glove thickness is not necessarily a good predictor of glove resistance to a specific chemical, as the permeation efficiency of the glove will be dependent on the exact composition of the glove material. Therefore, glove selection should also be based on consideration of the task requirements and knowledge of breakthrough times.
- The selection of suitable gloves does not only depend on the material, but also on further marks of quality which vary from manufacturer to manufacturer. Where the chemical is a preparation of several substances, the resistance of the glove material can not be calculated in advance and has therefore to be checked prior to the application.
- The exact break through time for substances has to be obtained from the manufacturer of the protective gloves and has to be observed when making a final choice.
- Personal hygiene is a key element of effective hand care. Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturiser is recommended.

#### Hands/feet protection

- **Safety glasses with side shields.**
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### Skin protection

- **See Hand protection below**

### Eye and face protection

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### Body protection

- **See Other protection below**

### Other protection

- **All employees working with isocyanates must be informed of the hazards from exposure to the contaminant and the precautions necessary to prevent damage to their health. They should be made aware of the need to carry out their work so that as little contamination as possible is produced, and of the importance of the proper use of all safeguards against exposure to themselves and their fellow workers. Adequate training, both in the proper execution of the task and in the use of all associated engineering controls, as well as of any personal protective equipment, is essential.**
- **Employees exposed to contamination hazards should be educated in the need for, and proper use of, facilities, clothing and equipment and thereby maintain a high standard of personal cleanliness. Special attention should be given to ensuring that all personnel understand instructions, especially newly recruited employees and those with local-language difficulties, where they are known.**

#### Hands/feet protection

- **Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturiser is recommended.**
- **Do NOT wear natural rubber (latex gloves).**
- **Isocyanate resistant materials include Teflon, Tilon, nitrile rubber and some PVA gloves.**
- **Protective gloves and overalls should be worn as specified in the appropriate national standard.**
- **Contaminated garments should be removed promptly and should not be re-used until they have been decontaminated.**
- **NOTE: Natural rubber, neoprene, PVC can be affected by isocyanates.**
- **DO NOT use skin cream unless necessary and then use only minimum amount.**
- **Isocyanate vapour may be absorbed into skin cream and this increases hazard.**

#### Skin protection

- **See Hand protection below**

#### Eye and face protection

- **Safety glasses with side shields.**
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- **Isocyanate vapour may be absorbed into skin cream and this increases hazard.**
electricity from the body to reduce the possibility of ignition of volatile compounds. Electrical resistance must range between 0 to 500,000 ohms. Conductive shoes should be stored in lockers close to the room in which they are worn. Personnel who have been issued conductive footwear should not wear them from their place of work to their homes and return.

### Recommended material(s)

**GLOVE SELECTION INDEX**

Glove selection is based on a modified presentation of the: "Forsberg Clothing Performance Index". The effect(s) of the following substance(s) are taken into account in the computer-generated selection: WANNATE® HT-75B

<table>
<thead>
<tr>
<th>Material</th>
<th>CPI</th>
</tr>
</thead>
<tbody>
<tr>
<td>BUTYL</td>
<td>C</td>
</tr>
<tr>
<td>BUTYLNOPRENE</td>
<td>C</td>
</tr>
<tr>
<td>HYPRALON</td>
<td>C</td>
</tr>
<tr>
<td>NATURAL RUBBER</td>
<td>C</td>
</tr>
<tr>
<td>NEOPRENE</td>
<td>C</td>
</tr>
<tr>
<td>NEOPRENE/NATURAL</td>
<td>C</td>
</tr>
<tr>
<td>NITRILE</td>
<td>C</td>
</tr>
<tr>
<td>NITRILE+PVC</td>
<td>C</td>
</tr>
<tr>
<td>PE</td>
<td>C</td>
</tr>
<tr>
<td>PE/EVAL/PE</td>
<td>C</td>
</tr>
<tr>
<td>PVA</td>
<td>C</td>
</tr>
<tr>
<td>PVC</td>
<td>C</td>
</tr>
<tr>
<td>SARANEX-23</td>
<td>C</td>
</tr>
<tr>
<td>TEFION</td>
<td>C</td>
</tr>
<tr>
<td>VITON/BUTYL</td>
<td>C</td>
</tr>
</tbody>
</table>

* CPI - Chemwatch Performance Index
  A: Best Selection
  B: Satisfactory; may degrade after 4 hours continuous immersion
  C: Poor to Dangerous Choice for other than short term immersion

**NOTE:** As a series of factors will influence the actual performance of the glove, a final selection must be based on detailed observation.

* *Where the glove is to be used on a short term, casual or infrequent basis, factors such as "feel" or convenience (e.g. disposability), may dictate a choice of gloves which might otherwise be unsuitable following long-term or frequent use. A qualified practitioner should be consulted.

### SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties:

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relative density (Water = 1)</td>
<td>1.08 g/cm³ (25 °C)</td>
</tr>
<tr>
<td>Partition coefficient n-octanol / water</td>
<td>Not Available</td>
</tr>
<tr>
<td>Auto-ignition temperature (°C)</td>
<td>Not Available</td>
</tr>
<tr>
<td>Decomposition temperature</td>
<td>Not Available</td>
</tr>
<tr>
<td>Molecular weight (g/mol)</td>
<td>Not Available</td>
</tr>
<tr>
<td>Taste</td>
<td>Not Available</td>
</tr>
<tr>
<td>Explosive properties</td>
<td>Not Available</td>
</tr>
<tr>
<td>Oxidising properties</td>
<td>Not Available</td>
</tr>
<tr>
<td>Surface Tension (dyn/cm or mN/m)</td>
<td>Not Available</td>
</tr>
<tr>
<td>Lower Explosive Limit (%)</td>
<td>Not Available</td>
</tr>
<tr>
<td>Volatile Component (%vol)</td>
<td>Not Available</td>
</tr>
<tr>
<td>Gas group</td>
<td>Not Available</td>
</tr>
<tr>
<td>Immiscible</td>
<td>Not Available</td>
</tr>
<tr>
<td>pH as a solution (1%)</td>
<td>Not Available</td>
</tr>
<tr>
<td>VOC g/L</td>
<td>Not Available</td>
</tr>
</tbody>
</table>

### SECTION 10 STABILITY AND REACTIVITY

**Reactivity**

See section 7
### SECTION 11 TOXICOLOGICAL INFORMATION

#### WANNATE® HT-75B

<table>
<thead>
<tr>
<th>Chemical stability</th>
<th>Possibility of hazardous reactions</th>
<th>Conditions to avoid</th>
<th>Incompatible materials</th>
<th>Hazardous decomposition products</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unstable in the presence of incompatible materials.</td>
<td>See section 7</td>
<td>See section 7</td>
<td>See section 7</td>
</tr>
<tr>
<td></td>
<td>Product is considered stable.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hazardous polymerisation will not occur.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### hexamethylene diisocyanate

<table>
<thead>
<tr>
<th>TOXICITY</th>
<th>IRRITATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dermal (rabbit) LD50: 570 mg/kg&lt;sup&gt;[1]&lt;/sup&gt;</td>
<td>Not Available</td>
</tr>
<tr>
<td>Inhalation (rat) LC50: 6E-5 mg/L/4h&lt;sup&gt;[2]&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>Oral (rat) LD50: 738 mg/kg&lt;sup&gt;[2]&lt;/sup&gt;</td>
<td></td>
</tr>
</tbody>
</table>

#### n-butyl acetate

<table>
<thead>
<tr>
<th>TOXICITY</th>
<th>IRRITATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dermal (rabbit) LD50: 3200 mg/kg&lt;sup&gt;[2]&lt;/sup&gt;</td>
<td>Eye (human): 300 mg</td>
</tr>
<tr>
<td>Inhalation (rat) LC50: 1.802 mg/L&lt;sub&gt;4&lt;/sub&gt;&lt;sup&gt;[1]&lt;/sup&gt;</td>
<td>Eye (rabbit): 20 mg (open) - SEVERE</td>
</tr>
<tr>
<td>Oral (rat) LD50: 10768 mg/kg&lt;sup&gt;[2]&lt;/sup&gt;</td>
<td>Eye (rabbit): 20 mg/24h - moderate</td>
</tr>
<tr>
<td></td>
<td>Skin (rabbit): 500 mg/24h - moderate</td>
</tr>
</tbody>
</table>

#### hexamethylene diisocyanate polymer

<table>
<thead>
<tr>
<th>TOXICITY</th>
<th>IRRITATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dermal (rabbit) LD50: &gt;5000 mg/kg&lt;sup&gt;[2]&lt;/sup&gt;</td>
<td>Skin (rabbit): 500 mg - moderate</td>
</tr>
<tr>
<td>Inhalation (rat) LC50: 0.004625 mg/L/4h&lt;sup&gt;[2]&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>Oral (rat) LD50: &gt;10000 mg/kg&lt;sup&gt;[2]&lt;/sup&gt;</td>
<td></td>
</tr>
</tbody>
</table>

**Legend:**
1. Value obtained from Europe ECHA Registered Substances - Acute toxicity
2. Value obtained from manufacturer’s SDS. Unless otherwise specified data extracted from RTECS - Register of Toxic Effect of chemical Substances

#### HEXAMETHYLENE DIISOCYANATE

Asthma-like symptoms may continue for months or even years after exposure to the material ceases. This may be due to a non-allergic condition known as reactive airways dysfunction syndrome (RADS) which can occur following exposure to high levels of highly irritating compound. Key criteria for the diagnosis of RADS include the absence of preceding respiratory disease, in a non-atopic individual, with abrupt onset of persistent asthma-like symptoms in minutes to hours of a documented exposure to the irritant. A reversible airflow pattern, on spirometry, with the presence of moderate to severe bronchial hyperreactivity on methacholine challenge testing and the lack of minimal lymphocytic inflammation, without eosinophilia, have been also included in the criteria for diagnosis of RADS. RADS (or asthma) following an irritating inhalation is an infrequent disorder with rates related to the concentration of and duration of exposure to the irritating substance. Industrial bronchitis, on the other hand, is a disorder that occurs as result of exposure due to high concentrations of irritating substance (often particulate in nature) and is completely reversible after exposure ceases. The disorder is characterised by dyspnea, cough and mucus production.

For 1,6-hexamethylene diisocyanate:

Exposures to HDI are often associated with exposures to its prepolymers, especially to a trimeric biuretic prepolymer of HDI (HDI-BT), which is widely used as a hardener in automobile and airplane paints, and which typically contains 0.5-1% unreacted HDI. There is evidence that diisocyanate prepolymers may induce asthma at the same or greater frequency as the monomers; therefore, there is a need to assess the potential for human exposure to prepolymeric HDI as well as monomeric HDI.

1,6-Hexamethylene diisocyanate is corrosive to the skin and the eye.

1,6-Hexamethylene diisocyanate was found to induce dermal and respiratory sensitization in animals and humans. There is no threshold known for this effect.

Inhalation studies with repeated exposures to 1,6-hexamethylene diisocyanate vapor show that the respiratory tract is the target with 1,6-hexamethylene diisocyanate showing primarily upper respiratory tract lesions (nasal cavity). 1,6-Hexamethylene diisocyanate did not show a neurotoxic effect in a combined reproduction/developmental/neurotoxicity study. Life-time inhalation exposure to rats revealed a progression of non-neoplastic respiratory tract lesions, primarily to the nasal cavity, and represented the sequelae of non-specific irritation. Based on the presence of only reversible tissue responses to irritation at the low concentration of 0.005 ppm, this concentration was a NOAEL. No carcinogenic potential in rats was observed after life-time inhalation.

1,6-Hexamethylene diisocyanate showed no mutagenic activity in vitro in bacterial and in mammalian cell test systems.

1,6-Hexamethylene diisocyanate showed no clastogenic activity in vivo.

1,6-Hexamethylene diisocyanate has no effect on fertility and post-natal viability through post-natal day 4 in the rat after inhalation up to 0.299 ppm. The overall NOEL was 0.005 ppm.

Inhalation of 1,6-hexamethylene diisocyanate during the pregnancy of rats produced maternal effects (nasal turbinate histopathology) at concentrations ≥ 0.052 ppm. No developmental toxicity was observed up to 0.308 ppm.

#### N-BUTYL ACETATE

The material may produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

#### HEXAMETHYLENE DIISOCYANATE POLYMER

The material may produce moderate eye irritation leading to inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

* Bayer SDS ** Ardex SDS
## SECTION 12 ECOLOGICAL INFORMATION

### Toxicity

<table>
<thead>
<tr>
<th>ENDPOINT</th>
<th>TEST DURATION (HR)</th>
<th>SPECIES</th>
<th>VALUE</th>
<th>SOURCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not Available</td>
<td>Not Available</td>
<td>Not Available</td>
<td>Not Available</td>
<td>Not Available</td>
</tr>
</tbody>
</table>

**Hexamethylene diisocyanate**

<table>
<thead>
<tr>
<th>ENDPOINT</th>
<th>TEST DURATION (HR)</th>
<th>SPECIES</th>
<th>VALUE</th>
<th>SOURCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>LC50</td>
<td>96</td>
<td>Fish</td>
<td>22mg/L</td>
<td>1</td>
</tr>
<tr>
<td>EC50</td>
<td>72</td>
<td>Algae or other aquatic plants</td>
<td>&gt;77.4mg/L</td>
<td>2</td>
</tr>
<tr>
<td>ECO</td>
<td>24</td>
<td>Crustacea</td>
<td>&lt;0.33mg/L</td>
<td>1</td>
</tr>
<tr>
<td>NOEC</td>
<td>72</td>
<td>Algae or other aquatic plants</td>
<td>11.7mg/L</td>
<td>2</td>
</tr>
</tbody>
</table>

**n-Butyl acetate**

<table>
<thead>
<tr>
<th>ENDPOINT</th>
<th>TEST DURATION (HR)</th>
<th>SPECIES</th>
<th>VALUE</th>
<th>SOURCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>LC50</td>
<td>96</td>
<td>Fish</td>
<td>18mg/L</td>
<td>4</td>
</tr>
<tr>
<td>EC50</td>
<td>48</td>
<td>Crustacea</td>
<td>&lt;0.2mg/L</td>
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<tr>
<td>EC50</td>
<td>72</td>
<td>Algae or other aquatic plants</td>
<td>&lt;674.7mg/L</td>
<td>1</td>
</tr>
<tr>
<td>ECO</td>
<td>192</td>
<td>Algae or other aquatic plants</td>
<td>&lt;21mg/L</td>
<td>1</td>
</tr>
</tbody>
</table>

**Hexamethylene diisocyanate polymer**

<table>
<thead>
<tr>
<th>ENDPOINT</th>
<th>TEST DURATION (HR)</th>
<th>SPECIES</th>
<th>VALUE</th>
<th>SOURCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not Available</td>
<td>Not Available</td>
<td>Not Available</td>
<td>Not Available</td>
<td>Not Available</td>
</tr>
</tbody>
</table>

**Legend:**

- Data available but does not fill the criteria for classification
- Data available to make classification
- Data Not Available to make classification

---

### Hexamethylene diisocyanate & Hexamethylene diisocyanate polymer

The following information refers to contact allergens as a group and may not be specific to this product.

Contact allergens quickly manifest themselves as contact eczema, more rarely as urticaria or Quincke’s oedema. The pathogenesis of contact eczema involves a cell-mediated (T lymphocytes) immune reaction of the delayed type. Other allergic skin reactions, e.g. contact urticaria, involve antibody-mediated immune reactions. The significance of the contact allergen is not simply determined by its sensitisation potential: the distribution of the substance and the opportunities for contact with it are equally important. A weakly sensitising substance which is widely distributed can be a more important allergen than one with stronger sensitising potential with which few individuals come into contact. From a clinical point of view, substances are noteworthy if they produce an allergic test reaction in more than 1% of the persons tested.

### Hexamethylene diisocyanate & Hexamethylene diisocyanate polymer

Allergic reactions which develop in the respiratory passages as bronchial asthma or rhinoconjunctivitis, are mostly the result of reactions of the allergen with specific antibodies of the IgE class and belong in their reaction rates to the manifestation of the immediate type. In addition to the allergen-specific potential for causing respiratory sensitisation, the amount of the allergen, the exposure period and the genetically determined disposition of the exposed person are likely to be decisive. Factors which increase the sensitivity of the mucosa may play a role in predisposing a person to allergy. They may be genetically determined or acquired, for example, during infections or exposure to irritant substances. Immunologically the low molecular weight substances become complete allergens in the organism either by binding to peptides or proteins (hapitens) or after metabolism (prohapitens).

### Hexamethylene diisocyanate & Hexamethylene diisocyanate polymer

Particular attention is drawn to so-called atopic diathesis which is characterised by an increased susceptibility to allergic rhinitis, allergic bronchial asthma and atopic eczema (neurodermatitis) which is associated with increased IgE synthesis. Isocyanate vapours/mists are irritating to the upper respiratory tract and lungs; the response may be severe enough to produce bronchitis with wheezing, gasping and severe distress, even sudden loss of consciousness, and pulmonary oedema. Possible neurological symptoms arising from isocyanate exposure include headache, insomnia, euphoria, ataxia, anxiety, depression and paranoia. Gastrointestinal disturbances are characterised by nausea and vomiting. Pulmonary sensitisation may produce asthmatic reactions ranging from minor breathing difficulties to severe allergic attacks; this may occur following a single acute exposure or may develop without warning after a period of tolerance. A respiratory response may occur following minor skin contact. Skin sensitisation is possible and may result in allergic dermatitis responses including rash, itching, hives and swelling of extremities. Isocyanate-containing vapours/mists may cause inflammation of eyes and nasal passages. Skinsensitised persons should not be allowed to work in situations allowing exposure to this material. The material may cause skin irritation after prolonged or repeated exposure and may produce a contact dermatitis (nonallergic). This form of dermatitis is often characterised by skin redness (erythema) and swelling the epidermis. Histologically there may be intercellular oedema of the spongy layer (spongiosis) and intracellular oedema of the epidermis.

### Hexamethylene diisocyanate & Hexamethylene diisocyanate polymer

Exogenous allergic aloësis is induced essentially by allergen specific immune-complexes of the IgG type; cell-mediated reactions (T lymphocytes) may be involved. Such allergy is of the delayed type with onset up to four hours following exposure.
for polyisocyanates:

Polyisocyanates are not readily biodegradable. However, due to other elimination mechanisms (hydrolysis, adsorption), long retention times in water are not to be expected. The resulting polyurea is more or less inert and, due to its molecular size, not bioavailable. Within the limits of water solubility, polyisocyanates have a low to moderate toxicity for aquatic organisms.

Hydrolysis would represent the primary fate mechanism for the majority of the commercial isocyanate monomers, but, is tempered somewhat by the lack of water solubility. In the absence of hydrolysis, sorption to solids (e.g., sludge and sediments) will be the primary mechanism of removal. Biodegradation is minimal for most compounds and volatilisation is negligible. Atmospheric degradation is not expected from air occurring by washout or dry deposition. Volatilisation from surface waters (e.g., lakes and rivers) is expected to take years. In wastewater treatment this process is not expected to be significant.

Review of the estimated properties of the isocyanates suggest that sorption is the primary removal mechanism in the ambient environment and in wastewater treatment in the absence of significant hydrolysis. Sorption to solids in wastewater treatment is considered strong to very strong for most compounds. Sorption to sediments and soils in the ambient environment is very strong in most instances. Migration to groundwater and surface waters is not expected due to sorption or hydrolysis. Hydrolysis of the N=C=O will occur in less than hours in most instances and within minutes for more than 90% of the commercial isocyanates. However, the low to very low solubility of these substances will generally lessen the effectiveness of hydrolysis as a fate pathway. But hydrolysis should be considered one of the two major fate processes for the isocyanates.

Aerobic and/or anaerobic biodegradation of the isocyanates is not expected to occur at significant levels. Most of the substances take several months to degrade.

Degradation of the hydrolysis products will occur at varying rates depending on the moiety formed.

For n-butyl acetate:

- Half-life (hr) air: 144
- Half-life (hr) H2O surface water: 178-27156
- Henry’s atm-m3/mol: 3.20E-04
- BOD 5 if unstated: 0.15-1.02
- COD: 78%
- THOD: 2.207
- BCF: 4.14

Environmental Fate:

TERRESTRIAL FATE: An estimated Koc value of 200 determined from a measured log Kow of 1.78 indicates that n-butyl acetate is expected to have moderate mobility in soil. Volatilisation of n-butyl acetate is expected from moist soil surfaces given its Henry’s Law constant of 2.8x10-4 atm-cu m/mole. Volatilisation from dry soil surfaces is expected based on a measured vapor pressure of 11.5 mm Hg. Using a standard BOD dilution technique and a sewage inoculum, theoretical BODs of 56 % to 86 % were observed during 5-20 day incubation periods, which suggests that n-butyl-acetate may biodegrade in soil.

AQUATIC FATE: An estimated Koc value indicates that n-butyl acetate is not expected to adsorb to suspended solids and sediment in water. Butyl acetate is expected to volatilise from water surfaces based on a Henry’s Law constant of 2.8x10-4 atm-cu m/mole. Estimated half-lives for a model river and model lake are 7 and 127, hours respectively. An estimated BCF value of 10 based on the log Kow, suggests that bioconcentration in aquatic organisms is low. Using a filtered sewage seed, 5-day and 20-day theoretical BODs of 40 % and 61 % were measured in salt water. A 5-day theoretical BOD of 56.8 % and 51.8 % were measured for n-butyl acetate in distilled water and seawater, respectively. Hydrolysis may be an important environmental fate for this compound based upon experimentally determined hydrolysis half-lives of 114 and 11 days at pH 8 and 9 respectively.

ATMOSPHERIC FATE: According to a model of gas/particle partitioning of semivolatile organic compounds in the atmosphere, n-butyl acetate, which has a vapour pressure of 11.5 mm Hg at 25 deg C, is expected to exist solely as a vapor in the ambient atmosphere. Vapour-phase n-butyl acetate is degraded in the atmosphere by reaction with photochemically-produced hydroxyl radicals; the half-life for this reaction in air is estimated to be about 4 days.

Environmental fate:

- Fish LC50 (96 h, 25 C): island silverside (Menidia beryllina) 185 ppm (static bioassy in synthetic seawater, mild aeration applied after 24 h); bluegill sunfish (Lepomis macrochirus) 100 ppm (static bioassy in fresh water, mild aeration applied after 24 h)
- Fish EC50 (96 h): fathead minnow (Pimephales promelas) 18 mg/l (affected fish lost equilibrium prior to death)
- Daphnia LC50 (48 h): 44 ppm
- Algal LC50 (96 h): Scenedesmus 320 ppm
- DO NOT discharge into sewer or waterways.

Persistence and degradability

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Persistence: Water/Soil</th>
<th>Persistence: Air</th>
</tr>
</thead>
<tbody>
<tr>
<td>hexamethylene diisocyanate</td>
<td>LOW</td>
<td>LOW</td>
</tr>
<tr>
<td>n-butyl acetate</td>
<td>LOW</td>
<td>LOW</td>
</tr>
<tr>
<td>hexamethylene diisocyanate polymer</td>
<td>HIGH</td>
<td>HIGH</td>
</tr>
</tbody>
</table>

Bioaccumulating potential

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Bioaccumulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>hexamethylene diisocyanate</td>
<td>LOW (LogKOW = 3.1956)</td>
</tr>
<tr>
<td>n-butyl acetate</td>
<td>LOW (BCF = 14)</td>
</tr>
<tr>
<td>hexamethylene diisocyanate polymer</td>
<td>LOW (LogKOW = 7.5795)</td>
</tr>
</tbody>
</table>

Mobility in soil

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Mobility</th>
</tr>
</thead>
<tbody>
<tr>
<td>hexamethylene diisocyanate</td>
<td>LOW (KOC = 5864)</td>
</tr>
<tr>
<td>n-butyl acetate</td>
<td>LOW (KOC = 20.86)</td>
</tr>
<tr>
<td>hexamethylene diisocyanate polymer</td>
<td>LOW (KOC = 18650000)</td>
</tr>
</tbody>
</table>

Other adverse effects

No data available

SECTION 13 DISPOSAL CONSIDERATIONS

Waste treatment methods

- Containers may still present a chemical hazard/ danger when empty.
- Return to supplier for reuse/ recycling if possible.
- Otherwise:
  - If container can not be cleaned sufficiently well to ensure that residuals do not remain or if the container cannot be used to store the same product, then puncture containers, to prevent re-use, and bury at an authorised landfill.
Where possible retain label warnings and SDS and observe all notices pertaining to the product. Legislation addressing waste disposal requirements may differ by country, state and/or territory. Each user must refer to laws operating in their area. In some areas, certain wastes must be tracked.

A Hierarchy of Controls seems to be common - the user should investigate:
- \textbf{Reduction}
- \textbf{Reuse}
- \textbf{Recycling}
- \textbf{Disposal (if all else fails)}

This material may be recycled if unused, or if it has not been contaminated so as to make it unsuitable for its intended use. If it has been contaminated, it may be possible to reclaim the product by filtration, distillation or some other means. Shelf life considerations should also be applied in making decisions of this type.

Note that properties of a material may change in use, and recycling or reuse may not always be appropriate.
- DO NOT allow wash water from cleaning or process equipment to enter drains.
- It may be necessary to collect all wash water for treatment before disposal.
- In all cases disposal to sewer may be subject to local laws and regulations and these should be considered first.
- Where in doubt contact the responsible authority.

Recycle wherever possible. Consult manufacturer for recycling options or consult local or regional waste management authority for disposal if no suitable treatment or disposal facility can be identified.

Dispose of by: burial in a land-fill specifically licensed to accept chemical and/or pharmaceutical wastes or incineration in a licensed apparatus (after admixture with suitable combustible material).

Decontaminate empty containers. Observe all label safeguards until containers are cleaned and destroyed.

\begin{tabular}{|c|}
\hline
\textbf{Contaminated packing materials:} & Refer to section above \\
\hline
\textbf{Precautions for Transport:} & Refer to section above \\
\hline
\end{tabular}

\textbf{SECTION 14 TRANSPORT INFORMATION}

\begin{tabular}{|c|c|}
\hline
\textbf{Labels Required} & \\
\hline
\end{tabular}

\begin{tabular}{|c|}
\hline
\textbf{Marine Pollutant} & NO \\
\hline
\end{tabular}

\begin{tabular}{|c|c|}
\hline
\textbf{Land transport (UN)} & \\
\hline
\textbf{UN number} & 1866 \\
\hline
\textbf{UN proper shipping name} & RESIN SOLUTION, flammable \\
\hline
\textbf{Transport hazard class(es)} & \\
Class & 3 \\
Subrisk & Not Applicable \\
\hline
\textbf{Packing group} & III \\
\textbf{Environmental hazard} & Not Applicable \\
\textbf{Special precautions for user} & \\
Special provisions & 223 \\
Limited quantity & 5 L \\
\hline
\end{tabular}

\begin{tabular}{|c|c|}
\hline
\textbf{Air transport (ICAO-IATA / DGR)} & \\
\hline
\textbf{UN number} & 1866 \\
\hline
\textbf{UN proper shipping name} & Resin solution flammable \\
\hline
\textbf{Transport hazard class(es)} & \\
ICAO/IATA Class & 3 \\
ICAO / IATA Subrisk & Not Applicable \\
ERG Code & 3L \\
\hline
\textbf{Packing group} & III \\
\textbf{Environmental hazard} & Not Applicable \\
\textbf{Special precautions for user} & \\
Special provisions & A3 \\
Cargo Only Packing Instructions & 366 \\
Cargo Only Maximum Qty / Pack & 220 L \\
Passenger and Cargo Packing Instructions & 385 \\
Passenger and Cargo Maximum Qty / Pack & 60 L \\
Passenger and Cargo Limited Quantity Packing Instructions & Y344 \\
Passenger and Cargo Limited Maximum Qty / Pack & 10 L \\
\hline
\end{tabular}

\begin{tabular}{|c|}
\hline
\textbf{Sea transport (IMDG-Code / GGVSee)} & \\
\hline
\end{tabular}

Continued...
Transport in bulk according to Annex II of MARPOL and the IBC code
Not Applicable

Precautions for Transport

Transportation precautions:
- Documentation covering all dangerous goods carried on the vehicle
- The transport unit must be placarded and marked in accordance with relevant transporting requirements.
- Personal protective equipment must be in sufficient quantities and suitable for use by the driver of the vehicle and where required for escape purposes, any other persons travelling in the vehicle.
- Vehicles transporting dangerous goods need to be equipped with sufficient and adequate fire protection systems and emergency equipment to handle spillages.
- Ensure all ignition sources are identified and eliminated or reduced where there is any likelihood of an incident due to a spill or release of fire risk dangerous goods.
- Likely to be incompatible however refer to SDS for further details:
  - Class 2.1, 2.2, 2.2 (with subrisk 5.1), 2.3, 4.1, 4.2, 4.3, 5.1, 5.2, 6.1
- If applicable, use appropriate types of segregation devices to isolate incompatible dangerous goods:
- Incompatible for transport with foodstuffs (including stock feed).
- Routes for road vehicles should avoid heavily populated or environmentally sensitive areas, congested crossings or a concentration of people
- Vehicle exhaust or hot engine components must be shielded to ensure cargo temperatures cannot be raised.

Suitable Containers
See section 7

SECTION 15 REGULATORY INFORMATION

Safety, health and environmental regulations / legislation specific for the substance or mixture

HEXAMETHYLENE DIISOCYANATE(822-06-0) IS FOUND ON THE FOLLOWING REGULATORY LISTS

<table>
<thead>
<tr>
<th>China Inventory of Existing Chemical Substances</th>
<th>China Inventory of Hazardous Chemicals (Chinese)</th>
<th>China Occupational Exposure Limits for Hazardous Agents in the Workplace</th>
</tr>
</thead>
</table>

N-BUTYL ACETATE(123-86-4) IS FOUND ON THE FOLLOWING REGULATORY LISTS

<table>
<thead>
<tr>
<th>China Inventory of Existing Chemical Substances</th>
<th>China Inventory of Hazardous Chemicals (Chinese)</th>
<th>China Occupational Exposure Limits for Hazardous Agents in the Workplace</th>
</tr>
</thead>
</table>

HEXAMETHYLENE DIISOCYANATE POLYMER(28182-81-2) IS FOUND ON THE FOLLOWING REGULATORY LISTS

<table>
<thead>
<tr>
<th>China Inventory of Existing Chemical Substances</th>
<th>China Inventory of Hazardous Chemicals (Chinese)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>National Inventory</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia - AICS</td>
<td>Y</td>
</tr>
<tr>
<td>Canada - DSL</td>
<td>Y</td>
</tr>
<tr>
<td>Canada - NDSL</td>
<td>N (n-butyl acetate; hexamethylene diisocyanate)</td>
</tr>
<tr>
<td>China - IECSC</td>
<td>Y</td>
</tr>
<tr>
<td>Europe - EINEC / ELINCS / NLP</td>
<td>Y</td>
</tr>
<tr>
<td>Japan - ENCS</td>
<td>N (hexamethylene diisocyanate polymer)</td>
</tr>
<tr>
<td>Korea - KECI</td>
<td>Y</td>
</tr>
<tr>
<td>New Zealand - NZIoC</td>
<td>Y</td>
</tr>
<tr>
<td>Philippines - PICCS</td>
<td>Y</td>
</tr>
<tr>
<td>USA - TSCA</td>
<td>Y</td>
</tr>
</tbody>
</table>

Legend:  
Y = All ingredients are on the inventory  
N = Not determined or one or more ingredients are not on the inventory and are not exempt from listing (see specific ingredients in brackets)

SECTION 16 OTHER INFORMATION

Other information

Ingredients with multiple cas numbers

<table>
<thead>
<tr>
<th>Name</th>
<th>CAS No</th>
</tr>
</thead>
</table>

Continued...
Classification of the preparation and its individual components has drawn on official and authoritative sources as well as independent review by the Chemwatch Classification committee using available literature references. The SDS is a Hazard Communication tool and should be used to assist in the Risk Assessment. Many factors determine whether the reported Hazards are Risks in the workplace or other settings. Risks may be determined by reference to Exposures Scenarios. Scale of use, frequency of use and current or available engineering controls must be considered.

Definitions and abbreviations

PC—TWA: Permissible Concentration-Time Weighted Average
PC—STEL: Permissible Concentration-Short Term Exposure Limit
IARC: International Agency for Research on Cancer
ACGIH: American Conference of Governmental Industrial Hygienists
STEL: Short Term Exposure Limit
TEEL: Temporary Emergency Exposure Limit,
IDLH: Immediately Dangerous to Life or Health Concentrations
OSF: Odour Safety Factor
NOAEL: No Observed Adverse Effect Level
LOAEL: Lowest Observed Adverse Effect Level
TLV: Threshold Limit Value
LOD: Limit Of Detection
OTV: Odour Threshold Value
BCF: BioConcentration Factors
BEI: Biological Exposure Index

Disclaimer

The information in the SDS applies only for the specified product and does not include mixtures of this product with other substances and mixtures. The SDS provides product safety information for personnel trained to use this product only.

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