Kit Revision Date: 26/10/2021

# 8820 High Temperature Rigid Urethane Kit

**MG Chemicals Multipart Product Kit**

This product is a kit made up of multiple parts. Each part is an independently packaged chemical component and has independent hazard assessments.

**Kit Content**

| *Part* | *Product Name* | *Product Use* |
|---|---|---|
| A | 8820-A | Urethane resin for use with hardeners |
| B | 8820-B | Urethane hardener for use with resins |

*Safety Data Sheets for each part listed above follow this cover sheet.*

## Transportation Instruction

Before offering this product kit for transport, read Section 14 for all parts listed above.

# 8820-A High Temperature Rigid Urethane

## MG Chemicals UK Limited

Version No: **A-2.00**
Safety data sheet according to REACH Regulation (EC) No 1907/2006, as amended by UK REACH Regulations SI 2019/758

Issue Date:**25/10/2021**
Revision Date: **25/10/2021**
L.REACH.GB.EN

## SECTION 1 Identification of the substance / mixture and of the company / undertaking

### 1.1. Product Identifier

| | |
|---|---|
| **Product name** | 8820-A |
| **Synonyms** | SDS Code: 8820-Part A; 8820-375ML, 8820-2.55L, 8820-10.8L, 8820-60L \| UFI:G8N0-A0HU-H00V-HPYN |
| **Other means of identification** | High Temperature Rigid Urethane |

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

| | |
|---|---|
| **Relevant identified uses** | Urethane resin for use with hardeners |
| **Uses advised against** | Not Applicable |

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

| | | |
|---|---|---|
| **Registered company name** | **MG Chemicals UK Limited** | **MG Chemicals (Head office)** |
| **Address** | Heame House, 23 Bilston Street, Sedgely Dudley DY3 1JA United Kingdom | 9347 - 193 Street Surrey V4N 4E7 British Columbia Canada |
| **Telephone** | +(44) 1663 362888 | +(1) 800-201-8822 |
| **Fax** | Not Available | +(1) 800-708-9888 |
| **Website** | Not Available | www.mgchemicals.com |
| **Email** | sales@mgchemicals.com | Info@mgchemicals.com |

### 1.4. Emergency telephone number

| | |
|---|---|
| **Association / Organisation** | **Verisk 3E (Access code: 335388)** |
| **Emergency telephone numbers** | +(44) 20 35147487 |
| **Other emergency telephone numbers** | +(0) 800 680 0425 |

## SECTION 2 Hazards identification

### 2.1. Classification of the substance or mixture

| | |
|---|---|
| **Classified according to GB-CLP Regulation, UK SI 2019/720 and UK SI 2020/1567 [1]** | H361 - Reproductive Toxicity Category 2, H317 - Sensitisation (Skin) Category 1, H412 - Hazardous to the Aquatic Environment Long-Term Hazard Category 3 |
| ***Legend:*** | *1. Classified by Chemwatch; 2. Classification drawn from GB-CLP Regulation, UK SI 2019/720 and UK SI 2020/1567* |

### 2.2. Label elements

| | |
|---|---|
| **Hazard pictogram(s)** |  |
| **Signal word** | **Warning** |

### Hazard statement(s)

| | |
|---|---|
| **H361** | Suspected of damaging fertility or the unborn child. |
| **H317** | May cause an allergic skin reaction. |
| **H412** | Harmful to aquatic life with long lasting effects. |

### Supplementary statement(s)

| | |
|---|---|
| **EUH205** | Contains epoxy constituents. May produce an allergic reaction. |

**Page 1 continued...**

**Precautionary statement(s) Prevention**

| | |
|---|---|
| **P201** | Obtain special instructions before use. |
| **P280** | Wear protective gloves and protective clothing. |
| **P261** | Avoid breathing mist/vapours/spray. |
| **P273** | Avoid release to the environment. |
| **P272** | Contaminated work clothing should not be allowed out of the workplace. |

**Precautionary statement(s) Response**

| | |
|---|---|
| **P308+P313** | IF exposed or concerned: Get medical advice/ attention. |
| **P302+P352** | IF ON SKIN: Wash with plenty of water and soap. |
| **P333+P313** | If skin irritation or rash occurs: Get medical advice/attention. |
| **P362+P364** | Take off contaminated clothing and wash it before reuse. |

**Precautionary statement(s) Storage**

| | |
|---|---|
| **P405** | Store locked up. |

**Precautionary statement(s) Disposal**

| | |
|---|---|
| **P501** | Dispose of contents/container to authorised hazardous or special waste collection point in accordance with any local regulation. |

### 2.3. Other hazards

Cumulative effects may result following exposure*.

Limited evidence of a carcinogenic effect*.

| | |
|---|---|
| **methanol** | Listed in the Europe Regulation (EC) No 1907/2006 - Annex XVII (Restrictions may apply) |

## SECTION 3 Composition / information on ingredients

### 3.1.Substances

See 'Composition on ingredients' in Section 3.2

### 3.2.Mixtures

| **1.CAS No<br>2.EC No<br>3.Index No<br>4.REACH No** | **%[weight]** | **Name** | **Classified according to GB-CLP Regulation, UK SI 2019/720 and UK SI 2020/1567** | **Nanoform Particle Characteristics** |
|---|---|---|---|---|
| 1.1318-02-1<br>2.215-283-8<br>3.Not Available<br>4.Not Available | 7 | zeolites | Not Applicable | Not Available |
| 1.1675-54-3<br>2.216-823-5<br>3.603-073-00-2\|603-074-00-8<br>4.Not Available | 3 | bisphenol A diglycidyl ether | Skin Corrosion/Irritation Category 2, Serious Eye Damage/Eye Irritation Category 2, Sensitisation (Skin) Category 1; H315, H319, H317 [2] | Not Available |
| 1.1333-86-4<br>2.215-609-9\|435-640-3\|422-130-0<br>3.Not Available<br>4.Not Available | 0.9 | carbon black | Carcinogenicity Category 2; H351 [1] | Not Available |
| 1.68609-97-2<br>2.271-846-8<br>3.603-103-00-4<br>4.Not Available | 0.7 | (C12-14)alkylglycidyl ether | Skin Corrosion/Irritation Category 2, Sensitisation (Skin) Category 1; H315, H317 [2] | Not Available |
| 1.67-56-1<br>2.200-659-6<br>3.603-001-00-X<br>4.Not Available | 0.1 | methanol<br>* | Flammable Liquids Category 2, Acute Toxicity (Oral) Category 3, Acute Toxicity (Dermal) Category 3, Acute Toxicity (Inhalation) Category 3, Specific Target Organ Toxicity - Single Exposure Category 1; H225, H301, H311, H331, H370 ** [2] | Not Available |
| ***Legend:*** | *1. Classified by Chemwatch; 2. Classification drawn from GB-CLP Regulation, UK SI 2019/720 and UK SI 2020/1567; 3. Classification drawn from C&L; * EU IOELVs available; [e] Substance identified as having endocrine disrupting properties* | | | |

## SECTION 4 First aid measures

### 4.1. Description of first aid measures

| | |
|---|---|
| **Eye Contact** | If this product comes in contact with the eyes:<br>▸ Wash out immediately with fresh running water.<br>▸ 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.<br>▸ Seek medical attention without delay; if pain persists or recurs seek medical attention.<br>▸ Removal of contact lenses after an eye injury should only be undertaken by skilled personnel. |

**Continued...**

| | |
|---|---|
| **Skin Contact** | If skin contact occurs:<br>▸ Immediately remove all contaminated clothing, including footwear.<br>▸ Flush skin and hair with running water (and soap if available).<br>▸ Seek medical attention in event of irritation.<br>For thermal burns:<br>▸ Decontaminate area around burn.<br>▸ Consider the use of cold packs and topical antibiotics.<br>For first-degree burns (affecting top layer of skin)<br>▸ Hold burned skin under cool (not cold) running water or immerse in cool water until pain subsides.<br>▸ Use compresses if running water is not available.<br>▸ Cover with sterile non-adhesive bandage or clean cloth.<br>▸ Do NOT apply butter or ointments; this may cause infection.<br>▸ Give over-the counter pain relievers if pain increases or swelling, redness, fever occur.<br>For second-degree burns (affecting top two layers of skin)<br>▸ Cool the burn by immerse in cold running water for 10-15 minutes.<br>▸ Use compresses if running water is not available.<br>▸ Do NOT apply ice as this may lower body temperature and cause further damage.<br>▸ Do NOT break blisters or apply butter or ointments; this may cause infection.<br>▸ Protect burn by cover loosely with sterile, nonstick bandage and secure in place with gauze or tape.<br>To prevent shock: (unless the person has a head, neck, or leg injury, or it would cause discomfort):<br>▸ Lay the person flat.<br>▸ Elevate feet about 12 inches.<br>▸ Elevate burn area above heart level, if possible.<br>▸ Cover the person with coat or blanket.<br>▸ Seek medical assistance.<br>For third-degree burns<br>Seek immediate medical or emergency assistance.<br>In the mean time:<br>▸ Protect burn area cover loosely with sterile, nonstick bandage or, for large areas, a sheet or other material that will not leave lint in wound.<br>▸ Separate burned toes and fingers with dry, sterile dressings.<br>▸ Do not soak burn in water or apply ointments or butter; this may cause infection.<br>▸ To prevent shock see above.<br>▸ For an airway burn, do not place pillow under the person's head when the person is lying down. This can close the airway.<br>▸ Have a person with a facial burn sit up.<br>▸ Check pulse and breathing to monitor for shock until emergency help arrives. |
| **Inhalation** | ▸ If fumes, aerosols or combustion products are inhaled remove from contaminated area.<br>▸ Other measures are usually unnecessary. |
| **Ingestion** | ▸ Immediately give a glass of water.<br>▸ First aid is not generally required. If in doubt, contact a Poisons Information Centre or a doctor. |

### 4.2 Most important symptoms and effects, both acute and delayed

See Section 11

### 4.3. Indication of any immediate medical attention and special treatment needed

For acute and short term repeated exposures to methanol:

- Toxicity results from accumulation of formaldehyde/formic acid.
- Clinical signs are usually limited to CNS, eyes and GI tract Severe metabolic acidosis may produce dyspnea and profound systemic effects which may become intractable. All symptomatic patients should have arterial pH measured. Evaluate airway, breathing and circulation.
- Stabilise obtunded patients by giving naloxone, glucose and thiamine.
- Decontaminate with Ipecac or lavage for patients presenting 2 hours post-ingestion. Charcoal does not absorb well; the usefulness of cathartic is not established.
- Forced diuresis is not effective; haemodialysis is recommended where peak methanol levels exceed 50 mg/dL (this correlates with serum bicarbonate levels below 18 meq/L).
- Ethanol, maintained at levels between 100 and 150 mg/dL, inhibits formation of toxic metabolites and may be indicated when peak methanol levels exceed 20 mg/dL. An intravenous solution of ethanol in D5W is optimal.
- Folate, as leucovorin, may increase the oxidative removal of formic acid. 4-methylpyrazole may be an effective adjunct in the treatment. 8.Phenytoin may be preferable to diazepam for controlling seizure.

[Ellenhorn Barceloux: Medical Toxicology]

BIOLOGICAL EXPOSURE INDEX - BEI

| Determinant | Index | Sampling Time | Comment |
|---|---|---|---|
| 1. Methanol in urine | 15 mg/l | End of shift | B, NS |
| 2. Formic acid in urine | 80 mg/gm creatinine | Before the shift at end of workweek | B, NS |

B: Background levels occur in specimens collected from subjects **NOT** exposed.

NS: Non-specific determinant - observed following exposure to other materials.

## SECTION 5 Firefighting measures

### 5.1. Extinguishing media

- Foam.
- Dry chemical powder.
- BCF (where regulations permit).
- Carbon dioxide.
- Water spray or fog - Large fires only.

### 5.2. 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 |

**Continued...**

### 5.3. Advice for firefighters

| | |
|---|---|
| **Fire Fighting** | ▸ Alert Fire Brigade and tell them location and nature of hazard.<br>▸ Wear full body protective clothing with breathing apparatus.<br>▸ Prevent, by any means available, spillage from entering drains or water course.<br>▸ Use water delivered as a fine spray to control fire and cool adjacent area.<br>▸ Avoid spraying water onto liquid pools.<br>▸ **DO NOT** approach containers suspected to be hot.<br>▸ Cool fire exposed containers with water spray from a protected location.<br>▸ If safe to do so, remove containers from path of fire. |
| **Fire/Explosion Hazard** | ▸ Combustible.<br>▸ Slight fire hazard when exposed to heat or flame.<br>▸ Heating may cause expansion or decomposition leading to violent rupture of containers.<br>▸ On combustion, may emit toxic fumes of carbon monoxide (CO).<br>▸ May emit acrid smoke.<br>▸ Mists containing combustible materials may be explosive.<br>Combustion products include:<br>carbon dioxide ($CO_2$)<br>other pyrolysis products typical of burning organic material.<br>**Contains low boiling substance:** Closed containers may rupture due to pressure buildup under fire conditions.<br>May emit poisonous fumes.<br>May emit corrosive fumes. |

## SECTION 6 Accidental release measures

### 6.1. Personal precautions, protective equipment and emergency procedures

See section 8

### 6.2. Environmental precautions

See section 12

### 6.3. Methods and material for containment and cleaning up

| | |
|---|---|
| **Minor Spills** | ▸ Remove all ignition sources.<br>▸ Clean up all spills immediately.<br>▸ Avoid breathing vapours and contact with skin and eyes.<br>▸ Control personal contact with the substance, by using protective equipment.<br>▸ Contain and absorb spill with sand, earth, inert material or vermiculite.<br>▸ Wipe up.<br>▸ Place in a suitable, labelled container for waste disposal. |
| **Major Spills** | Moderate hazard.<br>▸ Clear area of personnel and move upwind.<br>▸ Alert Fire Brigade and tell them location and nature of hazard.<br>▸ Wear breathing apparatus plus protective gloves.<br>▸ Prevent, by any means available, spillage from entering drains or water course.<br>▸ No smoking, naked lights or ignition sources.<br>▸ Increase ventilation.<br>▸ Stop leak if safe to do so.<br>▸ Contain spill with sand, earth or vermiculite.<br>▸ Collect recoverable product into labelled containers for recycling.<br>▸ Absorb remaining product with sand, earth or vermiculite.<br>▸ Collect solid residues and seal in labelled drums for disposal.<br>▸ Wash area and prevent runoff into drains.<br>▸ If contamination of drains or waterways occurs, advise emergency services. |

### 6.4. Reference to other sections

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

## SECTION 7 Handling and storage

### 7.1. Precautions for safe handling

| | |
|---|---|
| **Safe handling** | **Contains low boiling substance:**<br>Storage in sealed containers may result in pressure buildup causing violent rupture of containers not rated appropriately.<br>▸ Check for bulging containers.<br>▸ Vent periodically<br>▸ Always release caps or seals slowly to ensure slow dissipation of vapours<br>▸ Avoid all personal contact, including inhalation.<br>▸ Wear protective clothing when risk of exposure occurs.<br>▸ Use in a well-ventilated area.<br>▸ Prevent concentration in hollows and sumps.<br>▸ **DO NOT** enter confined spaces until atmosphere has been checked.<br>▸ Avoid smoking, naked lights or ignition sources.<br>▸ Avoid contact with incompatible materials.<br>▸ When handling, **DO NOT** eat, drink or smoke.<br>▸ Keep containers securely sealed when not in use.<br>▸ Avoid physical damage to containers.<br>▸ Always wash hands with soap and water after handling.<br>▸ Work clothes should be laundered separately.<br>▸ Use good occupational work practice. |

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| | |
|---|---|
| | ‣ Observe manufacturer's storage and handling recommendations contained within this SDS.<br>‣ Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions.<br>‣ **DO NOT** allow clothing wet with material to stay in contact with skin |
| **Fire and explosion protection** | See section 5 |
| **Other information** | ‣ Store in original containers.<br>‣ Keep containers securely sealed.<br>‣ No smoking, naked lights or ignition sources.<br>‣ Store in a cool, dry, well-ventilated area.<br>‣ Store away from incompatible materials and foodstuff containers.<br>‣ Protect containers against physical damage and check regularly for leaks.<br>‣ Observe manufacturer's storage and handling recommendations contained within this SDS. |

### 7.2. Conditions for safe storage, including any incompatibilities

| | |
|---|---|
| **Suitable container** | ‣ Metal can or drum<br>‣ Packaging as recommended by manufacturer.<br>‣ Check all containers are clearly labelled and free from leaks. |
| **Storage incompatibility** | Glycidyl ethers:<br>‣ may form unstable peroxides on storage in air ,light, sunlight, UV light or other ionising radiation, trace metals - inhibitor should be maintained at adequate levels<br>‣ may polymerise in contact with heat, organic and inorganic free radical producing initiators<br>‣ may polymerise with evolution of heat in contact with oxidisers, strong acids, bases and amines<br>‣ react violently with strong oxidisers, permanganates, peroxides, acyl halides, alkalis, ammonium persulfate, bromine dioxide<br>‣ attack some forms of plastics, coatings, and rubber<br>‣ Avoid reaction with oxidising agents |

### 7.3. Specific end use(s)

See section 1.2

## SECTION 8 Exposure controls / personal protection

### 8.1. Control parameters

| Ingredient | DNELs<br>Exposure Pattern Worker | PNECs<br>Compartment |
|---|---|---|
| bisphenol A diglycidyl ether | Dermal 0.75 mg/kg bw/day (Systemic, Chronic)<br>Inhalation 4.93 mg/m³ (Systemic, Chronic)<br>*Dermal 89.3 µg/kg bw/day (Systemic, Chronic) **<br>*Inhalation 0.87 mg/m³ (Systemic, Chronic) **<br>*Oral 0.5 mg/kg bw/day (Systemic, Chronic) ** | 0.006 mg/L (Water (Fresh))<br>0.001 mg/L (Water - Intermittent release)<br>0.018 mg/L (Water (Marine))<br>0.341 mg/kg sediment dw (Sediment (Fresh Water))<br>0.034 mg/kg sediment dw (Sediment (Marine))<br>0.065 mg/kg soil dw (Soil)<br>10 mg/L (STP)<br>11 mg/kg food (Oral) |
| carbon black | Inhalation 1 mg/m³ (Systemic, Chronic)<br>Inhalation 0.5 mg/m³ (Local, Chronic)<br>*Inhalation 0.06 mg/m³ (Systemic, Chronic) ** | 1 mg/L (Water (Fresh))<br>0.1 mg/L (Water - Intermittent release)<br>10 mg/L (Water (Marine)) |
| (C12-14)alkylglycidyl ether | Dermal 1 mg/kg bw/day (Systemic, Chronic)<br>Inhalation 3.6 mg/m³ (Systemic, Chronic)<br>*Dermal 0.5 mg/kg bw/day (Systemic, Chronic) **<br>*Inhalation 0.87 mg/m³ (Systemic, Chronic) **<br>*Oral 0.5 mg/kg bw/day (Systemic, Chronic) ** | 0.106 mg/L (Water (Fresh))<br>0.011 mg/L (Water - Intermittent release)<br>0.072 mg/L (Water (Marine))<br>307.16 mg/kg sediment dw (Sediment (Fresh Water))<br>30.72 mg/kg sediment dw (Sediment (Marine))<br>1.234 mg/kg soil dw (Soil)<br>10 mg/L (STP) |
| methanol | Dermal 20 mg/kg bw/day (Systemic, Chronic)<br>Inhalation 130 mg/m³ (Systemic, Chronic)<br>Inhalation 130 mg/m³ (Local, Chronic)<br>Dermal 20 mg/kg bw/day (Systemic, Acute)<br>Inhalation 130 mg/m³ (Systemic, Acute)<br>Inhalation 130 mg/m³ (Local, Acute)<br>*Dermal 4 mg/kg bw/day (Systemic, Chronic) **<br>*Inhalation 26 mg/m³ (Systemic, Chronic) **<br>*Oral 4 mg/kg bw/day (Systemic, Chronic) **<br>*Inhalation 26 mg/m³ (Local, Chronic) **<br>*Dermal 4 mg/kg bw/day (Systemic, Acute) **<br>*Inhalation 26 mg/m³ (Systemic, Acute) **<br>*Oral 4 mg/kg bw/day (Systemic, Acute) **<br>*Inhalation 26 mg/m³ (Local, Acute) ** | 20.8 mg/L (Water (Fresh))<br>2.08 mg/L (Water - Intermittent release)<br>1540 mg/L (Water (Marine))<br>77 mg/kg sediment dw (Sediment (Fresh Water))<br>7.7 mg/kg sediment dw (Sediment (Marine))<br>100 mg/kg soil dw (Soil)<br>100 mg/L (STP) |

* Values for General Population

**Occupational Exposure Limits (OEL)**

**INGREDIENT DATA**

| Source | Ingredient | Material name | TWA | STEL | Peak | Notes |
|---|---|---|---|---|---|---|
| UK Workplace Exposure Limits (WELs) | carbon black | Carbon black | 3.5 mg/m3 | 7 mg/m3 | Not Available | Not Available |
| EU Consolidated List of Indicative Occupational Exposure Limit Values (IOELVs) | methanol | Methanol | 200 ppm / 260 mg/m3 | Not Available | Not Available | Skin |

**Continued...**

| Source | Ingredient | Material name | TWA | STEL | Peak | Notes |
|---|---|---|---|---|---|---|
| UK Workplace Exposure Limits (WELs) | methanol | Methanol | 200 ppm / 266 mg/m3 | 333 mg/m3 / 250 ppm | Not Available | Sk |

**Emergency Limits**

| Ingredient | TEEL-1 | TEEL-2 | TEEL-3 |
|---|---|---|---|
| zeolites | 30 mg/m3 | 330 mg/m3 | 2,000 mg/m3 |
| zeolites | 30 mg/m3 | 330 mg/m3 | 2,000 mg/m3 |
| bisphenol A diglycidyl ether | 39 mg/m3 | 430 mg/m3 | 2,600 mg/m3 |
| bisphenol A diglycidyl ether | 90 mg/m3 | 990 mg/m3 | 5,900 mg/m3 |
| carbon black | 9 mg/m3 | 99 mg/m3 | 590 mg/m3 |
| methanol | Not Available | Not Available | Not Available |

| Ingredient | Original IDLH | Revised IDLH |
|---|---|---|
| zeolites | Not Available | Not Available |
| bisphenol A diglycidyl ether | Not Available | Not Available |
| carbon black | 1,750 mg/m3 | Not Available |
| (C12-14)alkylglycidyl ether | Not Available | Not Available |
| methanol | 6,000 ppm | Not Available |

**Occupational Exposure Banding**

| Ingredient | Occupational Exposure Band Rating | Occupational Exposure Band Limit |
|---|---|---|
| bisphenol A diglycidyl ether | E | ≤ 0.1 ppm |
| (C12-14)alkylglycidyl ether | E | ≤ 0.1 ppm |
| ***Notes:*** | *Occupational exposure banding is a process of assigning chemicals into specific categories or bands based on a chemical's potency and the adverse health outcomes associated with exposure. The output of this process is an occupational exposure band (OEB), which corresponds to a range of exposure concentrations that are expected to protect worker health.* | |

**MATERIAL DATA**

For epichlorohydrin
Odour Threshold Value: 0.08 ppm
NOTE: Detector tubes for epichlorohydrin, measuring in excess of 5 ppm, are commercially available.
Exposure at or below the recommended TLV-TWA is thought to minimise the potential for adverse respiratory, liver, kidney effects. Epichlorohydrin has been implicated as a human skin sensitiser, hence individuals who are hypersusceptible or otherwise unusually responsive to certain chemicals may NOT be adequately protected from adverse health effects.
Odour Safety Factor (OSF)
OSF=0.54 (EPICHLOROHYDRIN)

For methanol:
Odour Threshold Value: 4.2-5960 ppm (detection), 53.0-8940 ppm (recognition)
NOTE: Detector tubes for methanol, measuring in excess of 50 ppm, are commercially available.
Exposure at or below the recommended TLV-TWA is thought to substantially reduce the significant risk of headache, blurred vision and other ocular and systemic effects.
Odour Safety Factor (OSF)
OSF=2 (METHANOL)

### 8.2. Exposure controls

**8.2.1. Appropriate engineering 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.

Local exhaust ventilation usually required. If risk of overexposure exists, wear approved respirator. Correct fit is essential to obtain adequate protection. Supplied-air type respirator may be required in special circumstances. Correct fit is essential to ensure adequate protection.
An approved self contained breathing apparatus (SCBA) may be required in some situations.
Provide adequate ventilation in warehouse or closed storage area. 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.

| Type of Contaminant: | Air Speed: |
|---|---|
| solvent, vapours, degreasing etc., evaporating from tank (in still air). | 0.25-0.5 m/s (50-100 f/min.) |
| aerosols, fumes from pouring operations, intermittent container filling, low speed conveyer transfers, welding, spray drift, plating acid fumes, pickling (released at low velocity into zone of active generation) | 0.5-1 m/s (100-200 f/min.) |
| direct spray, spray painting in shallow booths, drum filling, conveyer loading, crusher dusts, gas discharge (active generation into zone of rapid air motion) | 1-2.5 m/s (200-500 f/min.) |
| grinding, abrasive blasting, tumbling, high speed wheel generated dusts (released at high initial velocity into zone of very high rapid air motion). | 2.5-10 m/s (500-2000 f/min.) |

Within each range the appropriate value depends on:

| Lower end of the range | Upper end of the range |
|---|---|
| 1: Room air currents minimal or favourable to capture | 1: Disturbing room air currents |
| 2: Contaminants of low toxicity or of nuisance value only. | 2: Contaminants of high toxicity |

**Continued...**

| | |
|---|---|
| | 3: Intermittent, low production. \| 3: High production, heavy use<br>4: Large hood or large air mass in motion \| 4: Small hood-local control only<br><br>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 (in simple cases). Therefore the air speed at the extraction point should be adjusted, accordingly, after reference to distance from the contaminating source. The air velocity at the extraction fan, for example, should be a minimum of 1-2 m/s (200-400 f/min) for extraction of solvents generated in a tank 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. |
| **8.2.2. Personal protection** |  |
| **Eye and face protection** | ‣ Safety glasses with side shields.<br>‣ Chemical goggles.<br>‣ 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 adsorption 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 1336 or national equivalent] |
| **Skin protection** | See Hand protection below |
| **Hands/feet protection** | **NOTE:**<br>‣ The material may produce skin sensitisation in predisposed individuals. Care must be taken, when removing gloves and other protective equipment, to avoid all possible skin contact.<br>‣ Contaminated leather items, such as shoes, belts and watch-bands should be removed and destroyed.<br>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.<br>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.<br>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.<br>Suitability and durability of glove type is dependent on usage. Important factors in the selection of gloves include:<br>· frequency and duration of contact,<br>· chemical resistance of glove material,<br>· glove thickness and<br>· dexterity<br>Select gloves tested to a relevant standard (e.g. Europe EN 374, US F739, AS/NZS 2161.1 or national equivalent).<br>· When prolonged or frequently repeated contact may occur, a glove with a protection class of 5 or higher (breakthrough time greater than 240 minutes according to EN 374, AS/NZS 2161.10.1 or national equivalent) is recommended.<br>· When only brief contact is expected, a glove with a protection class of 3 or higher (breakthrough time greater than 60 minutes according to EN 374, AS/NZS 2161.10.1 or national equivalent) is recommended.<br>· Some glove polymer types are less affected by movement and this should be taken into account when considering gloves for long-term use.<br>· Contaminated gloves should be replaced.<br>As defined in ASTM F-739-96 in any application, gloves are rated as:<br>· Excellent when breakthrough time > 480 min<br>· Good when breakthrough time > 20 min<br>· Fair when breakthrough time < 20 min<br>· Poor when glove material degrades<br>For general applications, gloves with a thickness typically greater than 0.35 mm, are recommended.<br>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.<br>Glove thickness may also vary depending on the glove manufacturer, the glove type and the glove model. Therefore, the manufacturers' technical data should always be taken into account to ensure selection of the most appropriate glove for the task.<br>Note: Depending on the activity being conducted, gloves of varying thickness may be required for specific tasks. For example:<br>· Thinner gloves (down to 0.1 mm or less) may be required where a high degree of manual dexterity is needed. However, these gloves are only likely to give short duration protection and would normally be just for single use applications, then disposed of.<br>· Thicker gloves (up to 3 mm or more) may be required where there is a mechanical (as well as a chemical) risk i.e. where there is abrasion or puncture potential<br>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.<br>When handling liquid-grade epoxy resins wear chemically protective gloves , boots and aprons.<br>The performance, based on breakthrough times ,of:<br>· Ethyl Vinyl Alcohol (EVAL laminate) is generally excellent<br>· Butyl Rubber ranges from excellent to good<br>· Nitrile Butyl Rubber (NBR) from excellent to fair.<br>· Neoprene from excellent to fair<br>· Polyvinyl (PVC) from excellent to poor<br>As defined in ASTM F-739-96<br>· Excellent breakthrough time > 480 min<br>· Good breakthrough time > 20 min<br>· Fair breakthrough time < 20 min<br>· Poor glove material degradation<br>Gloves should be tested against each resin system prior to making a selection of the most suitable type. Systems include both the resin and any hardener, individually and collectively)<br>· **DO NOT** use cotton or leather (which absorb and concentrate the resin), natural rubber (latex), medical or polyethylene gloves (which absorb the resin).<br>· **DO NOT** use barrier creams containing emulsified fats and oils as these may absorb the resin; silicone-based barrier creams |

**Continued...**

| | |
|---|---|
| | should be reviewed prior to use.<br>Replacement time should be considered when selecting the most appropriate glove. It may be more effective to select a glove with lower chemical resistance but which is replaced frequently than to select a more resistant glove which is reused many times |
| **Body protection** | See Other protection below |
| **Other protection** | ‣ Overalls.<br>‣ P.V.C apron.<br>‣ Barrier cream.<br>‣ Skin cleansing cream.<br>‣ Eye wash unit. |

### 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) is taken into account in the ***computer-generated*** selection:
8820-A High Temperature Rigid Urethane

| Material | CPI |
|---|---|
| BUTYL | A |
| BUTYL/NEOPRENE | A |
| PE/EVAL/PE | A |
| PVDC/PE/PVDC | A |
| SARANEX-23 | A |
| SARANEX-23 2-PLY | A |
| TEFLON | A |
| VITON/NEOPRENE | A |
| NEOPRENE | B |
| NAT+NEOPR+NITRILE | C |
| NATURAL RUBBER | C |
| NATURAL+NEOPRENE | C |
| NEOPRENE/NATURAL | C |
| NITRILE | C |
| PVA | C |
| PVC | C |

* 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.

### Respiratory protection

Type AX Filter of sufficient capacity. (AS/NZS 1716 & 1715, EN 143:2000 & 149:2001, ANSI Z88 or national equivalent)

Where the concentration of gas/particulates in the breathing zone, approaches or exceeds the 'Exposure Standard' (or ES), respiratory protection is required. Degree of protection varies with both face-piece and Class of filter; the nature of protection varies with Type of filter.

| Required Minimum Protection Factor | Half-Face Respirator | Full-Face Respirator | Powered Air Respirator |
|---|---|---|---|
| up to 10 x ES | AX-AUS | - | AX-PAPR-AUS / Class 1 |
| up to 50 x ES | - | AX-AUS / Class 1 | - |
| up to 100 x ES | - | AX-2 | AX-PAPR-2 ^ |

^ - Full-face
A(All classes) = Organic vapours, B AUS or B1 = Acid gasses, B2 = Acid gas or hydrogen cyanide(HCN), B3 = Acid gas or hydrogen cyanide(HCN), E = Sulfur dioxide(SO2), G = Agricultural chemicals, K = Ammonia(NH3), Hg = Mercury, NO = Oxides of nitrogen, MB = Methyl bromide, AX = Low boiling point organic compounds(below 65 degC)

- Cartridge respirators should never be used for emergency ingress or in areas of unknown vapour concentrations or oxygen content.
- The wearer must be warned to leave the contaminated area immediately on detecting any odours through the respirator. The odour may indicate that the mask is not functioning properly, that the vapour concentration is too high, or that the mask is not properly fitted. Because of these limitations, only restricted use of cartridge respirators is considered appropriate.
- Cartridge performance is affected by humidity. Cartridges should be changed after 2 hr of continuous use unless it is determined that the humidity is less than 75%, in which case, cartridges can be used for 4 hr. Used cartridges should be discarded daily, regardless of the length of time used

Selection of the Class and Type of respirator will depend upon the level of breathing zone contaminant and the chemical nature of the contaminant. Protection Factors (defined as the ratio of contaminant outside and inside the mask) may also be important.

| Required minimum protection factor | Maximum gas/vapour concentration present in air p.p.m. (by volume) | Half-face Respirator | Full-Face Respirator |
|---|---|---|---|
| up to 10 | 1000 | AX-AUS / Class 1 | - |
| up to 50 | 1000 | - | AX-AUS / Class 1 |
| up to 50 | 5000 | Airline * | - |
| up to 100 | 5000 | - | AX-2 |
| up to 100 | 10000 | - | AX-3 |
| 100+ | | - | Airline** |

** - Continuous-flow or positive pressure demand.
A(All classes) = Organic vapours, B AUS or B1 = Acid gases, B2 = Acid gas or hydrogen cyanide(HCN), B3 = Acid gas or hydrogen cyanide(HCN), E = Sulfur dioxide(SO2), G = Agricultural chemicals, K = Ammonia(NH3), Hg = Mercury, NO = Oxides of nitrogen, MB = Methyl bromide, AX = Low boiling point organic compounds(below 65 deg C)

### 8.2.3. Environmental exposure controls

See section 12

## SECTION 9 Physical and chemical properties

### 9.1. Information on basic physical and chemical properties

| | | | |
|---|---|---|---|
| **Appearance** | Black | | |
| **Physical state** | Liquid | **Relative density (Water = 1)** | 1.15 |

**Continued...**

| | | | |
|---|---|---|---|
| **Odour** | Not Available | **Partition coefficient n-octanol / water** | Not Available |
| **Odour threshold** | Not Available | **Auto-ignition temperature (°C)** | >385 |
| **pH (as supplied)** | Not Available | **Decomposition temperature** | Not Available |
| **Melting point / freezing point (°C)** | Not Available | **Viscosity (cSt)** | 305.00 |
| **Initial boiling point and boiling range (°C)** | 35 | **Molecular weight (g/mol)** | Not Available |
| **Flash point (°C)** | >100 | **Taste** | Not Available |
| **Evaporation rate** | <1 BuAC = 1 | **Explosive properties** | Not Available |
| **Flammability** | Not Applicable | **Oxidising properties** | Not Available |
| **Upper Explosive Limit (%)** | Not Available | **Surface Tension (dyn/cm or mN/m)** | Not Available |
| **Lower Explosive Limit (%)** | Not Available | **Volatile Component (%vol)** | Not Available |
| **Vapour pressure (kPa)** | Not Available | **Gas group** | Not Available |
| **Solubility in water** | Immiscible | **pH as a solution (%)** | Not Available |
| **Vapour density (Air = 1)** | Not Available | **VOC g/L** | Not Available |
| **Nanoform Solubility** | Not Available | **Nanoform Particle Characteristics** | Not Available |
| **Particle Size** | Not Available | | |

### 9.2. Other information

Not Available

## SECTION 10 Stability and reactivity

| | |
|---|---|
| **10.1.Reactivity** | See section 7.2 |
| **10.2. Chemical stability** | ▸ Unstable in the presence of incompatible materials.<br>▸ Product is considered stable.<br>▸ Hazardous polymerisation will not occur. |
| **10.3. Possibility of hazardous reactions** | See section 7.2 |
| **10.4. Conditions to avoid** | See section 7.2 |
| **10.5. Incompatible materials** | See section 7.2 |
| **10.6. Hazardous decomposition products** | See section 5.3 |

## SECTION 11 Toxicological information

### 11.1. Information on toxicological effects

| | |
|---|---|
| **Inhaled** | The material is not thought to produce adverse health effects or irritation of the respiratory tract (as classified by EC Directives using animal models). Nevertheless, good hygiene practice requires that exposure be kept to a minimum and that suitable control measures be used in an occupational setting.<br><br>Material is highly volatile and may quickly form a concentrated atmosphere in confined or unventilated areas. The vapour may displace and replace air in breathing zone, acting as a simple asphyxiant. This may happen with little warning of overexposure.<br>The use of a quantity of material in an unventilated or confined space may result in increased exposure and an irritating atmosphere developing. Before starting consider control of exposure by mechanical ventilation.<br>Minor but regular methanol exposures may effect the central nervous system, optic nerves and retinae. Symptoms may be delayed, with headache, fatigue, nausea, blurring of vision and double vision. Continued or severe exposures may cause damage to optic nerves, which may become severe with permanent visual impairment even blindness resulting.<br>**WARNING**: Methanol is only slowly eliminated from the body and should be regarded as a cumulative poison which cannot be made non-harmful [*CCINFO*] |
| **Ingestion** | Reactive diluents exhibit a range of ingestion hazards. Small amounts swallowed incidental to normal handling operations are not likely to cause injury. However, swallowing larger amounts may cause injury.<br>Male rats exposed to a single oral dose of bisphenol A diglycidyl ether (BADGE) at 750, 1000, and 2000 mg/kg/day showed a significantly increase in the number of immature and maturing sperm on the testis. There were no significant differences with respect to sperm head count, sperm motility, and sperm abnormality in the BADGE treatment groups<br>The material has **NOT** been classified by EC Directives or other classification systems as 'harmful by ingestion'. This is because of the lack of corroborating animal or human evidence. The material may still be damaging to the health of the individual, following ingestion, especially where pre-existing organ (e.g liver, kidney) damage is evident. Present definitions of harmful or toxic substances are generally based on doses producing mortality rather than those producing morbidity (disease, ill-health). Gastrointestinal tract discomfort may produce nausea and vomiting. In an occupational setting however, ingestion of insignificant quantities is not thought to be cause for concern. |

**Continued...**

| | |
|---|---|
| **Skin Contact** | Skin contact is not thought to have harmful health effects (as classified under EC Directives); the material may still produce health damage following entry through wounds, lesions or abrasions.<br><br>Limited evidence exists, or practical experience predicts, that the material either produces inflammation of the skin in a substantial number of individuals following direct contact, and/or produces significant inflammation when applied to the healthy intact skin of animals, for up to four hours, such inflammation being present twenty-four hours or more after the end of the exposure period. Skin irritation may also be present after prolonged or repeated exposure; this may result in a form of contact dermatitis (nonallergic). The dermatitis is often characterised by skin redness (erythema) and swelling (oedema) which may progress to blistering (vesiculation), scaling and thickening of the epidermis. At the microscopic level there may be intercellular oedema of the spongy layer of the skin (spongiosis) and intracellular oedema of the epidermis.<br>Bisphenol A diglycidyl ether (BADGE) may produce contact dermatitis characterised by erythema and oedema, with weeping followed by crusting and scaling. A liquid resin with a molecular weight of 350 produced severe skin irritation in rabbits when applied daily for 4 hours over 20 days.<br>Following the initial contact there may be a discrete erythematous lesion, confined to the point of contact, which may persist for 48 hours to 10 days; the erythema may give way to a papular, vesicular rash with scaling.<br>In animals uncured resin produces moderate ante-mortem depression, loss of body weight and diarrhoea. Local irritation, inflammation and death resulting from respiratory system depression are recorded. Higher molecular weight resins generally produce lower toxicity.<br>Open cuts, abraded or irritated skin should not be exposed to this material<br>Entry into the blood-stream through, for example, cuts, abrasions, puncture wounds or lesions, may produce systemic injury with harmful effects.<br>Examine the skin prior to the use of the material and ensure that any external damage is suitably protected. |
| **Eye** | Evidence exists, or practical experience predicts, that the material may cause eye irritation in a substantial number of individuals and/or may produce significant ocular lesions which are present twenty-four hours or more after instillation into the eye(s) of experimental animals.<br>Repeated or prolonged eye contact may cause inflammation characterised by temporary redness (similar to windburn) of the conjunctiva (conjunctivitis); temporary impairment of vision and/or other transient eye damage/ulceration may occur. |
| **Chronic** | On the basis, primarily, of animal experiments, concern has been expressed that the material may produce carcinogenic or mutagenic effects; in respect of the available information, however, there presently exists inadequate data for making a satisfactory assessment.<br>Repeated or long-term occupational exposure is likely to produce cumulative health effects involving organs or biochemical systems.<br>Practical experience shows that skin contact with the material is capable either of inducing a sensitisation reaction in a substantial number of individuals, and/or of producing a positive response in experimental animals.<br>Substances that can cause occupational asthma (also known as asthmagens and respiratory sensitisers) can induce a state of specific airway hyper-responsiveness via an immunological, irritant or other mechanism. Once the airways have become hyper-responsive, further exposure to the substance, sometimes even to tiny quantities, may cause respiratory symptoms. These symptoms can range in severity from a runny nose to asthma. Not all workers who are exposed to a sensitiser will become hyper-responsive and it is impossible to identify in advance who are likely to become hyper-responsive.<br>Substances than can cuase occupational asthma should be distinguished from substances which may trigger the symptoms of asthma in people with pre-existing air-way hyper-responsiveness. The latter substances are not classified as asthmagens or respiratory sensitisers<br>Wherever it is reasonably practicable, exposure to substances that can cuase occupational asthma should be prevented. Where this is not possible the primary aim is to apply adequate standards of control to prevent workers from becoming hyper-responsive.<br>Activities giving rise to short-term peak concentrations should receive particular attention when risk management is being considered. Health surveillance is appropriate for all employees exposed or liable to be exposed to a substance which may cause occupational asthma and there should be appropriate consultation with an occupational health professional over the degree of risk and level of surveillance.<br>Exposure to the material may cause concerns for human fertility, generally on the basis that results in animal studies provide sufficient evidence to cause a strong suspicion of impaired fertility in the absence of toxic effects, or evidence of impaired fertility occurring at around the same dose levels as other toxic effects, but which are not a secondary non-specific consequence of other toxic effects.<br><br>Exposure to the material may cause concerns for humans owing to possible developmental toxic effects, generally on the basis that results in appropriate animal studies provide strong suspicion of developmental toxicity in the absence of signs of marked maternal toxicity, or at around the same dose levels as other toxic effects but which are not a secondary non-specific consequence of other toxic effects.<br>All glycidyl ethers show genotoxic potential due their alkylating properties. Those glycidyl ethers that have been investigated in long term studies exhibit more or less marked carcinogenic potential. Alkylating agents may damage the stem cell which acts as the precursor to components of the blood. Loss of the stem cell may result in pancytopenia (a reduction in the number of red and white blood cells and platelets) with a latency period corresponding to the lifetime of the individual blood cells. Granulocytopenia (a reduction in granular leukocytes) develops within days and thrombocytopenia (a disorder involving platelets), within 1-2 weeks, whilst loss of erythrocytes (red blood cells) need months to become clinically manifest. Aplastic anaemia develops due to complete destruction of the stem cells.<br>Reported adverse effects in laboratory animals include sensitization, and skin and eye irritation, as well as mutagenic and tumorigenic activity..<br>Testicular abnormalities (including testicular atrophy with decreased spermatogenic activity) following exposure to glycidyl ethers have been reported. Haemopoietic abnormalities following exposure to glycidyl ethers, including alteration of the leukocyte count, atrophy of lymphoid tissue, and bone marrow cytotoxicity have also been reported. These abnormalities were usually observed along with pneumonia and/or toxemia, and therefore may be secondary effects. However, especially in light of the generalized reduction in leukocytes and the atrophy of lymphoid tissues, the observed haemopoietic abnormalities may have been predisposing factors to pneumonia. While none of the individual research reports are conclusive with respect to the ability of glycidyl ethers to produce permanent changes to the testes or haemopoietic system in laboratory animals, the pattern of displayed effects is reason for concern<br>Glycidyl ethers have been shown to cause allergic contact dermatitis in humans. Glycidyl ethers generally cause skin sensitization in experimental animals. Necrosis of the mucous membranes of the nasal cavities was induced in mice exposed to allyl glycidyl ether.<br>A study of workers with mixed exposures was inconclusive with regard to the effects of specific glycidyl ethers. Phenyl glycidyl ether, but not n-butyl glycidyl ether, induced morphological transformation in mammalian cells in vitro. n-Butyl glycidyl ether induced micronuclei in mice in vivo following intraperitoneal but not oral administration. Phenyl glycidyl ether did not induce micronuclei or chromosomal aberrations in vivo or chromosomal aberrations in animal cells in vitro. Alkyl C12 or C14 glycidyl ether did not induce DNA damage in cultured human cells or mutation in cultured animal cells. Allyl glycidyl ether induced mutation in Drosophila. The glycidyl ethers were generally mutagenic to bacteria.<br>Bisphenol A diglycidyl ethers (BADGEs) produce sensitisation dermatitis characterised by a papular, vesicular eczema with considerable itching of the back of the hand, the forearm and face and neck. This lesion may persist for 10-14 days after withdrawal from exposure and recur immediately on re-exposure. This dermatitis may persist for longer periods following each exposure but is unlikely to become more intense. Lesions may develop a brownish colour and scaling occurs frequently. Lower molecular weight species produce sensitisation more readily.<br>In mice technical grades of bisphenol A diglycidyl ether produced epidermal tumours and a small increase in the incidence kidney tumours in males and of lymphoreticular/ haematopoietic tumours in females. Subcutaneous injection produced a small number of fibrosarcomas in rats.<br>BADGE is listed as an IARC Group 3 carcinogen, meaning it is 'not classifiable as to its carcinogenicity to humans'. Concern has been raised over this possible carcinogenicity because BADGE is used in epoxy resins in the lining of some tin cans for foodstuffs, and unreacted BADGE may end up in the contents of those cans.<br>For some reactive diluents, prolonged or repeated skin contact may result in absorption of potentially harmful amounts or allergic skin reactions<br>Exposure to some reactive diluents (notably neopentylglycol diglycidyl ether, CAS RN:17557-23-2) has caused cancer in some animal testing.<br>Long-term exposure to methanol vapour, at concentrations exceeding 3000 ppm, may produce cumulative effects characterised by gastrointestinal disturbances (nausea, vomiting), headache, ringing in the ears, insomnia, trembling, unsteady gait, vertigo, conjunctivitis and clouded or double vision. Liver and/or kidney injury may also result. Some individuals show severe eye damage following prolonged exposure to 800 ppm of the vapour. |

**Continued...**

| | |
|---|---|
| | All workers involved in the production and use of zeolite-containing products are potentially exposed to erionite, a fibrous form of zeolite, which is mined with deposits of other zeolites. When administered by inhalation erionite induced pleural mesotheliomas in rats of both sexes. When administered by intraperitoneal injection, erionite induced peritoneal mesotheliomas in male mice. When introduced by intrapleural injection erionite induced pleural mesotheliomas in male and female rats.<br>Descriptive studies have demonstrated a very high mortality from malignant mesotheliomas, mainly of the pleura, in three Turkish villages where there has been contamination from erionite and where the population had been exposed from birth. Erionite fibres were identified in lung tissue samples in cases of pleural mesotheliomas; ferruginous bodies were found in a much higher proportion of inhabitants in contaminated villages than those of control villages.<br>Intratracheal instillation of another species of zeolite, mordenite, in rats, produced a mild fibrosis and hyperplasia. No significant pulmonary inflammation or interstitial fibrosis was seen in inhalation studies. Mordenite exhibits low cytotoxicity, in vitro.<br>A sample of natural zeolite particles induced aberrant metaphase in human whole blood cultures in vitro. This zeolite sample also induced aberrant metaphases in cells collected by peritoneal lavage of mice after intraperitoneal injection. |

| **8820-A High Temperature Rigid Urethane** | |
|---|---|
| **TOXICITY** | **IRRITATION** |
| Not Available | Not Available |

| **zeolites** | |
|---|---|
| **TOXICITY** | **IRRITATION** |
| Dermal (rabbit) LD50: >2000 mg/kg[2] | Not Available |
| Inhalation(Rat) LC50; >0.5 mg/l4h[2] | |
| Oral(Rat) LD50; >2000 mg/kg[1] | |

| **bisphenol A diglycidyl ether** | |
|---|---|
| **TOXICITY** | **IRRITATION** |
| dermal (rat) LD50: >2000 mg/kg[1] | Eye (rabbit): 2 mg/24h - SEVERE |
| Oral(Rat) LD50; >2000 mg/kg[1] | Eye: adverse effect observed (irritating)[1] |
| | Skin (rabbit): 500 mg - mild |
| | Skin: adverse effect observed (irritating)[1] |

| **carbon black** | |
|---|---|
| **TOXICITY** | **IRRITATION** |
| Dermal (rabbit) LD50: >3000 mg/kg[2] | Eye: no adverse effect observed (not irritating)[1] |
| Oral(Rat) LD50; >8000 mg/kg[1] | Skin: no adverse effect observed (not irritating)[1] |

| **(C12-14)alkylglycidyl ether** | |
|---|---|
| **TOXICITY** | **IRRITATION** |
| Oral(Rat) LD50; >10000 mg/kg[2] | Eye (rabbit): mild [Ciba] |
| | Eye: adverse effect observed (irritating)[1] |
| | Skin (guinea pig): sensitiser |
| | Skin (human): Irritant |
| | Skin (human): non- sensitiser |
| | Skin (rabbit): moderate |
| | Skin : Moderate |
| | Skin: adverse effect observed (irritating)[1] |

| **methanol** | |
|---|---|
| **TOXICITY** | **IRRITATION** |
| Dermal (rabbit) LD50: 15800 mg/kg[2] | Eye (rabbit): 100 mg/24h-moderate |
| Inhalation(Rat) LC50; 64000 ppm4h[2] | Eye (rabbit): 40 mg-moderate |
| Oral(Rat) LD50; 5628 mg/kg[2] | Eye: no adverse effect observed (not irritating)[1] |
| | Skin (rabbit): 20 mg/24 h-moderate |
| | Skin: no adverse effect observed (not irritating)[1] |

| | |
|---|---|
| ***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* |

| | |
|---|---|
| **ZEOLITES** | Inhalation (-) LC50: >18.3 mg/l/1hr for sodium aluminosilicate, zeolite A: Skin (rabbit): non-irritating Eye (rabbit): slight [Grace] |
| **BISPHENOL A DIGLYCIDYL ETHER** | Bisphenol A exhibits hormone-like properties that raise concern about its suitability in consumer products and food containers. Bisphenol A is thought to be an endocrine disruptor which can mimic oestrogen and may lead to negative health effects. More specifically, bisphenol A closely mimics the structure and function of the hormone oestradiol with the ability to bind to and activate the same oestrogen receptor as the natural hormone. The presence of the p-hydroxy group on the benzene rings is though to be responsible for the oestradiol mimicry.<br>. Early developmental stages appear to be the period of greatest sensitivity to its effects and some studies have linked prenatal exposure to later physical and neurological difficulties. Regulatory bodies have determined safety levels for humans, but those safety levels are being questioned or are under review.<br>A 2009 study on Chinese workers in bisphenol A factories found that workers were four times more likely to report erectile dysfunction, reduced sexual desire and overall dissatisfaction with their sex life than workers with no heightened bisphenol A exposure. Bisphenol A workers were also seven times more likely to have ejaculation difficulties. They were also more likely to report reduced sexual function within one year of beginning employment at the factory, and the higher the exposure, the more likely they were to have sexual difficulties. |

**Continued...**

| | |
|---|---|
| | Bisphenol A in weak concentrations is sufficient to produce a negative reaction on the human testicle. The researchers found that a concentration equal to 2 ug/ litre of bisphenol A in the culture medium, a concentration equal to the average concentration generally found in the blood, urine and amniotic fluid of the population, was sufficient to produce the effects. The researchers believe that exposure of pregnant women to bisphenol A may be one of the causes of congenital masculinisation defects of the hypospadia and cryptorchidism types the frequency of which has doubled overall since the 70's. They also suggested that 'it is also possible that bisphenol A contributes to a reduction in the production of sperm and the increase in the incidence of testicular cancer in adults that have been observed in recent decades'<br>One review has concluded that obesity may be increased as a function of bisphenol A exposure, which '...merits concern among scientists and public health officials'<br>One study demonstrated that adverse neurological effects occur in non-human primates regularly exposed to bisphenol A at levels equal to the United States Environmental Protection Agency's (EPA) maximum safe dose of 50 ug/kg/day This research found a connection between bisphenol A and interference with brain cell connections vital to memory, learning, and mood.<br>A further review concluded that bisphenol-A has been shown to bind to thyroid hormone receptor and perhaps have selective effects on its functions. Carcinogenicity studies have shown increases in leukaemia and testicular interstitial cell tumours in male rats. However, 'these studies have not been considered as convincing evidence of a potential cancer risk because of the doubtful statistical significance of the small differences in incidences from controls'. Another in vitro study has concluded that bisphenol A is able to induce neoplastic transformation in human breast epithelial cells.[whilst a further study concluded that maternal oral exposure to low concentrations of bisphenol A, during lactation, increases mammary carcinogenesis in a rodent model. In vitro studies have suggested that bisphenol A can promote the growth of neuroblastoma cells and potently promotes invasion and metastasis of neuroblastoma cells. Newborn rats exposed to a low-dose of bisphenol A (10 ug/kg) showed increased prostate cancer susceptibility when adults. At least one study has suggested that bisphenol A suppresses DNA methylation which is involved in epigenetic changes.<br>Bisphenol A is the isopropyl adduct of 4,4'-dihydroxydiphenyl oxide (DHDPO). A series of DHDPO analogues have been investigated as potential oestrogen receptor/anti-tumour drug carriers in the development of a class of therapeutic drugs called 'cytostatic hormones'. Oestrogenic activity is induced with 1 to 100 mg/kg body weight in animal models. Bisphenol A sealants are frequently used in dentistry for treatment of dental pits and fissures. Samples of saliva collected from dental patients during a 1-hour period following application contain the monomer. A bisphenol-A sealant has been shown to be oestrogenic in vitro; such sealants may represent an additional source of xenoestrogens in humans and may be the cause of additional concerns in children.<br>Concerns have been raised about the possible developmental effects on the foetus/embryo or neonate resulting from the leaching of bisphenol A from epoxy linings in metal cans which come in contact with food-stuffs.<br>Many drugs, including naproxen, salicylic acid, carbamazepine and mefenamic acid can, in vitro, significantly inhibit bisphenol A glucuronidation (detoxification).<br>BPA belongs to the list of compounds having this property as the rodent models have shown that BPA exposure is linked with increased body weigh (obesogens)t. Several mechanisms can help explain the effect of BPA on body weight increase. A possible mechanism leading to triglyceride accumulation is the decreased production of the hormone adiponectin from all human adipose tissue tested when exposed to very low levels (below nanomolar range) of BPA in cell or explant culture settings . The expression of leptin as well as several enzymes and transcription factors is also affected by BPA exposure in vivo as well as in vitro. Together, the altered expression and activity of these important mediators of fat metabolism could explain the increase in weight following BPA exposure in rodent models. These results also suggest that, together with other obesogens, low, environmentally relevant levels of BPA may contribute to the human obesity phenomenon.<br>All glycidyl ethers show genotoxic potential due their alkylating properties. Those glycidyl ethers that have been investigated in long term studies exhibit more or less marked carcinogenic potential. Alkylating agents may damage the stem cell which acts as the precursor to components of the blood. Loss of the stem cell may result in pancytopenia (a reduction in the number of red and white blood cells and platelets) with a latency period corresponding to the lifetime of the individual blood cells. Granulocytopenia (a reduction in granular leukocytes) develops within days and thrombocytopenia (a disorder involving platelets), within 1-2 weeks, whilst loss of erythrocytes (red blood cells) need months to become clinically manifest. Aplastic anaemia develops due to complete destruction of the stem cells.<br>Reported adverse effects in laboratory animals include sensitization, and skin and eye irritation, as well as mutagenic and tumorigenic activity..<br>Testicular abnormalities (including testicular atrophy with decreased spermatogenic activity) following exposure to glycidyl ethers have been reported. Haemopoietic abnormalities following exposure to glycidyl ethers, including alteration of the leukocyte count, atrophy of lymphoid tissue, and bone marrow cytotoxicity have also been reported. These abnormalities were usually observed along with pneumonia and/or toxemia, and therefore may be secondary effects. However, especially in light of the generalized reduction in leukocytes and the atrophy of lymphoid tissues, the observed haemopoietic abnormalities may have been predisposing factors to pneumonia. While none of the individual research reports are conclusive with respect to the ability of glycidyl ethers to produce permanent changes to the testes or haemopoietic system in laboratory animals, the pattern of displayed effects is reason for concern<br>Glycidyl ethers have been shown to cause allergic contact dermatitis in humans. Glycidyl ethers generally cause skin sensitization in experimental animals. Necrosis of the mucous membranes of the nasal cavities was induced in mice exposed to allyl glycidyl ether.<br>A study of workers with mixed exposures was inconclusive with regard to the effects of specific glycidyl ethers. Phenyl glycidyl ether, but not n-butyl glycidyl ether, induced morphological transformation in mammalian cells in vitro. n-Butyl glycidyl ether induced micronuclei in mice in vivo following intraperitoneal but not oral administration. Phenyl glycidyl ether did not induce micronuclei or chromosomal aberrations in vivo or chromosomal aberrations in animal cells in vitro. Alkyl C12 or C14 glycidyl ether did not induce DNA damage in cultured human cells or mutation in cultured animal cells. Allyl glycidyl ether induced mutation in Drosophila. The glycidyl ethers were generally mutagenic to bacteria.<br>55badger<br>The substance is classified by IARC as Group 3:<br>**NOT** classifiable as to its carcinogenicity to humans.<br>Evidence of carcinogenicity may be inadequate or limited in animal testing. |
| **CARBON BLACK** | Inhalation (rat) TCLo: 50 mg/m3/6h/90D-I Nil reported No significant acute toxicological data identified in literature search.<br><br>**WARNING:** This substance has been classified by the IARC as Group 2B: Possibly Carcinogenic to Humans. |
| **METHANOL** | 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. |
| **8820-A High Temperature Rigid Urethane & BISPHENOL A DIGLYCIDYL ETHER & (C12-14)ALKYLGLYCIDYL ETHER** | The following information refers to contact allergens as a group and may not be specific to this product.<br>Contact allergies 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.<br>Oxiranes (including glycidyl ethers and alkyl oxides, and epoxides) exhibit many common characteristics with respect to animal toxicology. One such oxirane is ethyloxirane; data presented here may be taken as representative. |
| **8820-A High Temperature Rigid Urethane & BISPHENOL A DIGLYCIDYL ETHER** | In mice, dermal application of bisphenol A diglycidyl ether (BADGE) (1, 10, or 100 mg/kg) for 13 weeks produced mild to moderate chronic active dermatitis. At the high dose, spongiosis and epidermal micro abscess formation were observed. In rats, dermal application of BADGE (10, 100, or 1000 mg/kg) for 13 weeks resulted in a decrease in body weight at the high dose. The no-observable effect level (NOEL) for dermal exposure was 100 mg/kg for both sexes. In a separate study, application of BADGE (same doses) five times per week for ~13 weeks not only caused a decrease in body weight but also produced chronic dermatitis at all dose levels in males and at >100 mg/kg in females (as well as in a satellite group of females given 1000 mg/kg).<br>**Reproductive and Developmental Toxicity**: BADGE (50, 540, or 750 mg/kg) administered to rats via gavage for 14 weeks (P1) or 12 weeks (P2) produced decreased body weight in all males at the mid dose and in both males and females at the high dose, but had no reproductive effects. The NOEL for reproductive effects was 750 mg/kg. |

**Continued...**

| | |
|---|---|
| | **Carcinogenicity:** IARC concluded that 'there is limited evidence for the carcinogenicity of bisphenol A diglycidyl ether in experimental animals.' Its overall evaluation was 'Bisphenol A diglycidyl ether is not classifiable as to its carcinogenicity to humans (Group 3).<br>In a lifetime tumourigenicity study in which 90-day-old C3H mice received three dermal applications per week of BADGE (undiluted dose) for 23 months, only one out of 32 animals developed a papilloma after 16 months. A retest, in which skin paintings were done for 27 months, however, produced no tumours (Weil et al., 1963). In another lifetime skin-painting study, BADGE (dose n.p.) was also reported to be noncarcinogenic to the skin of C3H mice; it was, however, weakly carcinogenic to the skin of C57BL/6 mice (Holland et al., 1979; cited by Canter et al., 1986). In a two-year bioassay, female Fisher 344 rats dermally exposed to BADGE (1, 100, or 1000 mg/kg) showed no evidence of dermal carcinogenicity but did have low incidences of tumours in the oral cavity (U.S. EPA, 1997).<br>**Genotoxicity**: In S. typhimurium strains TA100 and TA1535, BADGE (10-10,000 ug/plate) was mutagenic with and without S9; negative results were obtained in TA98 and TA1537 (Canter et al., 1986; Pullin, 1977). In a spot test, BADGE (0.05 or 10.00 mg) failed to show mutagenicity in strains TA98 and TA100 (Wade et al., 1979). Negative results were also obtained in the body fluid test using urine of female BDF and ICR mice (1000 mg/kg BADGE), the mouse host-mediated assay (1000 mg/kg), micronucleus test (1000 mg/kg), and dominant lethal assay (~3000 mg/kg).<br>**Immunotoxicity:** Intracutaneous injection of diluted BADGE (0.1 mL) three times per week on alternate days (total of 8 injections) followed by a three-week incubation period and a challenge dose produced sensitisation in 19 of 20 guinea pigs<br>-<br>**Consumer exposure** to BADGE is almost exclusively from migration of BADGE from can coatings into food. Using a worst-case scenario that assumes BADGE migrates at the same level into all types of food, the estimated per capita daily intake for a 60-kg individual is approximately 0.16 ug/kg body weight/day. A review of one- and two-generation reproduction studies and developmental investigations found no evidence of reproductive or endocrine toxicity, the upper ranges of dosing being determined by maternal toxicity. The lack of endocrine toxicity in the reproductive and developmental toxicological tests is supported by negative results from both in vivo and in vitro assays designed specifically to detect oestrogenic and androgenic properties of BADGE. An examination of data from sub-chronic and chronic toxicological studies support a NOAEL of 50 mg/ kg/body weight day from the 90-day study, and a NOAEL of 15 mg/kg body weigh/day (male rats) from the 2-year carcinogenicity study. Both NOAELS are considered appropriate for risk assessment. Comparing the estimated daily human intake of 0.16 ug/kg body weight/day with the NOAELS of 50 and 15 mg/kg body weight/day shows human exposure to BADGE from can coatings is between 250,000 and 100,000-fold lower than the NOAELs from the most sensitive toxicology tests. These large margins of safety together with lack of reproductive, developmental, endocrine and carcinogenic effects supports the continued use of BADGE for use in articles intended to come into contact with foodstuffs. |
| **BISPHENOL A DIGLYCIDYL ETHER & (C12-14)ALKYLGLYCIDYL ETHER** | for 1,2-butylene oxide (ethyloxirane):<br>Ethyloxirane increased the incidence of tumours of the respiratory system in male and female rats exposed via inhalation. Significant increases in nasal papillary adenomas and combined alveolar/bronchiolar adenomas and carcinomas were observed in male rats exposed to 1200 mg/m3 ethyloxirane via inhalation for 103 weeks. There was also a significant positive trend in the incidence of combined alveolar/bronchiolar adenomas and carcinomas. Nasal papillary adenomas were also observed in 2/50 high-dose female rats with none occurring in control or low-dose animals. In mice exposed chronically via inhalation, one male mouse developed a squamous cell papilloma in the nasal cavity (300 mg/m3) but other tumours were not observed. Tumours were not observed in mice exposed chronically via dermal exposure. When trichloroethylene containing 0.8% ethyloxirane was administered orally to mice for up to 35 weeks, followed by 0.4% from weeks 40 to 69, squamous-cell carcinomas of the forestomach occurred in 3/49 males (p=0.029, age-adjusted) and 1/48 females at week 106. Trichloroethylene administered alone did not induce these tumours and they were not observed in control animals . Two structurally related substances, oxirane (ethylene oxide) and methyloxirane (propylene oxide), which are also direct-acting alkylating agents, have been classified as carcinogenic |

| | | | |
|---|---|---|---|
| **Acute Toxicity** | ✗ | **Carcinogenicity** | ✗ |
| **Skin Irritation/Corrosion** | ✗ | **Reproductivity** | ✓ |
| **Serious Eye Damage/Irritation** | ✗ | **STOT - Single Exposure** | ✗ |
| **Respiratory or Skin sensitisation** | ✓ | **STOT - Repeated Exposure** | ✗ |
| **Mutagenicity** | ✗ | **Aspiration Hazard** | ✗ |

***Legend:*** ✗ *– Data either not available or does not fill the criteria for classification*
✓ *– Data available to make classification*

### 11.2.1. Endocrine Disruption Properties

Not Available

## SECTION 12 Ecological information

### 12.1. Toxicity

**8820-A High Temperature Rigid Urethane**

| Endpoint | Test Duration (hr) | Species | Value | Source |
|---|---|---|---|---|
| Not Available | Not Available | Not Available | Not Available | Not Available |

**zeolites**

| Endpoint | Test Duration (hr) | Species | Value | Source |
|---|---|---|---|---|
| ErC50 | 72h | Algae or other aquatic plants | 18mg/l | 1 |
| EC50 | 48h | Crustacea | >100mg/l | 2 |
| LC50 | 96h | Fish | >1000mg/l | 1 |
| EC10(ECx) | 96h | Algae or other aquatic plants | 4.9mg/l | 1 |
| EC50 | 96h | Algae or other aquatic plants | 18mg/l | 1 |

**bisphenol A diglycidyl ether**

| Endpoint | Test Duration (hr) | Species | Value | Source |
|---|---|---|---|---|
| EC50 | 72h | Algae or other aquatic plants | 9.4mg/l | 2 |
| LC50 | 96h | Fish | 1.2mg/l | 2 |
| EC50 | 48h | Crustacea | 1.1mg/l | 2 |
| NOEC(ECx) | 504h | Crustacea | 0.3mg/l | 2 |

**Continued...**

**carbon black**

| Endpoint | Test Duration (hr) | Species | Value | Source |
|---|---|---|---|---|
| EC50 | 72h | Algae or other aquatic plants | >0.2mg/l | 2 |
| LC50 | 96h | Fish | >100mg/l | 2 |
| EC50 | 48h | Crustacea | 33.076-41.968mg/l | 4 |
| NOEC(ECx) | 24h | Crustacea | 3200mg/l | 1 |

**(C12-14)alkylglycidyl ether**

| Endpoint | Test Duration (hr) | Species | Value | Source |
|---|---|---|---|---|
| EC50(ECx) | 48h | Crustacea | 6.07mg/l | 2 |
| LC50 | 96h | Fish | >5000mg/l | 2 |
| EC50 | 48h | Crustacea | 6.07mg/l | 2 |

**methanol**

| Endpoint | Test Duration (hr) | Species | Value | Source |
|---|---|---|---|---|
| EC50(ECx) | 96h | Algae or other aquatic plants | <0.001mg/L | 4 |
| LC50 | 96h | Fish | >100mg/l | 4 |
| EC50 | 48h | Crustacea | >10000mg/l | 2 |
| EC50 | 96h | Algae or other aquatic plants | <0.001mg/L | 4 |

***Legend:*** *Extracted from 1. IUCLID Toxicity Data 2. Europe ECHA Registered Substances - Ecotoxicological Information - Aquatic Toxicity 3. EPIWIN Suite V3.12 (QSAR) - Aquatic Toxicity Data (Estimated) 4. US EPA, Ecotox database - Aquatic Toxicity Data 5. ECETOC Aquatic Hazard Assessment Data 6. NITE (Japan) - Bioconcentration Data 7. METI (Japan) - Bioconcentration Data 8. Vendor Data*

Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
Do NOT allow product to come in contact with surface waters or to intertidal areas below the mean high water mark. Do not contaminate water when cleaning equipment or disposing of equipment wash-waters.
Wastes resulting from use of the product must be disposed of on site or at approved waste sites.
Liquid epoxy resins and some reactive diluents are not readily biodegradable, although its epoxy functional groups are hydrolysed in contact with water, they have the potential to bio-accumulate and are moderately toxic to aquatic organisms. They are generally classified as dangerous for the environment according to the European Union classification criteria.
Uncured solid resins on the other hand are not readily bio-available, not toxic to aquatic and terrestrial organisms, not readily biodegradable, but hydrolysable.They present no significant hazard for the environment.

Significant environmental findings are limited. Oxiranes (including glycidyl ethers and alkyl oxides, and epoxides) exhibit common characteristics with respect to environmental fate and ecotoxicology. One such oxirane is ethyloxirane and data presented here may be taken as representative.
for 1,2-butylene oxide (ethyloxirane):
**Environmental fate:** Ethyloxirane is highly soluble in water and has a very low soil-adsorption coefficient, which suggests that if released to water, adsorption of ethyloxirane to sediment and suspended solids is not expected. Volatilisation of ethyloxirane from water surfaces would be expected based on the moderate estimated Henry's Law constant. If ethyloxirane is released to soil, it is expected to have low adsorption and thus very high mobility. Volatilisation from moist soil and dry soil surfaces is expected, based on its vapour pressure. It is expected that ethyloxirane exists solely as a vapour in ambient atmosphere, based on its very high vapour pressure. Ethyloxirane may also be removed from the atmosphere by wet deposition processes, considering its relatively high water solubility.
**Persistence:** The half-life in air is about 5.6 days from the reaction of ethyloxirane with photochemically produced hydroxyl radicals which indicates that this chemical meets the persistence criterion in air (half-life of = 2 days)*.
Ethyloxirane is hydrolysable, with a half-life of 6.5 days, and biodegradable up to 100% degradation and is not expected to persist in water. A further model-predicted biodegradation half-life of 15 days in water was obtained and used to predict the half-life of this chemical in soil and sediment by applying Boethling's extrapolation factors ( t1/2water : t1/2 soil : t1/2sediment = 1: 1: 4 ) (Boethling 1995). According to these values, it can be concluded that ethyloxirane does not meet the persistence criteria in water and soil (half-lives = 182 days) and sediments (half-life = 365 days).
Experimental and modelled log Kow values of 0.68 and 0.86, respectively, indicate that the potential for bioaccumulation of ethyloxirane in organisms is likely to be low. Modelled bioaccumulation -factor (BAF) and bioconcentration -factor (BCF) values of 1 to 17 L/kg indicate that ethyloxirane does not meet the bioaccumulation criteria (BCF/BAF = 5000)*
**Ecotoxicity:**
Experimental ecotoxicological data for ethyloxirane (OECD 2001) indicate low to moderate toxicity to aquatic organisms. For fish and water flea, acute LC50/EC50 values vary within a narrow range of 70-215 mg/L; for algae, toxicity values exceed 500 mg/L, while for bacteria they are close to 5000 mg/L

* *Persistence and Bioaccumulation Regulations* (Canada 2000).
**DO NOT** discharge into sewer or waterways.

### 12.2. Persistence and degradability

| Ingredient | Persistence: Water/Soil | Persistence: Air |
|---|---|---|
| bisphenol A diglycidyl ether | HIGH | HIGH |
| methanol | LOW | LOW |

### 12.3. Bioaccumulative potential

| Ingredient | Bioaccumulation |
|---|---|
| bisphenol A diglycidyl ether | MEDIUM (LogKOW = 3.8446) |
| methanol | LOW (BCF = 10) |

### 12.4. Mobility in soil

| Ingredient | Mobility |
|---|---|
| bisphenol A diglycidyl ether | LOW (KOC = 1767) |
| methanol | HIGH (KOC = 1) |

### 12.5. Results of PBT and vPvB assessment

| | P | B | T |
|---|---|---|---|

**Continued...**

| | P | B | T |
|---|---|---|---|
| Relevant available data | Not Available | Not Available | Not Available |
| PBT | ✗ | ✗ | ✗ |
| vPvB | ✗ | ✗ | ✗ |

| | |
|---|---|
| PBT Criteria fulfilled? | No |
| vPvB | No |

### 12.6. Endocrine Disruption Properties

Not Available

### 12.7. Other adverse effects

Not Available

## SECTION 13 Disposal considerations

### 13.1. Waste treatment methods

| | |
|---|---|
| **Product / Packaging disposal** | ▸ Containers may still present a chemical hazard/ danger when empty.<br>▸ Return to supplier for reuse/ recycling if possible.<br>Otherwise:<br>▸ 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.<br>▸ Where possible retain label warnings and SDS and observe all notices pertaining to the product.<br>Waste Management<br>Production waste from epoxy resins and resin systems should be treated as hazardous waste in accordance with National regulations. Fire retarded resins containing halogenated compounds should also be treated as special waste. Accidental spillage of resins, curing agents and their formulations should be contained and absorbed by special mineral absorbents to prevent them from entering the environment.<br>Contaminated or surplus product should not be washed down the sink, but preferably be fully reacted to form cross-linked solids which is non-hazardous and can be more easily disposed.<br>Finished articles made from fully cured epoxy resins are hard, infusible solids presenting no hazard to the environment. However, finished articles from flame-retarded material containing halogenated resins should be considered hazardous waste, and disposed as required by National laws.<br>Articles made from epoxy resins, like other thermosets, can be recycled by grinding and used as fillers in other products. Another way of disposal and recovery is combustion with energy recovery.<br>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.<br>A Hierarchy of Controls seems to be common - the user should investigate:<br>▸ Reduction<br>▸ Reuse<br>▸ Recycling<br>▸ Disposal (if all else fails)<br>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.<br>▸ **DO NOT** allow wash water from cleaning or process equipment to enter drains.<br>▸ It may be necessary to collect all wash water for treatment before disposal.<br>▸ In all cases disposal to sewer may be subject to local laws and regulations and these should be considered first.<br>▸ Where in doubt contact the responsible authority.<br>▸ Recycle wherever possible or consult manufacturer for recycling options.<br>▸ Consult State Land Waste Authority for disposal.<br>▸ Bury or incinerate residue at an approved site.<br>▸ Recycle containers if possible, or dispose of in an authorised landfill. |
| **Waste treatment options** | Not Available |
| **Sewage disposal options** | Not Available |

## SECTION 14 Transport information

### Land transport (ADR): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

| | |
|---|---|
| 14.1. **UN number** | Not Applicable |
| 14.2. **UN proper shipping name** | Not Applicable |
| 14.3. **Transport hazard class(es)** | Class: Not Applicable<br>Subrisk: Not Applicable |
| 14.4. **Packing group** | Not Applicable |
| 14.5. **Environmental hazard** | Not Applicable |
| 14.6. **Special precautions for user** | Hazard identification (Kemler): Not Applicable<br>Classification code: Not Applicable<br>Hazard Label: Not Applicable<br>Special provisions: Not Applicable<br>Limited quantity: Not Applicable |

**Continued...**

| | | |
|---|---|---|
| | Tunnel Restriction Code | Not Applicable |

**Air transport (ICAO-IATA / DGR): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS**

| | |
|---|---|
| 14.1. **UN number** | Not Applicable |
| 14.2. **UN proper shipping name** | Not Applicable |
| 14.3. **Transport hazard class(es)** | ICAO/IATA Class: Not Applicable<br>ICAO / IATA Subrisk: Not Applicable<br>ERG Code: Not Applicable |
| 14.4. **Packing group** | Not Applicable |
| 14.5. **Environmental hazard** | Not Applicable |
| 14.6. **Special precautions for user** | Special provisions: Not Applicable<br>Cargo Only Packing Instructions: Not Applicable<br>Cargo Only Maximum Qty / Pack: Not Applicable<br>Passenger and Cargo Packing Instructions: Not Applicable<br>Passenger and Cargo Maximum Qty / Pack: Not Applicable<br>Passenger and Cargo Limited Quantity Packing Instructions: Not Applicable<br>Passenger and Cargo Limited Maximum Qty / Pack: Not Applicable |

**Sea transport (IMDG-Code / GGVSee): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS**

| | |
|---|---|
| 14.1. **UN number** | Not Applicable |
| 14.2. **UN proper shipping name** | Not Applicable |
| 14.3. **Transport hazard class(es)** | IMDG Class: Not Applicable<br>IMDG Subrisk: Not Applicable |
| 14.4. **Packing group** | Not Applicable |
| 14.5. **Environmental hazard** | Not Applicable |
| 14.6. **Special precautions for user** | EMS Number: Not Applicable<br>Special provisions: Not Applicable<br>Limited Quantities: Not Applicable |

**Inland waterways transport (ADN): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS**

| | |
|---|---|
| 14.1. **UN number** | Not Applicable |
| 14.2. **UN proper shipping name** | Not Applicable |
| 14.3. **Transport hazard class(es)** | Not Applicable: Not Applicable |
| 14.4. **Packing group** | Not Applicable |
| 14.5. **Environmental hazard** | Not Applicable |
| 14.6. **Special precautions for user** | Classification code: Not Applicable<br>Special provisions: Not Applicable<br>Limited quantity: Not Applicable<br>Equipment required: Not Applicable<br>Fire cones number: Not Applicable |

**14.7. Transport in bulk according to Annex II of MARPOL and the IBC code**

Not Applicable

**14.8. Transport in bulk in accordance with MARPOL Annex V and the IMSBC Code**

| Product name | Group |
|---|---|
| zeolites | Not Available |
| bisphenol A diglycidyl ether | Not Available |
| carbon black | Not Available |
| (C12-14)alkylglycidyl ether | Not Available |
| methanol | Not Available |

**14.9. Transport in bulk in accordance with the ICG Code**

| Product name | Ship Type |
|---|---|

**Continued...**

| Product name | Ship Type |
|---|---|
| zeolites | Not Available |
| bisphenol A diglycidyl ether | Not Available |
| carbon black | Not Available |
| (C12-14)alkylglycidyl ether | Not Available |
| methanol | Not Available |

## SECTION 15 Regulatory information

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

**zeolites is found on the following regulatory lists**

EU REACH Regulation (EC) No 1907/2006 - Proposals to identify Substances of Very High Concern: Annex XV reports for commenting by Interested Parties previous consultation
Europe EC Inventory
European Union - European Inventory of Existing Commercial Chemical Substances (EINECS)
International Agency for Research on Cancer (IARC) - Agents Classified by the IARC Monographs

**bisphenol A diglycidyl ether is found on the following regulatory lists**

Chemical Footprint Project - Chemicals of High Concern List
EU European Chemicals Agency (ECHA) Community Rolling Action Plan (CoRAP) List of Substances
Europe EC Inventory
European Union - European Inventory of Existing Commercial Chemical Substances (EINECS)
European Union (EU) Regulation (EC) No 1272/2008 on Classification, Labelling and Packaging of Substances and Mixtures - Annex VI
International Agency for Research on Cancer (IARC) - Agents Classified by the IARC Monographs

**carbon black is found on the following regulatory lists**

Chemical Footprint Project - Chemicals of High Concern List
EU European Chemicals Agency (ECHA) Community Rolling Action Plan (CoRAP) List of Substances
Europe EC Inventory
European Union - European Inventory of Existing Commercial Chemical Substances (EINECS)
International Agency for Research on Cancer (IARC) - Agents Classified by the IARC Monographs
International Agency for Research on Cancer (IARC) - Agents Classified by the IARC Monographs - Group 2B: Possibly carcinogenic to humans
International WHO List of Proposed Occupational Exposure Limit (OEL) Values for Manufactured Nanomaterials (MNMS)

**(C12-14)alkylglycidyl ether is found on the following regulatory lists**

Chemical Footprint Project - Chemicals of High Concern List
EU European Chemicals Agency (ECHA) Community Rolling Action Plan (CoRAP) List of Substances
Europe EC Inventory
European Union - European Inventory of Existing Commercial Chemical Substances (EINECS)
European Union (EU) Regulation (EC) No 1272/2008 on Classification, Labelling and Packaging of Substances and Mixtures - Annex VI

**methanol is found on the following regulatory lists**

Chemical Footprint Project - Chemicals of High Concern List
EU Consolidated List of Indicative Occupational Exposure Limit Values (IOELVs)
EU European Chemicals Agency (ECHA) Community Rolling Action Plan (CoRAP) List of Substances
EU REACH Regulation (EC) No 1907/2006 - Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles
Europe EC Inventory
European Union - European Inventory of Existing Commercial Chemical Substances (EINECS)
European Union (EU) Regulation (EC) No 1272/2008 on Classification, Labelling and Packaging of Substances and Mixtures - Annex VI

This safety data sheet is in compliance with the following EU legislation and its adaptations - as far as applicable - : Directives 98/24/EC, - 92/85/EEC, - 94/33/EC, - 2008/98/EC, - 2010/75/EU; Commission Regulation (EU) 2020/878; Regulation (EC) No 1272/2008 as updated through ATPs.

### 15.2. Chemical safety assessment

No Chemical Safety Assessment has been carried out for this substance/mixture by the supplier.

### National Inventory Status

| National Inventory | Status |
|---|---|
| Australia - AIIC / Australia Non-Industrial Use | Yes |
| Canada - DSL | Yes |
| Canada - NDSL | No (bisphenol A diglycidyl ether; carbon black; (C12-14)alkylglycidyl ether; methanol) |
| China - IECSC | Yes |
| Europe - EINEC / ELINCS / NLP | Yes |
| Japan - ENCS | No (zeolites; (C12-14)alkylglycidyl ether) |
| Korea - KECI | Yes |
| New Zealand - NZIoC | Yes |
| Philippines - PICCS | Yes |
| USA - TSCA | Yes |
| Taiwan - TCSI | Yes |
| Mexico - INSQ | No (bisphenol A diglycidyl ether; (C12-14)alkylglycidyl ether) |
| Vietnam - NCI | Yes |
| Russia - FBEPH | Yes |
| ***Legend:*** | *Yes = All CAS declared ingredients are on the inventory*<br>*No = One or more of the CAS listed ingredients are not on the inventory. These ingredients may be exempt or will require registration.* |

**Continued...**

## SECTION 16 Other information

| | |
|---|---|
| **Revision Date** | 25/10/2021 |
| **Initial Date** | 18/06/2018 |

### Full text Risk and Hazard codes

| | |
|---|---|
| **H225** | Highly flammable liquid and vapour. |
| **H301** | Toxic if swallowed. |
| **H311** | Toxic in contact with skin. |
| **H315** | Causes skin irritation. |
| **H319** | Causes serious eye irritation. |
| **H331** | Toxic if inhaled. |
| **H351** | Suspected of causing cancer. |
| **H370** | Causes damage to organs. |

### Other information

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.
For detailed advice on Personal Protective Equipment, refer to the following EU CEN Standards:
EN 166 Personal eye-protection
EN 340 Protective clothing
EN 374 Protective gloves against chemicals and micro-organisms
EN 13832 Footwear protecting against chemicals
EN 133 Respiratory protective devices

### 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
ES: Exposure Standard
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
AIIC: Australian Inventory of Industrial Chemicals
DSL: Domestic Substances List
NDSL: Non-Domestic Substances List
IECSC: Inventory of Existing Chemical Substance in China
EINECS: European INventory of Existing Commercial chemical Substances
ELINCS: European List of Notified Chemical Substances
NLP: No-Longer Polymers
ENCS: Existing and New Chemical Substances Inventory
KECI: Korea Existing Chemicals Inventory
NZIoC: New Zealand Inventory of Chemicals
PICCS: Philippine Inventory of Chemicals and Chemical Substances
TSCA: Toxic Substances Control Act
TCSI: Taiwan Chemical Substance Inventory
INSQ: Inventario Nacional de Sustancias Químicas
NCI: National Chemical Inventory
FBEPH: Russian Register of Potentially Hazardous Chemical and Biological Substances

### Reason for Change

A-2.00 - Added UFI number and format change to SDS

# 8820-B High Temperature Rigid Urethane

## MG Chemicals UK Limited

Version No: **A-2.00**
Safety data sheet according to REACH Regulation (EC) No 1907/2006, as amended by UK REACH Regulations SI 2019/758

Issue Date: **25/10/2021**
Revision Date: **26/10/2021**
L.REACH.GB.EN

## SECTION 1 Identification of the substance / mixture and of the company / undertaking

### 1.1. Product Identifier

| | |
|---|---|
| **Product name** | 8820-B |
| **Synonyms** | SDS Code: 8820-B; 8820-375ML, 8820-2.55L, 8820-10.8L, 8820-60L \| UFI:FCN0-U077-U00D-51JQ |
| **Other means of identification** | High Temperature Rigid Urethane |

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

| | |
|---|---|
| **Relevant identified uses** | Urethane hardener for use with resins |
| **Uses advised against** | FOR INDUSTRIAL USE ONLY |

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

| | | |
|---|---|---|
| **Registered company name** | **MG Chemicals UK Limited** | **MG Chemicals (Head office)** |
| **Address** | Heame House, 23 Bilston Street, Sedgely Dudley DY3 1JA United Kingdom | 9347 - 193 Street Surrey V4N 4E7 British Columbia Canada |
| **Telephone** | +(44) 1663 362888 | +(1) 800-201-8822 |
| **Fax** | Not Available | +(1) 800-708-9888 |
| **Website** | Not Available | www.mgchemicals.com |
| **Email** | sales@mgchemicals.com | Info@mgchemicals.com |

### 1.4. Emergency telephone number

| | |
|---|---|
| **Association / Organisation** | **Verisk 3E (Access code: 335388)** |
| **Emergency telephone numbers** | +(44) 20 35147487 |
| **Other emergency telephone numbers** | +(0) 800 680 0425 |

## SECTION 2 Hazards identification

### 2.1. Classification of the substance or mixture

| | |
|---|---|
| **Classified according to GB-CLP Regulation, UK SI 2019/720 and UK SI 2020/1567 [1]** | H334 - Sensitisation (Respiratory) Category 1, H373 - Specific Target Organ Toxicity - Repeated Exposure Category 2, H332 - Acute Toxicity (Inhalation) Category 4, H335 - Specific Target Organ Toxicity - Single Exposure (Respiratory Tract Irritation) Category 3, H315 - Skin Corrosion/Irritation Category 2, H319 - Serious Eye Damage/Eye Irritation Category 2, H317 - Sensitisation (Skin) Category 1 |
| ***Legend:*** | *1. Classified by Chemwatch; 2. Classification drawn from GB-CLP Regulation, UK SI 2019/720 and UK SI 2020/1567* |

### 2.2. Label elements

| | |
|---|---|
| **Hazard pictogram(s)** |  |
| **Signal word** | **Danger** |

### Hazard statement(s)

| | |
|---|---|
| **H334** | May cause allergy or asthma symptoms or breathing difficulties if inhaled. |
| **H373** | May cause damage to organs through prolonged or repeated exposure. |
| **H332** | Harmful if inhaled. |
| **H335** | May cause respiratory irritation. |
| **H315** | Causes skin irritation. |
| **H319** | Causes serious eye irritation. |
| **H317** | May cause an allergic skin reaction. |

**Page 1 continued...**

**Supplementary statement(s)**

| | |
|---|---|
| **EUH204** | Contains isocyanates. May produce an allergic reaction. |

**Precautionary statement(s) Prevention**

| | |
|---|---|
| **P260** | Do not breathe mist/vapours/spray. |
| **P271** | Use only outdoors or in a well-ventilated area. |
| **P280** | Wear protective gloves, protective clothing, eye protection and face protection. |
| **P284** | [In case of inadequate ventilation] wear respiratory protection. |
| **P264** | Wash all exposed external body areas thoroughly after handling. |
| **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. |
| **P342+P311** | If experiencing respiratory symptoms: Call a POISON CENTER/doctor/physician/first aider. |
| **P302+P352** | IF ON SKIN: Wash with plenty of water and soap. |
| **P305+P351+P338** | IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. |
| **P312** | Call a POISON CENTER/doctor/physician/first aider/if you feel unwell. |
| **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. |

**Precautionary statement(s) Storage**

| | |
|---|---|
| **P405** | Store locked up. |
| **P403+P233** | Store in a well-ventilated place. Keep container tightly closed. |

**Precautionary statement(s) Disposal**

| | |
|---|---|
| **P501** | Dispose of contents/container to authorised hazardous or special waste collection point in accordance with any local regulation. |

### 2.3. Other hazards

Skin contact may produce health damage*.

Ingestion may produce serious health damage*.

Cumulative effects may result following exposure*.

| | |
|---|---|
| **polymeric diphenylmethane diisocyanate** | Listed in the Europe Regulation (EC) No 1907/2006 - Annex XVII (Restrictions may apply) |
| **4,4'-diphenylmethane diisocyanate (MDI)** | Listed in the Europe Regulation (EC) No 1907/2006 - Annex XVII (Restrictions may apply) |
| **2,4'-diphenylmethane diisocyanate** | Listed in the Europe Regulation (EC) No 1907/2006 - Annex XVII (Restrictions may apply) |
| **2,2'-diphenylmethane diisocyanate** | Listed in the Europe Regulation (EC) No 1907/2006 - Annex XVII (Restrictions may apply) |

## SECTION 3 Composition / information on ingredients

### 3.1.Substances

See 'Composition on ingredients' in Section 3.2

### 3.2.Mixtures

| **1.CAS No<br>2.EC No<br>3.Index No<br>4.REACH No** | **%[weight]** | **Name** | **Classified according to GB-CLP Regulation, UK SI 2019/720 and UK SI 2020/1567** | **Nanoform Particle Characteristics** |
|---|---|---|---|---|
| 1.9016-87-9<br>2.Not Available<br>3.Not Available<br>4.Not Available | 58 | polymeric diphenylmethane diisocyanate | Acute Toxicity (Inhalation) Category 4, Skin Corrosion/Irritation Category 2, Serious Eye Damage/Eye Irritation Category 2, Sensitisation (Skin) Category 1, Sensitisation (Respiratory) Category 1, Carcinogenicity Category 2, Specific Target Organ Toxicity - Single Exposure (Respiratory Tract Irritation) Category 3 , Specific Target Organ Toxicity - Repeated Exposure Category 2; H332, H315, H319, H317, H334, H351, H335, H373, EUH204 [1] | Not Available |
| 1.101-68-8<br>2.202-966-0<br>3.615-005-00-9<br>4.Not Available | 38 | 4,4'-diphenylmethane diisocyanate (MDI) | Acute Toxicity (Inhalation) Category 4, Skin Corrosion/Irritation Category 2, Serious Eye Damage/Eye Irritation Category 2, Sensitisation (Skin) Category 1, Sensitisation (Respiratory) Category 1, Carcinogenicity Category 2, Specific Target Organ Toxicity - Single Exposure (Respiratory Tract Irritation) Category 3 , Specific Target Organ Toxicity - Repeated Exposure Category 2; H332, H315, H319, H317, H334, H351, H335, H373 [2] | Not Available |
| 1.5873-54-1<br>2.227-534-9<br>3.615-005-00-9<br>4.Not Available | 4 | 2,4'-diphenylmethane diisocyanate | Acute Toxicity (Inhalation) Category 4, Skin Corrosion/Irritation Category 2, Serious Eye Damage/Eye Irritation Category 2, Sensitisation (Skin) Category 1, Sensitisation (Respiratory) Category 1, Carcinogenicity Category 2, Specific Target Organ Toxicity - Single Exposure (Respiratory Tract Irritation) | Not Available |

**Continued...**

| 1.CAS No<br>2.EC No<br>3.Index No<br>4.REACH No | %[weight] | Name | Classified according to GB-CLP Regulation, UK SI 2019/720 and UK SI 2020/1567 | Nanoform Particle Characteristics |
|---|---|---|---|---|
| | | | Category 3 , Specific Target Organ Toxicity - Repeated Exposure Category 2; H332, H315, H319, H317, H334, H351, H335, H373 [2] | |
| 1.2536-05-2<br>2.219-799-4<br>3.615-005-00-9<br>4.Not Available | 0.2 | 2,2'-diphenylmethane diisocyanate | Acute Toxicity (Inhalation) Category 4, Skin Corrosion/Irritation Category 2, Serious Eye Damage/Eye Irritation Category 2, Sensitisation (Skin) Category 1, Sensitisation (Respiratory) Category 1, Carcinogenicity Category 2, Specific Target Organ Toxicity - Single Exposure (Respiratory Tract Irritation) Category 3 , Specific Target Organ Toxicity - Repeated Exposure Category 2; H332, H315, H319, H317, H334, H351, H335, H373 [2] | Not Available |
| ***Legend:*** | *1. Classified by Chemwatch; 2. Classification drawn from GB-CLP Regulation, UK SI 2019/720 and UK SI 2020/1567; 3. Classification drawn from C&L; * EU IOELVs available; [e] Substance identified as having endocrine disrupting properties* | | | |

## SECTION 4 First aid measures

### 4.1. Description of first aid measures

| | |
|---|---|
| **Eye Contact** | If this product comes in contact with the eyes:<br>▸ Immediately hold eyelids apart and flush the eye continuously with running water.<br>▸ 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.<br>▸ Continue flushing until advised to stop by the Poisons Information Centre or a doctor, or for at least 15 minutes.<br>▸ Transport to hospital or doctor without delay.<br>▸ Removal of contact lenses after an eye injury should only be undertaken by skilled personnel. |
| **Skin Contact** | If skin contact occurs:<br>▸ Immediately remove all contaminated clothing, including footwear.<br>▸ Flush skin and hair with running water (and soap if available).<br>▸ Seek medical attention in event of irritation. |
| **Inhalation** | ▸ If fumes or combustion products are inhaled remove from contaminated area.<br>▸ Lay patient down. Keep warm and rested.<br>▸ Prostheses such as false teeth, which may block airway, should be removed, where possible, prior to initiating first aid procedures.<br>▸ 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.<br>▸ Transport to hospital, or doctor, without delay.<br>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. |
| **Ingestion** | ▸ Immediately give a glass of water.<br>▸ First aid is not generally required. If in doubt, contact a Poisons Information Centre or a doctor. |

### 4.2 Most important symptoms and effects, both acute and delayed

See Section 11

### 4.3. Indication of any immediate medical attention and special treatment needed

For sub-chronic and chronic exposures to isocyanates:

- This material may be a potent pulmonary sensitiser 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 [adrenalin], 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.

[Ellenhorn and Barceloux; Medical Toxicology]

**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

### 5.1. 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.
- Foam.
- Dry chemical powder.
- BCF (where regulations permit).
- Carbon dioxide.

**Continued...**

- Water spray or fog - Large fires only.

### 5.2. 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 |

### 5.3. Advice for firefighters

| | |
|---|---|
| **Fire Fighting** | ‣ Alert Fire Brigade and tell them location and nature of hazard.<br>‣ Wear full body protective clothing with breathing apparatus.<br>‣ Prevent, by any means available, spillage from entering drains or water course.<br>‣ Use water delivered as a fine spray to control fire and cool adjacent area.<br>‣ Avoid spraying water onto liquid pools.<br>‣ **DO NOT** approach containers suspected to be hot.<br>‣ Cool fire exposed containers with water spray from a protected location.<br>‣ If safe to do so, remove containers from path of fire. |
| **Fire/Explosion Hazard** | - Combustible.<br>- Moderate fire hazard when exposed to heat or flame.<br>- When heated to high temperatures decomposes rapidly generating vapour which pressures and may then rupture containers with release of flammable and highly toxic isocyanate vapour.<br>- Burns with acrid black smoke and poisonous fumes.<br>- Due to reaction with water producing CO2-gas, a hazardous build-up of pressure could result if contaminated containers are re-sealed.<br>- Combustion yields traces of highly toxic hydrogen cyanide HCN, plus toxic nitrogen oxides NOx and carbon monoxide.<br>Combustion products include:<br>carbon dioxide (CO2)<br>isocyanates<br>hydrogen cyanide<br>and minor amounts of<br>nitrogen oxides (NOx)<br>other pyrolysis products typical of burning organic material.<br>May emit corrosive fumes.<br>When heated at high temperatures many isocyanates decompose rapidly generating a vapour which pressurises containers, possibly to the point of rupture. Release of toxic and/or flammable isocyanate vapours may then occur |

## SECTION 6 Accidental release measures

### 6.1. Personal precautions, protective equipment and emergency procedures

See section 8

### 6.2. Environmental precautions

See section 12

### 6.3. Methods and material for containment and cleaning up

| | |
|---|---|
| **Minor Spills** | ‣ Remove all ignition sources.<br>‣ Clean up all spills immediately.<br>‣ Avoid breathing vapours and contact with skin and eyes.<br>‣ Control personal contact with the substance, by using protective equipment.<br>‣ Contain and absorb spill with sand, earth, inert material or vermiculite.<br>‣ Wipe up.<br>‣ Place in a suitable, labelled container for waste disposal. |
| **Major Spills** | Chemical Class: cyanates and isocyanates<br>For release onto land: recommended sorbents listed in order of priority.<br><br>SORBENT TYPE / RANK / APPLICATION / COLLECTION / LIMITATIONS<br><br>LAND SPILL - SMALL<br><br>cross-linked polymer - particulate / 1 / shovel / shovel / R,W,SS<br>wood fiber - particulate / 1 / throw / pitchfork / R, P, DGC, RT<br>cross-linked polymer - pillow / 1 / throw / pitchfork / R, DGC, RT<br>sorbent clay - particulate / 2 / shovel / shovel / R, I, P<br>foamed glass - pillow / 2 / throw / pitchfork / R, P, DGC, RT<br>wood fiber - particulate / 3 / shovel / shovel / R, W, P, DGC<br><br>LAND SPILL - MEDIUM<br><br>cross-linked polymer -particulate / 1 / blower / skiploader / R, W, SS<br>cross-linked polymer - pillow / 1 / throw / skiploader / R,DGC, RT<br>polypropylene - particulate / 2 / blower / skiploader / R, SS, DGC<br>expanded mineral - particulate / 3 / blower / skiploader / R, I, W, P, DGC<br>wood fiber - particulate / 3 / blower / skiploader / R, W, P, DGC<br>polypropylene - mat / 3 / throw / skiploader / DGC, RT<br><br>Legend<br>DGC: Not effective where ground cover is dense |

**Continued...**

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 adsorbent materials (equal to that of estimated spill pool volume). Intensify 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. - Scrub area 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 decontaminate procedure immediately above
- Place loosely 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 polyisocyanates 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 to | 100% |

**Formulation B**

| | |
|---|---|
| liquid surfactant | 0.2-2% |
| concentrated ammonia | 3-8% |
| water to | 100% |

**Formulation C**

| | |
|---|---|
| ethanol, isopropanol or butanol | 50% |
| concentrated ammonia | 5% |
| water to | 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, alkalies 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.
- Open all containers with care.
- **DO NOT** touch the spill material

Moderate hazard.

- 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.
- No smoking, naked lights or ignition sources.
- Increase ventilation.
- Stop leak if safe to do so.
- Contain spill with sand, earth or vermiculite.
- Collect recoverable product into labelled containers for recycling.
- Absorb remaining product with sand, earth or vermiculite.
- 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.

### 6.4. Reference to other sections

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

**Continued...**

## SECTION 7 Handling and storage

### 7.1. Precautions for safe handling

| | |
|---|---|
| **Safe handling** | ‣ Avoid all personal contact, including inhalation.<br>‣ Wear protective clothing when risk of exposure occurs.<br>‣ Use in a well-ventilated area.<br>‣ Prevent concentration in hollows and sumps.<br>‣ **DO NOT** enter confined spaces until atmosphere has been checked.<br>‣ Avoid smoking, naked lights or ignition sources.<br>‣ Avoid contact with incompatible materials.<br>‣ When handling, **DO NOT** eat, drink or smoke.<br>‣ Keep containers securely sealed when not in use.<br>‣ Avoid physical damage to containers.<br>‣ Always wash hands with soap and water after handling.<br>‣ Work clothes should be laundered separately.<br>‣ Use good occupational work practice.<br>‣ Observe manufacturer's storage and handling recommendations contained within this SDS.<br>‣ Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions.<br>‣ **DO NOT** allow clothing wet with material to stay in contact with skin |
| **Fire and explosion protection** | See section 5 |
| **Other information** | Consider storage under inert gas.<br>for commercial quantities of isocyanates:<br>· 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.<br>· 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.<br>· Where stored 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)..<br>· 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.<br>· 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.<br>· Ideal storage temperature range is dependent on the specific polymer due to viscosity and melting point differences between the polymers. Use 25 deg C (77 deg F) to 30 deg C (86 deg F) as a guideline to most liquid isocyanates for optimum storage temperature. If some isocyanates are stored at or below a temperature of 25 deg C (77 deg F), crystallization and settling of the isocyanate may occur. Storage in a cold warehouse can cause crystals to form. These crystals can settle to the bottom of the container. If crystals do form, they can be melted easily with moderate heat. It is suggested that a container the size of a drum be warmed for 16-24 hours at sufficient temperature to melt the crystals. When the crystals are melted, the container should be agitated by rolling or stirring, until the contents are homogenous. Since heated isocyanate will generate vapors more rapidly than product stored at 25 deg C (77 deg F), be sure to follow the precautions under the Personal Protection.<br>‣ Store in original containers.<br>‣ Keep containers securely sealed.<br>‣ No smoking, naked lights or ignition sources.<br>‣ Store in a cool, dry, well-ventilated area.<br>‣ Store away from incompatible materials and foodstuff containers.<br>‣ Protect containers against physical damage and check regularly for leaks.<br>‣ Observe manufacturer's storage and handling recommendations contained within this SDS. |

### 7.2. Conditions for safe storage, including any incompatibilities

| | |
|---|---|
| **Suitable container** | ‣ Metal can or drum<br>‣ Packaging as recommended by manufacturer.<br>‣ Check all containers are clearly labelled and free from leaks. |
| **Storage incompatibility** | · Avoid reaction with water, alcohols and detergent solutions. Isocyanates are electrophiles, and as such they are reactive toward a variety of nucleophiles including alcohols, amines, and even water. Upon treatment with an alcohol, an isocyanate forms a urethane linkage. If a di-isocyanate is treated with a compound containing two or more hydroxyl groups, such as a diol or a polyol, polymer chains are formed, which are known as polyurethanes. Reaction between a di-isocyanate and a compound containing two or more amine groups, produces long polymer chains known as polyureas.<br>· Isocyanates and thioisocyanates are incompatible with many classes of compounds, reacting exothermically to release toxic gases. Reactions with amines, strong bases, aldehydes, 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.<br>· Isocyanates also can react with themselves. Aliphatic di-isocyanates can form trimers, which are structurally related to cyanuric acid. Isocyanates participate in Diels-Alder reactions, functioning as dienophiles<br>· Isocyanates easily form adducts with carbodiimides, isothiocyanates, ketenes, or with substrates containing activated CC or CN bonds.<br>· Some isocyanates react with water to form amines and liberate carbon dioxide. This reaction may also generate large volumes of foam and heat. Foaming spaces may produce pressure in confined spaces or containers. Gas generation may pressurise drums to the point of rupture.<br>· Do NOT reseal container if contamination is expected<br>· Open all containers with care<br>· 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,<br>· Isocyanates will attack and embrittle some plastics and rubbers.<br>· The isocyanate anion is a pseudohalide (syn pseudohalogen) whose chemistry, resembling that of the true halogens, allows it to substitute for halogens in several classes of chemical compounds.. The behavior and chemical properties of the several pseudohalides are identical to that of the true halide ions.<br><br>‣ A range of exothermic decomposition energies for isocyanates is given as 20-30 kJ/mol.<br>‣ 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.<br>‣ 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.<br>BRETHERICK: Handbook of Reactive Chemical Hazards, 4th Edition |

**Continued...**

### 7.3. Specific end use(s)

See section 1.2

## SECTION 8 Exposure controls / personal protection

### 8.1. Control parameters

| Ingredient | DNELs<br>Exposure Pattern Worker | PNECs<br>Compartment |
|---|---|---|
| 4,4'-diphenylmethane diisocyanate (MDI) | Inhalation 0.05 mg/m³ (Local, Chronic)<br>Inhalation 0.1 mg/m³ (Local, Acute)<br>*Inhalation 0.025 mg/m³ (Local, Chronic) **<br>*Inhalation 0.05 mg/m³ (Local, Acute) ** | 1 mg/L (Water (Fresh))<br>0.1 mg/L (Water - Intermittent release)<br>10 mg/L (Water (Marine))<br>1 mg/kg soil dw (Soil)<br>1 mg/L (STP) |
| 2,4'-diphenylmethane diisocyanate | Inhalation 0.05 mg/m³ (Local, Chronic)<br>Inhalation 0.1 mg/m³ (Local, Acute)<br>*Inhalation 0.025 mg/m³ (Local, Chronic) **<br>*Inhalation 0.05 mg/m³ (Local, Acute) ** | 1 mg/L (Water (Fresh))<br>0.1 mg/L (Water - Intermittent release)<br>10 mg/L (Water (Marine))<br>1 mg/kg soil dw (Soil)<br>1 mg/L (STP) |
| 2,2'-diphenylmethane diisocyanate | Inhalation 0.05 mg/m³ (Local, Chronic)<br>Inhalation 0.1 mg/m³ (Local, Acute)<br>*Inhalation 0.025 mg/m³ (Local, Chronic) **<br>*Inhalation 0.05 mg/m³ (Local, Acute) ** | 1 mg/L (Water (Fresh))<br>0.1 mg/L (Water - Intermittent release)<br>10 mg/L (Water (Marine))<br>1 mg/kg soil dw (Soil)<br>1 mg/L (STP) |

* Values for General Population

**Occupational Exposure Limits (OEL)**

**INGREDIENT DATA**

| Source | Ingredient | Material name | TWA | STEL | Peak | Notes |
|---|---|---|---|---|---|---|
| Europe ECHA Occupational exposure limits - Activity list | polymeric diphenylmethane diisocyanate | Not Available | Not Available | Not Available | Not Available | Not Available |
| UK Workplace Exposure Limits (WELs) | polymeric diphenylmethane diisocyanate | Isocyanates, all (as -NCO) Except methyl isocyanate | 0.02 mg/m3 | 0.07 mg/m3 | Not Available | Sen |
| Europe ECHA Occupational exposure limits - Activity list | 4,4'-diphenylmethane diisocyanate (MDI) | Not Available | Not Available | Not Available | Not Available | Not Available |
| UK Workplace Exposure Limits (WELs) | 4,4'-diphenylmethane diisocyanate (MDI) | Isocyanates, all (as -NCO) Except methyl isocyanate | 0.02 mg/m3 | 0.07 mg/m3 | Not Available | Sen |
| Europe ECHA Occupational exposure limits - Activity list | 2,4'-diphenylmethane diisocyanate | Not Available | Not Available | Not Available | Not Available | Not Available |
| UK Workplace Exposure Limits (WELs) | 2,4'-diphenylmethane diisocyanate | Isocyanates, all (as -NCO) Except methyl isocyanate | 0.02 mg/m3 | 0.07 mg/m3 | Not Available | Sen |
| Europe ECHA Occupational exposure limits - Activity list | 2,2'-diphenylmethane diisocyanate | Not Available | Not Available | Not Available | Not Available | Not Available |
| UK Workplace Exposure Limits (WELs) | 2,2'-diphenylmethane diisocyanate | Isocyanates, all (as -NCO) Except methyl isocyanate | 0.02 mg/m3 | 0.07 mg/m3 | Not Available | Sen |

**Emergency Limits**

| Ingredient | TEEL-1 | TEEL-2 | TEEL-3 |
|---|---|---|---|
| polymeric diphenylmethane diisocyanate | 0.15 mg/m3 | 3.6 mg/m3 | 22 mg/m3 |
| 4,4'-diphenylmethane diisocyanate (MDI) | 0.45 mg/m3 | Not Available | Not Available |
| 4,4'-diphenylmethane diisocyanate (MDI) | 29 mg/m3 | 40 mg/m3 | 240 mg/m3 |

| Ingredient | Original IDLH | Revised IDLH |
|---|---|---|
| polymeric diphenylmethane diisocyanate | Not Available | Not Available |
| 4,4'-diphenylmethane diisocyanate (MDI) | 75 mg/m3 | Not Available |
| 2,4'-diphenylmethane diisocyanate | Not Available | Not Available |
| 2,2'-diphenylmethane diisocyanate | Not Available | Not Available |

**MATERIAL DATA**

for isocyanates:
Some jurisdictions require that health surveillance be conducted on occupationally exposed workers. This should emphasise:

- demography, occupational and medical history and health advice
- completion of a standardised respiratory questionnaire
- physical examination of the respiratory system and skin
- standardised respiratory function tests such as FEV1, FVC and FEV1/FVC

Various portable or stationary instruments are available for the continuous measurement of isocyanates in the air. All of them function on the principle of colourimetric evaluation of an indicator paper strip. They are operating continuously and unattended. Paper tape systems are easy to use and do not require skilled analysts to operate them. They give rapid results

**Continued...**

and are therefore suitable for leak detection and in emergency situations. However,:

- they may read incorrect at very high or very low humidity,
- are unsuitable for aerosols
- and may not be accepted for purposes of regulatory compliance.

Air monitoring of isocyanates requires sound analytical knowledge. In order to obtain reliable results only laboratories with experience in that specific area should be engaged with such measurements

In the evaluation of the German MAK Commission the justification of the OEL for 4,4´- MDI/ pMDI is established based on the isocyanate (NCO) group which is common to the monomeric, oligomeric and the polymeric MDIs. This NCO group is highly reactive (see toxicokinetics and category justification for details). Due to this high reactivity of the functional NCO group towards nucleophilic biomolecules the primary health effect of MDI is irritation at the point of contact, which can be demonstrated by the numerous acute, subacute and chronic bioassays, and sensitization.
The most sensitive health effect resulting from acute inhalation exposure to respirable aerosols of MDI is irritation to predominately the bronchio-alveolar part of the respiratory tract. After inhalation exposure, MDI reacts with nucleophilic low and higher-molecular components of the liquid films that cover the airways, glutathione (GSH) represents the most important nucleophile in quantitative terms. The low-molecular adducts or conjugates of MDI are absorbed and direct transcarbamoylation results in plasma protein adducts (albumin, haemoglobin). All observed health effects resulting from exposure to respirable aerosols in acute, subchronic or chronic bioassays and human studies can be allocated to primary alveolar reactivity (respiratory irritation and/or sensitization). No systemic effect other than secondary to primary irritation has been described.
Biomonitoring for exposure to diisocyanates typically looks to assay derivatives (diamines) following hydrolysis of biological fluids and is routinely employed to measure occupational exposure to MDI and other diisocyanates. For diamine analysis, samples of urine are typically used, although blood samples can also be used. However, these markers are not specific for the diisocyanate exposure. The urine biomarkers (after acid or base hydrolysis) reflected recent exposures whereas certain haemoglobin (Hb) biomarkers did not necessarily correlate with the urine biomarkers, and were considered to reflect overall exposures over a longer term. The hydrolysis methods and conditions used release differing amounts of the diamine analyte.
Hydrolysis analytes are at low concentrations and proportionally little of the dose is in urine or blood, and that there is no standardised method for measuring biomarkers in hydrolyzed urine. Investigation of diisocyanate specific biomarkers has focused on the conjugated molecules in blood. Typically, conjugates with Hb or albumin (Alb) have been assessed, and there has been progress in application of experiments in animals to biomonitoring of human exposures to MDI.
The role for glutathione as an intermediary in transport of diisocyanates is now supported by good evidence using various model compounds. The most probable reactions of isocyanates with biological macromolecules are with the amine (mixed urea), the hydroxyl (carbamate) and the sulphydryl (thiolytic acid ester) and that latter is of a reversible nature. The thiocarbamate bond of isocyanate-sulphydryl is reversible, and various authors have found release and transfer of MDI moieties from thiocarbamate conjugates to other nucleophiles, notably protein. The conjugates were shown to be recognised by serum IgG from MDI exposed workers, demonstrating a non-enzymatic, thiol-mediated transcarbamolyating mechanism to protein.
The methods to identify and quantify MDI-adducts to plasma proteins particularly albumin (Alb) and to haemoglobin (Hb) have now been applied to biological monitoring, particularly useful since the amount of adducts would be indicative of an integrated exposure. In addition these adducts are specific for MDI exposure. However the total amount of the analyte MDA, retrievable from Hb-adducts and urinary precursors, accounts for less than 0.5 % of the applied dose of MDI, and the lack of linearity of biomarker to exposure dose makes uncertain the extrapolation from the yield of biomarkers in urine or blood towards inhalative MDI exposure. The use of protein adducts for biomonitoring appears to overcome some of these difficulties and benefits from specificity of the analyte. To date no diisocyanate specific urinary biomarker has been identified. For blood, the MDI-specific methods developed are: Hb-conjugate derived hydantoin, Alb-lysine conjugates and peptide conjugates. On the basis of limits of detection, the Hb-hydantoin method is most sensitive compared to the Alb-lysine method which in turn is more sensitive than the signature peptide method. The Hb-hydantoin method covers a longer period of exposure than the Alb-lysine, due to the longer half life of the erythrocyte compared to serum albumin.
for diphenylmethane diisocyanate (methylene bisphenyl isocyanate; MDI)
Odour Threshold Value: 0.39 ppm
IDLH Level: 10 mg/m3
Mean MDI exposures of less than 0.003 ppm appear to have no acute or chronic effect on pulmonary function.
MDI produces identical toxicological responses to those produced by TDI and the recommended TLV-TWA is identical for the two isocyanates. Exposure at or below the recommended value is thought to protect the worker against pulmonary function decrements as well as to minimise the potential for respiratory tract sensitisation. Individuals who may be hypersusceptible or otherwise unusually responsive to exposure to certain industrial chemicals may not adequately protected from adverse health effects caused by MDI at the recommended TLV-TWA. Ceiling values recommended by NIOSH and OSHA are synonymous with normal excursions allowable for exposures to the TLV-TWA (in excess of 3 x TLV-TWA for no more than a total of 30 minutes during a work day but in any case not exceeding 5 x TLV-TWA).

### 8.2. Exposure controls

**8.2.1. Appropriate engineering controls**

- 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.

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.

- Spraying of material or material in admixture with other components must be carried out in conditions conforming to local state regulations (AS/NZS 4114, UNI EN 12215:2010, ANSI/AIHA Z9.3–2007 or national equivalent).
- Local exhaust ventilation with full face positive-pressure air supplied breathing apparatus (hood or helmet type) is required.
- Spraying should be performed in a spray booth fitted with an effective exhaust system which complies with local environmental legislation.
- The spray booth area must be isolated from unprotected personnel whilst spraying is in progress and until all spraying mist has cleared.

**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.

| Type of Contaminant: | Air Speed: |
|---|---|
| direct spray, spray painting in shallow booths, drum filling, conveyer loading, crusher dusts, gas discharge (active generation into zone of rapid air motion) | 1-2.5 m/s (200-500 f/min.) |

Within each range the appropriate value depends on:

| Lower end of the range | Upper end of the range |
|---|---|
| 1: Room air currents minimal or favourable to capture | 1: Disturbing room air currents |
| 2: Contaminants of low toxicity or of nuisance value only | 2: Contaminants of high toxicity |
| 3: Intermittent, low production. | 3: High production, heavy use |
| 4: Large hood or large air mass in motion | 4: Small hood-local control only |

Simple theory shows that air velocity falls rapidly with distance away from the opening of a simple extraction pipe. Velocity generally decreases

**Continued...**

| | |
|---|---|
| | with the square of distance from the extraction point should be adjusted, accordingly, after reference to distance 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. |
| **8.2.2. Personal protection** |  |
| **Eye and face protection** | ▸ Safety glasses with side shields.<br>▸ Chemical goggles.<br>▸ 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 adsorption 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 1336 or national equivalent] |
| **Skin protection** | See Hand protection below |
| **Hands/feet protection** | **NOTE:**<br>▸ The material may produce skin sensitisation in predisposed individuals. Care must be taken, when removing gloves and other protective equipment, to avoid all possible skin contact.<br>▸ Contaminated leather items, such as shoes, belts and watch-bands should be removed and destroyed.<br>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.<br>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.<br>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.<br>Suitability and durability of glove type is dependent on usage. Important factors in the selection of gloves include:<br>· frequency and duration of contact,<br>· chemical resistance of glove material,<br>· glove thickness and<br>· dexterity<br>Select gloves tested to a relevant standard (e.g. Europe EN 374, US F739, AS/NZS 2161.1 or national equivalent).<br>· When prolonged or frequently repeated contact may occur, a glove with a protection class of 5 or higher (breakthrough time greater than 240 minutes according to EN 374, AS/NZS 2161.10.1 or national equivalent) is recommended.<br>· When only brief contact is expected, a glove with a protection class of 3 or higher (breakthrough time greater than 60 minutes according to EN 374, AS/NZS 2161.10.1 or national equivalent) is recommended.<br>· Some glove polymer types are less affected by movement and this should be taken into account when considering gloves for long-term use.<br>· Contaminated gloves should be replaced.<br>As defined in ASTM F-739-96 in any application, gloves are rated as:<br>· Excellent when breakthrough time > 480 min<br>· Good when breakthrough time > 20 min<br>· Fair when breakthrough time < 20 min<br>· Poor when glove material degrades<br>For general applications, gloves with a thickness typically greater than 0.35 mm, are recommended.<br>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.<br>Glove thickness may also vary depending on the glove manufacturer, the glove type and the glove model. Therefore, the manufacturers' technical data should always be taken into account to ensure selection of the most appropriate glove for the task.<br>Note: Depending on the activity being conducted, gloves of varying thickness may be required for specific tasks. For example:<br>· Thinner gloves (down to 0.1 mm or less) may be required where a high degree of manual dexterity is needed. However, these gloves are only likely to give short duration protection and would normally be just for single use applications, then disposed of.<br>· Thicker gloves (up to 3 mm or more) may be required where there is a mechanical (as well as a chemical) risk i.e. where there is abrasion or puncture potential<br>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.<br>▸ Do NOT wear natural rubber (latex gloves).<br>▸ Isocyanate resistant materials include Teflon, Viton, nitrile rubber and some PVA gloves.<br>▸ Protective gloves and overalls should be worn as specified in the appropriate national standard.<br>▸ Contaminated garments should be removed promptly and should not be re-used until they have been decontaminated.<br>▸ NOTE: Natural rubber, neoprene, PVC can be affected by isocyanates<br>▸ **DO NOT** use skin cream unless necessary and then use only minimum amount.<br>▸ Isocyanate vapour may be absorbed into skin cream and this increases hazard.<br>Avoid contact with moisture. |
| **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.<br>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. |

**Continued...**

| | |
|---|---|
| | ‣ Overalls.<br>‣ P.V.C apron.<br>‣ Barrier cream.<br>‣ Skin cleansing cream.<br>‣ Eye wash unit. |

### 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:
8820-B High Temperature Rigid Urethane

| Material | CPI |
|---|---|
| PE/EVAL/PE | A |

* 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.

### Respiratory protection

Full face respirator with supplied air.

- Cartridge respirators should never be used for emergency ingress or in areas of unknown vapour concentrations or oxygen content.
- The wearer must be warned to leave the contaminated area immediately on detecting any odours through the respirator. The odour may indicate that the mask is not functioning properly, that the vapour concentration is too high, or that the mask is not properly fitted. Because of these limitations, only restricted use of cartridge respirators is considered appropriate.
- Cartridge performance is affected by humidity. Cartridges should be changed after 2 hr of continuous use unless it is determined that the humidity is less than 75%, in which case, cartridges can be used for 4 hr. Used cartridges should be discarded daily, regardless of the length of time used

For spraying or operations which might generate aerosols:
Full face respirator with supplied air.

- In certain circumstances, personal protection of the individual employee is necessary. Personal protective devices should be regarded as being supplementary to substitution and engineering control and should not be used in preference to them as they do nothing to eliminate the hazard.
- However, in some situations, minimising exposure to isocyanates by enclosure and ventilation is not possible, and occupational exposure standards may be exceeded, particularly during on-site mixing of paints, spray-painting, foaming and maintenance of machine and ventilation systems. In these situations, air-line respirators or self-contained breathing apparatus complying with the appropriate nationals standard must be used.
- Organic vapour respirators with particulate pre- filters and powered, air-purifying respirators are NOT suitable.
- Personal protective equipment must be appropriately selected, individually fitted and workers trained in their correct use and maintenance. Personal protective equipment must be regularly checked and maintained to ensure that the worker is being protected.
- Air- line respirators or self-contained breathing apparatus complying with the appropriate national standard should be used during the clean-up of spills and the repair or clean-up of contaminated equipment and similar situations which cause emergency exposures to hazardous atmospheric concentrations of isocyanate.

### 8.2.3. Environmental exposure controls

See section 12

## SECTION 9 Physical and chemical properties

### 9.1. Information on basic physical and chemical properties

| | |
|---|---|
| **Appearance** | Brown |

| | | | |
|---|---|---|---|
| **Physical state** | Liquid | **Relative density (Water = 1)** | 1.24 |
| **Odour** | Not Available | **Partition coefficient n-octanol / water** | Not Available |
| **Odour threshold** | Not Available | **Auto-ignition temperature (°C)** | Not Available |
| **pH (as supplied)** | Not Available | **Decomposition temperature** | Not Available |
| **Melting point / freezing point (°C)** | Not Available | **Viscosity (cSt)** | 174.19 |
| **Initial boiling point and boiling range (°C)** | 208 | **Molecular weight (g/mol)** | Not Available |
| **Flash point (°C)** | 198 | **Taste** | Not Available |
| **Evaporation rate** | Not Available | **Explosive properties** | Not Available |
| **Flammability** | Not Applicable | **Oxidising properties** | Not Available |
| **Upper Explosive Limit (%)** | Not Available | **Surface Tension (dyn/cm or mN/m)** | Not Available |
| **Lower Explosive Limit (%)** | Not Available | **Volatile Component (%vol)** | Not Available |
| **Vapour pressure (kPa)** | <0.001 | **Gas group** | Not Available |
| **Solubility in water** | Immiscible | **pH as a solution (%)** | Not Available |
| **Vapour density (Air = 1)** | Not Available | **VOC g/L** | Not Available |

**Continued...**

| | | | |
|---|---|---|---|
| **Nanoform Solubility** | Not Available | **Nanoform Particle Characteristics** | Not Available |
| **Particle Size** | Not Available | | |

### 9.2. Other information

Not Available

## SECTION 10 Stability and reactivity

| | |
|---|---|
| **10.1.Reactivity** | See section 7.2 |
| **10.2. Chemical stability** | ▸ Unstable in the presence of incompatible materials.<br>▸ Product is considered stable.<br>▸ Hazardous polymerisation will not occur.<br>▸ Presence of elevated temperatures. |
| **10.3. Possibility of hazardous reactions** | See section 7.2 |
| **10.4. Conditions to avoid** | See section 7.2 |
| **10.5. Incompatible materials** | See section 7.2 |
| **10.6. Hazardous decomposition products** | See section 5.3 |

## SECTION 11 Toxicological information

### 11.1. Information on toxicological effects

| | |
|---|---|
| **Inhaled** | Evidence shows, or practical experience predicts, that the material produces irritation of the respiratory system, in a substantial number of individuals, following inhalation. In contrast to most organs, the lung is able to respond to a chemical insult by first removing or neutralising the irritant and then repairing the damage. The repair process, which initially evolved to protect mammalian lungs from foreign matter and antigens, may however, produce further lung damage resulting in the impairment of gas exchange, the primary function of the lungs. Respiratory tract irritation often results in an inflammatory response involving the recruitment and activation of many cell types, mainly derived from the vascular system.<br>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 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 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.<br>Inhalation hazard is increased at higher temperatures.<br>Inhalation of aerosols (mists, fumes), generated by the material during the course of normal handling, may produce severely toxic effects. Relatively small amounts absorbed from the lungs may prove fatal.<br><br>Strong evidence exists that exposure to the material may produce very serious irreversible damage (other than carcinogenesis, mutagenesis and teratogenesis) following a single exposure by inhalation. |
| **Ingestion** | The material has **NOT** been classified by EC Directives or other classification systems as 'harmful by ingestion'. This is because of the lack of corroborating animal or human evidence. The material may still be damaging to the health of the individual, following ingestion, especially where pre-existing organ (e.g liver, kidney) damage is evident. Present definitions of harmful or toxic substances are generally based on doses producing mortality rather than those producing morbidity (disease, ill-health). Gastrointestinal tract discomfort may produce nausea and vomiting. In an occupational setting however, ingestion of insignificant quantities is not thought to be cause for concern.<br>Accidental ingestion of the material may be seriously damaging to the health of the individual; animal experiments indicate that ingestion of less than 40 gram may be fatal. |
| **Skin Contact** | Evidence exists, or practical experience predicts, that the material either produces inflammation of the skin in a substantial number of individuals following direct contact, and/or produces significant inflammation when applied to the healthy intact skin of animals, for up to four hours, such inflammation being present twenty-four hours or more after the end of the exposure period. Skin irritation may also be present after prolonged or repeated exposure; this may result in a form of contact dermatitis (nonallergic). The dermatitis is often characterised by skin redness (erythema) and swelling (oedema) which may progress to blistering (vesiculation), scaling and thickening of the epidermis. At the microscopic level there may be intercellular oedema of the spongy layer of the skin (spongiosis) and intracellular oedema of the epidermis.<br>The material may accentuate any pre-existing dermatitis condition<br>Skin contact with the material may damage the health of the individual; systemic effects may result following absorption.<br>Open cuts, abraded or irritated skin should not be exposed to this material<br>Entry into the blood-stream through, for example, cuts, abrasions, puncture wounds or lesions, may produce systemic injury with harmful effects.<br>Examine the skin prior to the use of the material and ensure that any external damage is suitably protected. |
| **Eye** | Evidence exists, or practical experience predicts, that the material may cause eye irritation in a substantial number of individuals and/or may produce significant ocular lesions which are present twenty-four hours or more after instillation into the eye(s) of experimental animals. Repeated or prolonged eye contact may cause inflammation characterised by a temporary redness (similar to windburn) of the conjunctiva (conjunctivitis); temporary impairment of vision and/or other transient eye damage/ulceration may occur. |
| **Chronic** | Long-term exposure to respiratory irritants may result in disease of the airways involving difficult breathing and related systemic problems.<br>Practical evidence shows that inhalation of the material is capable of inducing a sensitisation reaction in a substantial number of individuals at a greater frequency than would be expected from the response of a normal population.<br>Pulmonary sensitisation, resulting in hyperactive airway dysfunction and pulmonary allergy may be accompanied by fatigue, malaise and aching.<br>Significant symptoms of exposure may persist for extended periods, even after exposure ceases. Symptoms can be activated by a variety of nonspecific environmental stimuli such as automobile exhaust, perfumes and passive smoking. |

**Continued...**

Practical experience shows that skin contact with the material is capable either of inducing a sensitisation reaction in a substantial number of individuals, and/or of producing a positive response in experimental animals.
Substances that can cause occupational asthma (also known as asthmagens and respiratory sensitisers) can induce a state of specific airway hyper-responsiveness via an immunological, irritant or other mechanism. Once the airways have become hyper-responsive, further exposure to the substance, sometimes even to tiny quantities, may cause respiratory symptoms. These symptoms can range in severity from a runny nose to asthma. Not all workers who are exposed to a sensitiser will become hyper-responsive and it is impossible to identify in advance who are likely to become hyper-responsive.
Substances than can cuase occupational asthma should be distinguished from substances which may trigger the symptoms of asthma in people with pre-existing air-way hyper-responsiveness. The latter substances are not classified as asthmagens or respiratory sensitisers
Wherever it is reasonably practicable, exposure to substances that can cuase occupational asthma should be prevented. Where this is not possible the primary aim is to apply adequate standards of control to prevent workers from becoming hyper-responsive.
Activities giving rise to short-term peak concentrations should receive particular attention when risk management is being considered. Health surveillance is appropriate for all employees exposed or liable to be exposed to a substance which may cause occupational asthma and there should be appropriate consultation with an occupational health professional over the degree of risk and level of surveillance.
Toxic: danger of serious damage to health by prolonged exposure through inhalation, in contact with skin and if swallowed.
Serious damage (clear functional disturbance or morphological change which may have toxicological significance) is likely to be caused by repeated or prolonged exposure. As a rule the material produces, or contains a substance which produces severe lesions. Such damage may become apparent following direct application in subchronic (90 day) toxicity studies or following sub-acute (28 day) or chronic (two-year) toxicity tests.
Limited evidence suggests that repeated or long-term occupational exposure may produce cumulative health effects involving organs or biochemical systems.
Polyisocyanates still contain small amounts of monomeric isocyanate (typically <0.5 parts per weight) and both – the polyisocyanate and the monomer - have toxicological importance. In addition, solvents also contribute to the overall toxicity of these products.
Due to the higher molecular weight and the much lower vapor pressure the polyisocyanates exhibit a significantly reduced health hazard as compared to the corresponding monomers. Nevertheless they should only be handled under controlled conditions. They are not or only slightly irritating to the skin and eyes, but might be irritating to the respiratory tract (nose, throat, lung). Polyisocyanates might act as skin sensitisers On that basis there is clear evidence from sensitive animal models that aliphatic polyisocyanates and prepolymers (HDI-based as well as IPDI-based, for example) may cause skin sensitisation. it is decided to classify all HDI-based and IPDI-based polyisocyanates and prepolymers as skin sensitisers. From animal models, however, there is no evidence that polyisocyanates are sensitising to the respiratory tract. Results from animal tests with repeated aerosol exposures indicate that under these conditions the respiratory tract is the primary target of aliphatic polyisocyanates, other organs are not significantly affected..
Available information does not provide evidence that polyisocyanates might either be mutagenic, carcinogenic or toxic to reproduction.
Polymers based on isocyanate monomers (polyurethanes) are generally of low concern. However, in the majority of cases it is not possible to conclude from the chemical name of the polymer whether an individual polyurethane is, or is not, of low concern.
Finished polyurethane polymers used in the majority of household applications contain no unreacted isocyanate groups. The production of these polymers involves the use of an excess of the hydroxyl group-containing monomer or monomers leading to complete reaction of all of the isocyanate groups.
For certain applications, however, similar polymer chemistry can be used with the isocyanate group-containing monomer in excess. This results in the formation of a polyurethane 'pre-polymer', which is intended to be further reacted in its end use. Where the pre-polymer is identified as being 'blocked', it indicates that there are no free isocyanate groups.
The polymer contained in this product has a reactive group generally considered to be of high concern (US EPA). There are health concerns for isocyanates on the basis of their skin and respiratory sensitisation properties and other lung effects e.g TDI and MDI). Aromatic isocyanates may be potentially carcinogenic (e.g. TDI and DADI). Frequently new chemical isocyanates are manufactured with a significant excess of isocyanate monomer. Whilst it is generally accepted that polymers with a molecular weight exceeding 1000 are unlikely to pass through biological membranes, oligomers with lower molecular weight and specifically, those with a molecular weight below 500, may. Estimations based on a 'highly' dispersed polymer population suggest that a polymer of approximate molecular weight 5000 could contain no more than one reactive group of high concern for it to be regulated as a polymer of low concern (a so-called PLC) Polymers with a molecular weight above 10000 are generally considered to be PLCs because these are not expected to be absorbed by biological systems. The choice of 10000 as a cut-off value is thought to provide a safety factor of 100, regarded as reasonable in light of limited data, duration of studies, dose levels at which effects are seen, and extrapolation from animals to humans.
Persons with a history of asthma or other respiratory problems or are known to be sensitised, should not be engaged in any work involving the handling of isocyanates.
The chemistry of reaction of isocyanates, as evidenced by MDI, in biological milieu is such that in the event of a true exposure of small MDI doses to the mouth, reactions will commence at once with biological macromolecules in the buccal region and will continue along the digestive tract prior to reaching the stomach. Reaction products will be a variety of polyureas and macromolecular conjugates with for example mucus, proteins and cell components.
This is corroborated by the results from an MDI inhalation study. Following an inhalation exposure of rats to radiolabelled MDI, 79% of the dose was excreted in faeces. The faecal excretion in these animals was considered entirely due to ingestion of radioactivity from grooming and ingestion of deposited material from the nasopharangeal region via the mucociliary escalator, i.e. not following systemic absorption. The faecal radioactivity was tentatively identified as mixed molecular weight polyureas derived from MDI. Diamine was not present. Thus, for MDI and diisocyanates in general the oral gavage dosing route is inappropriate for toxicological studies and risk assessment.
It is expected that oral gavage dosing will result in a similar outcome to that produced by TDI or MDI, that is (1) reaction with stomach contents and (2) polymerization to solid polyureas.

- Reaction with stomach contents is very plausibly described in case reports of accidental ingestion of polymeric MDI based glue in domestic animals. Extensive polymerization and CO2 liberation resulting in an expansion of the gastric content is described in the stomach, without apparent acute chemical toxicity
- Polyurea formation in organic and aqueous phases has been described. In this generally accepted chemistry of hydrolysis of an isocyanate the initially produced carbamate decarboxylates to an amine which. The amine, as a reactive intermediate, then reacts very readily with the present isocyanate to produce a solid and inert polyurea. This urea formation acts as a pH buffer in the stomach, thus promoting transformation of the diisocyanate into polyurea, even under the acidic conditions.

At the resorbtive tissues in the small intestine, these high molecular reaction products are likely to be of very low bioavailability, which is substantiated by the absence of systemic toxicity in acute oral bioassays with rats at the OECD limit dose (LC50>2 g/kg bw).
The respiratory tract may be regarded as the main entry for systemically available isocyanates as evidenced following MDI.exposures.
A detailed summary on urinary, plasma and in vitro metabolite studies is provided below. Taken together, all available studies provide convincing evidence that MDI-protein adduct and MDI-metabolite formation proceeds:

- via formation of a labile isocyanate glutathione (GSH)-adduct,
- then transfer to a more stable adduct with larger proteins, and
- without formation of free MDA. MDA reported as a metabolite is actually formed by analytical workup procedures (strong acid or base hydrolysis) and is not an identified metabolite in urine or blood

A 90-day inhalation study in rats with polymeric MDI (6 hours/day, 5 days/week) produced moderate to severe hyperplastic inflammatory lesions in the nasal cavities and lungs at levels of 8 mg/m3 or greater.
Rats exposed for two years to a respirable aerosol of polymeric MDI exhibited chronic pulmonary irritation at high concentrations. Only at the highest level (6 mg/m3),was there a significant incidence of a benign tumour of the lung (adenoma) and one malignant tumour (adenocarcinoma).There were no lung tumours at 1 mg/m3 and no effects at 0.2 mg/m3. Overall, the tumour incidence, both benign and malignant and the number of animals with the tumours were not different from controls.The increased incidence of lung tumours is associated with prolonged respiratory irritation and the concurrent accumulation of yellow material in the lung, which occurred throughout the study.In the absence of prolonged exposure to high concentrations leading to chronic irritation and lung damage,it is highly unlikely that tumour formation will occur.

**Continued...**

| | |
|---|---|
| | On the basis, primarily, of animal experiments, concern has been expressed that the material may produce carcinogenic or mutagenic effects; in respect of the available information, however, there presently exists inadequate data for making a satisfactory assessment.<br>Respiratory sensitisation may result in allergic/asthma like responses; from coughing and minor breathing difficulties to bronchitis with wheezing, gasping.<br>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 neurosis, 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.<br>Isocyanate-containing vapours/ mists may cause inflammation of eyes and nasal passages.<br>Onset of symptoms may be immediate or delayed for several hours after exposure. Sensitised people can react to very low levels of airborne isocyanates. Unprotected or sensitised persons should not be allowed to work in situations allowing exposure to this material. |

| | |
|---|---|
| **8820-B High Temperature Rigid Urethane** | |

| TOXICITY | IRRITATION |
|---|---|
| Not Available | Not Available |

| | |
|---|---|
| **polymeric diphenylmethane diisocyanate** | |

| TOXICITY | IRRITATION |
|---|---|
| Dermal (rabbit) LD50: >9400 mg/kg[2] | Eye (rabbit): 100 mg - mild |
| Inhalation(Rat) LC50; 0.49 mg/L4h[2] | |
| Oral(Rat) LD50; 43000 mg/kg[2] | |

| | |
|---|---|
| **4,4'-diphenylmethane diisocyanate (MDI)** | |

| TOXICITY | IRRITATION |
|---|---|
| Dermal (rabbit) LD50: >6200 mg/kg[2] | Dermal Sensitiser * |
| Inhalation(Rat) LC50; 0.368 mg/L4h[1] | Eye: no adverse effect observed (not irritating)[1] |
| Oral(Rat) LD50; >2000 mg/kg[1] | Skin (rabbit): 500 mg /24 hours |
| | Skin: adverse effect observed (irritating)[1] |

| | |
|---|---|
| **2,4'-diphenylmethane diisocyanate** | |

| TOXICITY | IRRITATION |
|---|---|
| Dermal (rabbit) LD50: >9400 mg/kg[1] | Not Available |
| Inhalation(Rat) LC50; 0.368 mg/L4h[1] | |
| Oral(Rat) LD50; >2000 mg/kg[1] | |

| | |
|---|---|
| **2,2'-diphenylmethane diisocyanate** | |

| TOXICITY | IRRITATION |
|---|---|
| Dermal (rabbit) LD50: >9400 mg/kg[1] | Not Available |
| Inhalation(Rat) LC50; 0.368 mg/L4h[1] | |
| Oral(Rat) LD50; >2000 mg/kg[1] | |

| | |
|---|---|
| ***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* |

| | |
|---|---|
| **POLYMERIC DIPHENYLMETHANE DIISOCYANATE** | product |
| **4,4'-DIPHENYLMETHANE DIISOCYANATE (MDI)** | Inhalation (human) TCLo: 0.13 ppm/30 mins Eye (rabbit): 0.10 mg moderate |
| **8820-B High Temperature Rigid Urethane & POLYMERIC DIPHENYLMETHANE DIISOCYANATE & 4,4'-DIPHENYLMETHANE DIISOCYANATE (MDI) & 2,4'-DIPHENYLMETHANE DIISOCYANATE & 2,2'-DIPHENYLMETHANE DIISOCYANATE** | Asthma-like symptoms may continue for months or even years after exposure to the material ceases. This may be due to a non-allergenic 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 within 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 also been 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.<br>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.<br>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.<br>Immunologically the low molecular weight substances become complete allergens in the organism either by binding to peptides or proteins (haptens) or after metabolism (prohaptens).<br>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.<br>Exogenous allergic alveolitis 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. |

**Continued...**

| | |
|---|---|
| | The following information refers to contact allergens as a group and may not be specific to this product.<br>Contact allergies 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.<br>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 neurosis, 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.<br>Isocyanate-containing vapours/ mists may cause inflammation of eyes and nasal passages.<br>Onset of symptoms may be immediate or delayed for several hours after exposure. Sensitised people can react to very low levels of airborne isocyanates. Unprotected or sensitised persons should not be allowed to work in situations allowing exposure to this material. |
| **POLYMERIC DIPHENYLMETHANE DIISOCYANATE & 4,4'-DIPHENYLMETHANE DIISOCYANATE (MDI)** | The material may produce moderate eye irritation leading to inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.<br>The substance is classified by IARC as Group 3:<br>**NOT** classifiable as to its carcinogenicity to humans.<br>Evidence of carcinogenicity may be inadequate or limited in animal testing. |
| **POLYMERIC DIPHENYLMETHANE DIISOCYANATE & 4,4'-DIPHENYLMETHANE DIISOCYANATE (MDI) & 2,4'-DIPHENYLMETHANE DIISOCYANATE & 2,2'-DIPHENYLMETHANE DIISOCYANATE** | for diisocyanates:<br>In general, there appears to be little or no difference between aromatic and aliphatic diisocyanates as toxicants. In addition, there are insufficient data available to make any major distinctions between polymeric (<1000 MW) and monomeric diisocyanates. Based on repeated dose studies in animals by the inhalation route, both aromatic and aliphatic diisocyanates appear to be of high concern for pulmonary toxicity at low exposure levels. Based upon a very limited data set, it appears that diisocyanate prepolymers exhibit the same respiratory tract effects as the monomers in repeated dose studies. There is also evidence that both aromatic and aliphatic diisocyanates are acutely toxic via the inhalation route. Most members of the diisocyanate category have not been tested for carcinogenic potential. Though the aromatic diisocyanates tested positive and the one aliphatic diisocyanate tested negative in one species, it is premature to make any generalizations about the carcinogenic potential of aromatic versus aliphatic diisocyanates. In the absence of more human data, it would be prudent at this time to assume that both aromatic and aliphatic diisocyanates are respiratory sensitisers. Diisocyanates are moderate to strong dermal sensitisers in animal studies. Skin irritation studies performed on rabbits and guinea pigs indicate no difference in the effects of aromatic versus aliphatic diisocyanates.<br>For monomers, effects on the respiratory tract (lungs and nasal cavities) were observed in animal studies at exposure concentrations of less than 0.005 mg/L. The experimental animal data available on prepolymeric diisocyanates show similar adverse effects at levels that range from 0.002 mg/L to 0.026 mg/L.<br>There is also evidence that both aromatic and aliphatic diisocyanates are acutely toxic via the inhalation route<br>**Oncogenicity:** Most members of the diisocyanate category have not been tested for carcinogenic potential. Commercially available Poly-MDI was tested in a 2-year inhalation study in rats. The tested material contained 47% aromatic 4,4'-methylenediphenyl diisocyanate (MDI) and 53% higher molecular weight oligomers. Interim sacrifices at one year showed that males and females in the highest dose group (6 mg/m3) had treatment related histological changes in the nasal cavity, lungs and mediastinal lymph nodes. The incidence and severity of degeneration and basal cell hyperplasia of the olfactory epithelium and Bowman's gland hyperplasia were increased in males at the mid and high doses and in females at the high dose following the two year exposure period. Pulmonary adenomas were found in 6 males and 2 females, and pulmonary adenocarcinoma in one male in the high dose group. However, aliphatic hexamethylene diisocyanate (HDI) was found not to be carcinogenic in a two year repeated dose study in rats by the inhalation route. HDI has not been tested in mice by the inhalation route.<br>Though the oral route is not an expected route of exposure to humans, it should be noted that in two year repeated dose studies by the oral route, aromatic toluene diisocyanate (TDI) and 3,3'-dimethoxy-benzidine-4,4'-diisocyanate (dianisidine diisocyanate, DADI) were found to be carcinogenic in rodents. TDI induced a statistically significant increase in the incidence of liver tumors in rats and mice as well as dose-related hemangiosarcomas of the circulatory system and has been classified by the Agency as a B2 carcinogen. DADI was found to be carcinogenic in rats, but not in mice, with a statistically increase in the incidence of pancreatic tumors observed.<br>**Respiratory and Dermal Sensitization:** Based on the available toxicity data in animals and epidemiologic studies of humans, aromatic diisocyanates such as TDI and MDI are strong respiratory sensitisers. Aliphatic diisocyanates are generally not active in animal models for respiratory sensitization. However, HDI and possibly isophorone diisocyanate (IPDI), are reported to be associated with respiratory sensitization in humans. Symptoms resulting from occupational exposure to HDI include shortness of breath, increased bronchoconstriction reaction to histamine challenges, asthmatic reactions, wheezing and coughing. Two case reports of human exposure to IPDI by inhalation suggest IPDI is a respiratory sensitiser in humans. In view of the information from case reports in humans, it would be prudent at this time to assume that both aromatic and aliphatic diisocyanates are respiratory sensitisers. Studies in both human and mice using TDI, HDI, MDI and dicyclohexylmethane-4,4'-diisocyanate (HMDI) suggest cross-reactivity with the other diisocyanates, irrespective of whether the challenge compound was an aliphatic or aromatic diisocyanate. Diisocyanates are moderate to strong dermal sensitisers in animal studies. There seems to be little or no difference in the level of reactivity between aromatic and aliphatic diisocyanates.<br>**Dermal Irritation:** Skin irritation studies performed on rabbits and guinea pigs indicate no difference in the effects of aromatic versus aliphatic diisocyanates. The level of irritation ranged from slightly to severely irritating to the skin. One chemical, hydrogenated MDI (1,1-methylenebis-4-isocyanatocyclohexane), was found to be corrosive to the skin in guinea pigs. |
| **2,4'-DIPHENYLMETHANE DIISOCYANATE & 2,2'-DIPHENYLMETHANE DIISOCYANATE** | No significant acute toxicological data identified in literature search. |

| | | | |
|---|---|---|---|
| **Acute Toxicity** | ✔ | **Carcinogenicity** | ✘ |
| **Skin Irritation/Corrosion** | ✔ | **Reproductivity** | ✘ |
| **Serious Eye Damage/Irritation** | ✔ | **STOT - Single Exposure** | ✔ |
| **Respiratory or Skin sensitisation** | ✔ | **STOT - Repeated Exposure** | ✔ |
| **Mutagenicity** | ✘ | **Aspiration Hazard** | ✘ |

***Legend:*** ✘ *– Data either not available or does not fill the criteria for classification*
✔ *– Data available to make classification*

### 11.2.1. Endocrine Disruption Properties

Not Available

## SECTION 12 Ecological information

**Continued...**

### 12.1. Toxicity

**8820-B High Temperature Rigid Urethane**

| Endpoint | Test Duration (hr) | Species | Value | Source |
|---|---|---|---|---|
| Not Available | Not Available | Not Available | Not Available | Not Available |

**polymeric diphenylmethane diisocyanate**

| Endpoint | Test Duration (hr) | Species | Value | Source |
|---|---|---|---|---|
| Not Available | Not Available | Not Available | Not Available | Not Available |

**4,4'-diphenylmethane diisocyanate (MDI)**

| Endpoint | Test Duration (hr) | Species | Value | Source |
|---|---|---|---|---|
| EC50 | 72h | Algae or other aquatic plants | >1640mg/l | 2 |
| LC50 | 96h | Fish | >1000mg/l | 2 |
| NOEC(ECx) | 504h | Crustacea | >=10mg/l | 2 |
| BCF | 672h | Fish | 61-150 | 7 |

**2,4'-diphenylmethane diisocyanate**

| Endpoint | Test Duration (hr) | Species | Value | Source |
|---|---|---|---|---|
| NOEC(ECx) | 504h | Crustacea | >=10mg/l | 2 |
| EC50 | 72h | Algae or other aquatic plants | >1640mg/l | 2 |
| LC50 | 96h | Fish | >1000mg/l | 2 |

**2,2'-diphenylmethane diisocyanate**

| Endpoint | Test Duration (hr) | Species | Value | Source |
|---|---|---|---|---|
| EC50 | 72h | Algae or other aquatic plants | >1640mg/l | 2 |
| LC50 | 96h | Fish | >1000mg/l | 2 |
| NOEC(ECx) | 504h | Crustacea | >=10mg/l | 2 |

***Legend:*** *Extracted from 1. IUCLID Toxicity Data 2. Europe ECHA Registered Substances - Ecotoxicological Information - Aquatic Toxicity 3. EPIWIN Suite V3.12 (QSAR) - Aquatic Toxicity Data (Estimated) 4. US EPA, Ecotox database - Aquatic Toxicity Data 5. ECETOC Aquatic Hazard Assessment Data 6. NITE (Japan) - Bioconcentration Data 7. METI (Japan) - Bioconcentration Data 8. Vendor Data*

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 represents 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. Hydrolysis products are predominantly insoluble stable polyureas.
Biodegradation is minimal for most compounds and volatilisation is negligible. Atmospheric degradation is not expected with removal 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.
**DO NOT** discharge into sewer or waterways.

### 12.2. Persistence and degradability

| Ingredient | Persistence: Water/Soil | Persistence: Air |
|---|---|---|
| 4,4'-diphenylmethane diisocyanate (MDI) | LOW (Half-life = 1 days) | LOW (Half-life = 0.24 days) |
| 2,4'-diphenylmethane diisocyanate | HIGH | HIGH |
| 2,2'-diphenylmethane diisocyanate | HIGH | HIGH |

### 12.3. Bioaccumulative potential

| Ingredient | Bioaccumulation |
|---|---|
| 4,4'-diphenylmethane diisocyanate (MDI) | LOW (BCF = 15) |
| 2,4'-diphenylmethane diisocyanate | HIGH (LogKOW = 5.4481) |
| 2,2'-diphenylmethane diisocyanate | HIGH (LogKOW = 5.4481) |

### 12.4. Mobility in soil

| Ingredient | Mobility |
|---|---|
| 4,4'-diphenylmethane diisocyanate (MDI) | LOW (KOC = 376200) |

**Continued...**

| Ingredient | Mobility |
|---|---|
| 2,4'-diphenylmethane diisocyanate | LOW (KOC = 384000) |
| 2,2'-diphenylmethane diisocyanate | LOW (KOC = 392000) |

### 12.5. Results of PBT and vPvB assessment

| | P | B | T |
|---|---|---|---|
| Relevant available data | Not Available | Not Available | Not Available |
| PBT | ✗ | ✗ | ✗ |
| vPvB | ✗ | ✗ | ✗ |

| | |
|---|---|
| PBT Criteria fulfilled? | No |
| vPvB | No |

### 12.6. Endocrine Disruption Properties

Not Available

### 12.7. Other adverse effects

Not Available

## SECTION 13 Disposal considerations

### 13.1. Waste treatment methods

| | |
|---|---|
| **Product / Packaging disposal** | ▸ Containers may still present a chemical hazard/ danger when empty.<br>▸ Return to supplier for reuse/ recycling if possible.<br>Otherwise:<br>▸ 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.<br>▸ Where possible retain label warnings and SDS and observe all notices pertaining to the product.<br>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.<br>A Hierarchy of Controls seems to be common - the user should investigate:<br>▸ Reduction<br>▸ Reuse<br>▸ Recycling<br>▸ Disposal (if all else fails)<br>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.<br>▸ **DO NOT** allow wash water from cleaning or process equipment to enter drains.<br>▸ It may be necessary to collect all wash water for treatment before disposal.<br>▸ In all cases disposal to sewer may be subject to local laws and regulations and these should be considered first.<br>▸ Where in doubt contact the responsible authority.<br>▸ **DO NOT** recycle spilled material.<br>▸ Consult State Land Waste Management Authority for disposal.<br>▸ Neutralise spill material carefully and decontaminate empty containers and spill residues with 10% ammonia solution plus detergent or a proprietary decontaminant prior to disposal.<br>▸ **DO NOT** seal or stopper drums being decontaminated as CO2 gas is generated and may pressurise containers.<br>▸ Puncture containers to prevent re-use.<br>▸ Bury or incinerate residues at an approved site. |
| **Waste treatment options** | Not Available |
| **Sewage disposal options** | Not Available |

## SECTION 14 Transport information

### Land transport (ADR): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

| | |
|---|---|
| 14.1. **UN number** | Not Applicable |
| 14.2. **UN proper shipping name** | Not Applicable |
| 14.3. **Transport hazard class(es)** | Class: Not Applicable<br>Subrisk: Not Applicable |
| 14.4. **Packing group** | Not Applicable |
| 14.5. **Environmental hazard** | Not Applicable |
| 14.6. **Special precautions for user** | Hazard identification (Kemler): Not Applicable<br>Classification code: Not Applicable<br>Hazard Label: Not Applicable<br>Special provisions: Not Applicable |

**Continued...**

| | | |
|---|---|---|
| | Limited quantity | Not Applicable |
| | Tunnel Restriction Code | Not Applicable |

**Air transport (ICAO-IATA / DGR): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS**

| | | |
|---|---|---|
| 14.1. **UN number** | Not Applicable | |
| 14.2. **UN proper shipping name** | Not Applicable | |
| 14.3. **Transport hazard class(es)** | ICAO/IATA Class | Not Applicable |
| | ICAO / IATA Subrisk | Not Applicable |
| | ERG Code | Not Applicable |
| 14.4. **Packing group** | Not Applicable | |
| 14.5. **Environmental hazard** | Not Applicable | |
| 14.6. **Special precautions for user** | Special provisions | Not Applicable |
| | Cargo Only Packing Instructions | Not Applicable |
| | Cargo Only Maximum Qty / Pack | Not Applicable |
| | Passenger and Cargo Packing Instructions | Not Applicable |
| | Passenger and Cargo Maximum Qty / Pack | Not Applicable |
| | Passenger and Cargo Limited Quantity Packing Instructions | Not Applicable |
| | Passenger and Cargo Limited Maximum Qty / Pack | Not Applicable |

**Sea transport (IMDG-Code / GGVSee): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS**

| | | |
|---|---|---|
| 14.1. **UN number** | Not Applicable | |
| 14.2. **UN proper shipping name** | Not Applicable | |
| 14.3. **Transport hazard class(es)** | IMDG Class | Not Applicable |
| | IMDG Subrisk | Not Applicable |
| 14.4. **Packing group** | Not Applicable | |
| 14.5. **Environmental hazard** | Not Applicable | |
| 14.6. **Special precautions for user** | EMS Number | Not Applicable |
| | Special provisions | Not Applicable |
| | Limited Quantities | Not Applicable |

**Inland waterways transport (ADN): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS**

| | | |
|---|---|---|
| 14.1. **UN number** | Not Applicable | |
| 14.2. **UN proper shipping name** | Not Applicable | |
| 14.3. **Transport hazard class(es)** | Not Applicable | Not Applicable |
| 14.4. **Packing group** | Not Applicable | |
| 14.5. **Environmental hazard** | Not Applicable | |
| 14.6. **Special precautions for user** | Classification code | Not Applicable |
| | Special provisions | Not Applicable |
| | Limited quantity | Not Applicable |
| | Equipment required | Not Applicable |
| | Fire cones number | Not Applicable |

### 14.7. Transport in bulk according to Annex II of MARPOL and the IBC code

Not Applicable

### 14.8. Transport in bulk in accordance with MARPOL Annex V and the IMSBC Code

| Product name | Group |
|---|---|
| polymeric diphenylmethane diisocyanate | Not Available |
| 4,4'-diphenylmethane diisocyanate (MDI) | Not Available |
| 2,4'-diphenylmethane diisocyanate | Not Available |
| 2,2'-diphenylmethane diisocyanate | Not Available |

**Continued...**

### 14.9. Transport in bulk in accordance with the ICG Code

| Product name | Ship Type |
|---|---|
| polymeric diphenylmethane diisocyanate | Not Available |
| 4,4'-diphenylmethane diisocyanate (MDI) | Not Available |
| 2,4'-diphenylmethane diisocyanate | Not Available |
| 2,2'-diphenylmethane diisocyanate | Not Available |

## SECTION 15 Regulatory information

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

**polymeric diphenylmethane diisocyanate is found on the following regulatory lists**

EU REACH Regulation (EC) No 1907/2006 - Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles

International Agency for Research on Cancer (IARC) - Agents Classified by the IARC Monographs

**4,4'-diphenylmethane diisocyanate (MDI) is found on the following regulatory lists**

EU European Chemicals Agency (ECHA) Community Rolling Action Plan (CoRAP) List of Substances

EU REACH Regulation (EC) No 1907/2006 - Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles

Europe EC Inventory

European Union - European Inventory of Existing Commercial Chemical Substances (EINECS)

European Union (EU) Regulation (EC) No 1272/2008 on Classification, Labelling and Packaging of Substances and Mixtures - Annex VI

International Agency for Research on Cancer (IARC) - Agents Classified by the IARC Monographs

**2,4'-diphenylmethane diisocyanate is found on the following regulatory lists**

EU REACH Regulation (EC) No 1907/2006 - Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles

Europe EC Inventory

European Union - European Inventory of Existing Commercial Chemical Substances (EINECS)

European Union (EU) Regulation (EC) No 1272/2008 on Classification, Labelling and Packaging of Substances and Mixtures - Annex VI

**2,2'-diphenylmethane diisocyanate is found on the following regulatory lists**

EU REACH Regulation (EC) No 1907/2006 - Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles

Europe EC Inventory

European Union - European Inventory of Existing Commercial Chemical Substances (EINECS)

European Union (EU) Regulation (EC) No 1272/2008 on Classification, Labelling and Packaging of Substances and Mixtures - Annex VI

This safety data sheet is in compliance with the following EU legislation and its adaptations - as far as applicable - : Directives 98/24/EC, - 92/85/EEC, - 94/33/EC, - 2008/98/EC, - 2010/75/EU; Commission Regulation (EU) 2020/878; Regulation (EC) No 1272/2008 as updated through ATPs.

### 15.2. Chemical safety assessment

No Chemical Safety Assessment has been carried out for this substance/mixture by the supplier.

### National Inventory Status

| National Inventory | Status |
|---|---|
| Australia - AIIC / Australia Non-Industrial Use | Yes |
| Canada - DSL | Yes |
| Canada - NDSL | No (polymeric diphenylmethane diisocyanate; 4,4'-diphenylmethane diisocyanate (MDI); 2,4'-diphenylmethane diisocyanate; 2,2'-diphenylmethane diisocyanate) |
| China - IECSC | Yes |
| Europe - EINEC / ELINCS / NLP | No (polymeric diphenylmethane diisocyanate) |
| Japan - ENCS | Yes |
| Korea - KECI | Yes |
| New Zealand - NZIoC | Yes |
| Philippines - PICCS | Yes |
| USA - TSCA | Yes |
| Taiwan - TCSI | Yes |
| Mexico - INSQ | No (2,4'-diphenylmethane diisocyanate; 2,2'-diphenylmethane diisocyanate) |
| Vietnam - NCI | Yes |
| Russia - FBEPH | No (2,2'-diphenylmethane diisocyanate) |
| ***Legend:*** | *Yes = All CAS declared ingredients are on the inventory*<br>*No = One or more of the CAS listed ingredients are not on the inventory. These ingredients may be exempt or will require registration.* |

## SECTION 16 Other information

| | |
|---|---|
| **Revision Date** | 25/10/2021 |
| **Initial Date** | 18/06/2018 |

**Continued...**

### Full text Risk and Hazard codes

| | |
|---|---|
| **H351** | Suspected of causing cancer. |

### Other information

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.
For detailed advice on Personal Protective Equipment, refer to the following EU CEN Standards:
EN 166 Personal eye-protection
EN 340 Protective clothing
EN 374 Protective gloves against chemicals and micro-organisms
EN 13832 Footwear protecting against chemicals
EN 133 Respiratory protective devices

### 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
ES: Exposure Standard
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
AIIC: Australian Inventory of Industrial Chemicals
DSL: Domestic Substances List
NDSL: Non-Domestic Substances List
IECSC: Inventory of Existing Chemical Substance in China
EINECS: European INventory of Existing Commercial chemical Substances
ELINCS: European List of Notified Chemical Substances
NLP: No-Longer Polymers
ENCS: Existing and New Chemical Substances Inventory
KECI: Korea Existing Chemicals Inventory
NZIoC: New Zealand Inventory of Chemicals
PICCS: Philippine Inventory of Chemicals and Chemical Substances
TSCA: Toxic Substances Control Act
TCSI: Taiwan Chemical Substance Inventory
INSQ: Inventario Nacional de Sustancias Químicas
NCI: National Chemical Inventory
FBEPH: Russian Register of Potentially Hazardous Chemical and Biological Substances

## Reason for Change

A-2.00 - Added UFI number and format change to SDS