



**Australian Government**

**Department of Health and Ageing**  
National Industrial Chemicals  
Notification and Assessment Scheme

## **INVENTORY MULTI-TIERED ASSESSMENT AND PRIORITISATION (IMAP)**



### **HUMAN HEALTH TIER II ASSESSMENT FOR Polymers containing isocyanate monomers**

## Polymers containing isocyanate monomers

| Chemical name in AICS   | CAS Number  |
|---|-------------|
| Furan, tetrahydro-, polymer with 1,1'-methylenebis[4-isocyanatobenzene]   | 37396-66-0  |
| 1,3-Propanediol, 2-ethyl-2-(hydroxymethyl)-, polymer with 1,3-diisocyanatomethylbenzene and 2,2'-oxybis[ethanol]  | 53317-61-6  |
| 1,3-Propanediol, 2-ethyl-2-(hydroxymethyl)-, polymer with 1,3-diisocyanatomethylbenzene, .alpha.-hydro-.omega.-hydroxypoly[oxy(methyl-1,2-ethanediyl)] and 2,2'-oxybis[ethanol]   | 68958-67-8  |
| Propanol, [(1-methyl-1,2-ethanediyl)bis(oxy)]bis-, polymer with 1,1'-methylenebis[isocyanatobenzene] and oxybis[propanol]   | 68092-58-0  |
| Isocyanic acid, polymethylenepolyphenylene ester, polymer with methyloxirane and 1,2,3-propanetriol   | 68400-69-1  |
| 2-Propenoic acid, 2-hydroxyethyl ester, polymer with 1,1'-methylenebis[4-isocyanatocyclohexane] and .alpha.,.alpha.',.alpha."-1,2,3-propanetriyltris[.omega.-hydroxypoly[oxy(methyl-1,2-ethanediyl)]]   | 73324-00-2  |
| Hexanedioic acid, polymer with 2-ethyl-2-(hydroxymethyl)-1,3-propanediol, 1,3-isobenzofurandione and 5-isocyanato-1-(isocyanatomethyl)-1,3,3-trimethylcyclohexane   | 68966-62-1  |
| 2-Propenoic acid, 2-hydroxyethyl ester, polymer with .alpha.-hydro-.omega.-hydroxypoly(oxy-1,2-ethanediyl) ether with 2-ethyl-2-(hydroxymethyl)-1,3-propanediol (3:1), 5-isocyanato-1-(isocyanatomethyl)-1,3,3-trimethylcyclohexane and 2,2'-thiobis[ethanol]               | 70069-72-6  |
| Oxirane, methyl-, polymer with oxirane, ether with 1,2-propanediol (2:1), polymer with 1,3-diisocyanatomethylbenzene and methyloxirane polymer with oxirane ether with 1,2,3-propanetriol (3:1)   | 84722-19-0  |
| Hexanedioic acid, polymer with 2,2-bis(hydroxymethyl)-1,3-propanediol, 1,3-diisocyanatomethylbenzene, methyloxirane polymer with oxirane ether with 1,2-propanediol (2:1), methyloxirane polymer with oxirane ether with 1,2,3-propanetriol (3:1), and 2,2'-oxybis[ethanol] | 104133-18-8 |
| Hexanedioic acid, polymer with dihydro-2,5-furandione, 1,3-diisocyanatomethylbenzene, methyloxirane, oxirane, 1,2-propanediol and 1,2,3-propanetriol 2-methyl-2-propenoate, block   | 109586-83-6 |
| Hexanedioic acid, polymer with 5-amino-1,3,3-trimethylcyclohexanemethanamine, 1,2-ethanediol, 5-isocyanato-1-(isocyanatomethyl)-1,3,3-trimethylcyclohexane and 2,2'-oxybis[ethanol]   | 129392-38-7 |
| Hexanedioic acid, polymer with 5-isocyanato-1-(isocyanatomethyl)-1,3,3-trimethylcyclohexane, 2-ethyl-2-(hydroxymethyl)-1,3-propanediol, 1,3-benzenedicarboxylic acid, 2,2-dimethyl-1,3-propanediol and 2-hydroxyethyl-2-propenoate  | 218448-06-7 |

## **PREFACE**

As part of the reform regarding assessment of Existing Chemicals, the National Industrial Chemicals Notification and Assessment Scheme (NICNAS) is implementing a new framework to address the human health and environmental impacts of industrial chemicals, not yet assessed, on the Australian Inventory of Chemical Substances (AICS).

The framework provides a more rapid, flexible and transparent approach for the assessment of existing chemicals.

The Inventory Multi-tiered Assessment and Prioritisation (IMAP) framework was developed, with significant input from stakeholders, and will be applied in stages.

Stage One of this program, which will take four years, started 1 July 2012 and is examining 3000 chemicals meeting characteristics identified by stakeholders as needing priority assessment. This includes chemicals for which NICNAS already holds exposure information, chemicals identified as a concern or for which regulatory action has been taken overseas, and chemicals detected in international studies analysing chemicals present in babies' umbilical cord blood.

The IMAP framework is a science and risk-based model designed to align the assessment effort with the human health and environmental impacts of chemicals. It has three tiers of assessment, with the assessment effort increasing with each tier. The Tier I assessment is a high throughput approach using tabulated electronic data. The Tier II assessment is an evaluation of risk on a substance-by-substance or chemical category-by-category basis. Tier III assessments are conducted to address specific concerns that could not be resolved during the Tier II assessment.

This chemical/group of chemicals is/are being assessed at Tier II because the Tier I assessment indicated that it needed further investigation.

**For more detail on the new program please visit: [www.nicnas.gov.au](http://www.nicnas.gov.au)**

### **Disclaimer**

NICNAS has made every effort to assure the quality of information available in this report. However, before relying on it for a specific purpose, users should obtain advice relevant to their particular circumstances. This report has been prepared by NICNAS using a range of sources, including information from databases maintained by third parties, which include data supplied by industry. NICNAS has not verified and cannot guarantee the correctness of all information obtained from those databases. Reproduction or further distribution of this information may be subject to copyright protection. Use of this information without obtaining the permission from the owner(s) of the respective information might violate the rights of the owner. NICNAS does not take any responsibility whatsoever for any copyright or other infringements that may be caused by using this information.

**ACRONYMS & ABBREVIATIONS**

|                    |  |
|--------------------|--|
| ACToR              | Aggregated Computational Toxicology Resource (US)                        |
| AICS               | Australian Inventory of Chemical Substances                              |
| ASTDR              | Agency for Toxic Substances and Disease Registry (US)                    |
| bw                 | bodyweight   |
| CAS                | Chemical Abstracts Service   |
| CFR                | Code of Federal Regulations (US)   |
| CHO                | Chinese hamster ovary  |
| CosIng             | Cosmetic Ingredients and Substances database (EU)                        |
| d                  | day  |
| DNA                | Deoxyribonucleic acid  |
| EC                 | European Commission  |
| EC3                | Estimated concentration three  |
| ECHA               | European Chemicals Agency  |
| ESIS               | European Chemical Substances Information System                          |
| EU                 | European Union   |
| EU RAR             | European Union Risk Assessment Report                                    |
| FDA                | Food and Drug Administration (US)  |
| FSANZ              | Food Standards Australia and New Zealand                                 |
| g                  | gram   |
| g/mol              | grams per mole   |
| GHS                | Globally Harmonized System of Classification and Labelling of Chemicals* |
| GLP                | Good Laboratory Practice   |
| GMP                | Good Manufacturing Practice  |
| GPMT               | Guinea Pig Maximisation Test   |
| h                  | hour   |
| HGPRT              | hypoxanthine guanine phosphoribosyltransferase                           |
| HPV                | high production volume   |
| HSDB               | Hazardous Substances Data Bank   |
| HSIS               | Hazardous Substances Information System                                  |
| HVACL              | High Volume Industrial Chemicals List                                    |
| IARC               | International Agency for Research on Cancer                              |
| INCHEM             | International Programme on Chemical Safety (also known as IPCS)          |
| INCI               | International Nomenclature of Cosmetic Ingredients                       |
| ip                 | intraperitoneal  |
| IRIS               | Integrated Risk Information System (US)                                  |
| IUCLID             | International Uniform Chemical Information Database                      |
| iv                 | intravenous  |
| kg                 | kilogram   |
| L                  | litre  |
| LC50               | median lethal concentration  |
| LD50               | median lethal dose   |
| LCLo               | lowest published lethal concentration                                    |
| LLNA               | local lymph node assay   |
| LOAEL              | lowest observed adverse effect level                                     |
| LOEL               | lowest observed effect level   |
| m <sup>3</sup>     | cubic metre  |
| mg                 | milligram  |
| mg/cm <sup>3</sup> | milligrams per cubic centimetre  |
| mg/kg bw/d         | milligrams per kilogram bodyweight per day                               |
| min                | minute   |
| mL                 | millilitre   |
| µg                 | microgram  |
| µL                 | microlitre   |
| (m)SDS             | (material) Safety Data Sheet   |
| NIOSH              | National Institute for Occupational Safety and Health (US)               |

|        |   |
|--------|---|
| NOAEC  | no observed adverse effect concentration  |
| NOAEL  | no observed adverse effect level  |
| NOEC   | no observed effect concentration  |
| NOEL   | no observed effect level  |
| NOHSC  | National Occupational Health and Safety Commission                                    |
| NTP    | National Toxicology Program (US)  |
| OECD   | Organisation for Economic Cooperation and Development                                 |
| OEL    | occupational exposure limit   |
| PCBU   | person conducting a business or undertaking   |
| PEL    | permissible exposure limit  |
| PND    | postnatal day   |
| ppb    | parts per billion   |
| PPE    | personal protective equipment   |
| ppm    | parts per million   |
| REACH  | Registration Evaluation Authorisation of Chemicals (ECHA)                             |
| SD     | Sprague Dawley  |
| SIAP   | SIDS Initial Assessment Profile (OECD)  |
| SIAR   | SIDS Initial Assessment Report (OECD)   |
| SIDS   | Screening Information Data Set (OECD)   |
| SMILES | simplified molecular-input line-entry system  |
| SPIN   | Substances in Preparations In the Nordic countries                                    |
| STEL   | short-term exposure limits  |
| STV    | short-term value  |
| SUSMP  | Standard for the Uniform Scheduling of Medicines and Poisons (The Poisons Standard**) |
| TCLo   | lowest published toxic concentration  |
| TEEL   | temporary emergency exposure limits   |
| TSCA   | Toxic Substances Control Act (US EPA)   |
| TG     | test guideline  |
| TGA    | Therapeutic Goods Administration  |
| TLV    | threshold limit values  |
| TWA    | time weighted average   |
| UN     | United Nations  |
| US     | United States of America  |
| US EPA | United States Environmental Protection Agency   |
| WHS    | Work, Health and Safety   |
| wt     | weight  |
| w/w    | weight per weight   |

### Glossary

NICNAS uses the IPCS Risk Assessment Terminology (IPCS, 2004) glossary, which includes:

Part 1: IPCS/OECD Key Generic Terms used in Chemical Hazard/Risk Assessment; and

Part 2: IPCS Glossary of Key Exposure Assessment Terminology.

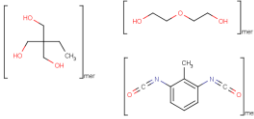
The IPCS Risk Assessment Terminology can be accessed at:

<http://www.who.int/ipcs/methods/harmonization/areas/ipcsterminologyparts1and2.pdf>

\*Globally Harmonized System of Classification and Labelling of Chemicals (GHS) United Nations, 2009.

Third edition. Can be accessed at: [http://www.unece.org/trans/danger/publi/ghs/ghs\\_rev03/03files\\_e.html](http://www.unece.org/trans/danger/publi/ghs/ghs_rev03/03files_e.html)

\*\*The Poisons Standard (the SUSMP) can be accessed at: <http://www.tga.gov.au/industry/scheduling-poisons-standard.htm>

| Chemical Name in AICS<br>(Including Synonyms)   | CAS<br>Number | Structural Formula   | Molecular<br>Formula   | Weight<br>(g/mol) |
|---|---------------|--|--|-------------------|
| <p><b>1,3-Propanediol, 2-ethyl-2-(hydroxymethyl)-, polymer with 1,3-diisocyanatomethylbenzene and 2,2'-oxybis[ethanol]</b></p> <p>Diethylene glycol, trimethylol propane, 1,3-diisocyanatomethylbenzene polymer<br/>Toluenediisocyanate, trimethylolpropane, diethylene glycol polymer<br/>Tolylenediisocyanate, diethylene glycol, trimethylol propane polyurethane<br/>Diethylene glycol-TDI-trimethylolpropane copolymer</p> | 53317-61-6    |  | (C <sub>9</sub> H <sub>6</sub> N <sub>2</sub> O <sub>2</sub> .C <sub>6</sub> H <sub>14</sub> O <sub>3</sub> .C <sub>4</sub> H <sub>10</sub> O) <sub>3</sub> x  | N/A               |
| <p><b>1,3-Propanediol, 2-ethyl-2-(hydroxymethyl)-, polymer with 1,3-diisocyanatomethylbenzene, .alpha.-hydro-.omega.-hydroxypoly[oxy(methyl-1,2-ethanediyl)] and 2,2'-oxybis[ethanol]</b></p> <p>Diethylene glycol-polypropylene glycol-TDI-trimethylolpropane copolymer</p>  | 68958-67-8    |  | (C <sub>9</sub> H <sub>6</sub> N <sub>2</sub> O <sub>2</sub> .C <sub>6</sub> H <sub>14</sub> O <sub>3</sub> .C <sub>4</sub> H <sub>10</sub> O) <sub>3</sub> .(C <sub>3</sub> H <sub>6</sub> O) <sub>n</sub> H <sub>2</sub> O) <sub>x</sub>   | N/A               |
| <p><b>2-Propenoic acid, 2-hydroxyethyl ester, polymer with .alpha.-hydro-.omega.-hydroxypoly(oxy-1,2-ethanediyl) ether with 2-ethyl-2-(hydroxymethyl)-1,3-propanediol (3:1), 5-isocyanato-1-(isocyanatomethyl)-1,3,3-trimethylcyclohexane and 2,2'-thiobis[ethanol]</b></p>   | 70069-72-6    |  | (C <sub>12</sub> H <sub>18</sub> N <sub>2</sub> O <sub>2</sub> .C <sub>5</sub> H <sub>8</sub> O <sub>3</sub> .C <sub>4</sub> H <sub>10</sub> O) <sub>2</sub> S.(C <sub>2</sub> H <sub>4</sub> O) <sub>n</sub> (C <sub>2</sub> H <sub>4</sub> O) <sub>n</sub> (C <sub>2</sub> H <sub>4</sub> O) <sub>n</sub> C <sub>6</sub> H <sub>14</sub> O <sub>3</sub> ) <sub>x</sub> | N/A               |

| Chemical Name in AICS<br>(Including Synonyms)   | CAS<br>Number | Structural Formula | Molecular<br>Formula   | Weight<br>(g/mol) |
|---|---------------|--------------------|--|-------------------|
| 2-Propenoic acid, 2-hydroxyethyl ester, polymer with 1,1'-methylenebis[4-isocyanatocyclohexane] and .alpha.,.alpha',.alpha"-1,2,3-propanetriyltris[.omega.-hydroxypoly[oxy(methyl-1,2-ethanediyl)]]   | 73324-00-2    |                    | (C15H22N2O2.C5H8O3.(C3H6O)n(C3H6O)n(C3H6O)nC3H8O3)x                    | N/A               |
| 2-Propenoic acid, 2-hydroxyethyl ester, polymer with 1,1'-methylenebis(4-isocyanatocyclohexane) and alpha,alpha',alpha"-1,2,3-propanetriyltris(omega-hydroxypoly(oxy(methyl-1,2-ethanediyl)))   |               |                    |  |                   |
| Furan, tetrahydro-, polymer with 1,1'-methylenebis[4-isocyanatobenzene]   | 37396-66-0    |                    | (C15H10N2O2.C4H8O)x  | N/A               |
| Polytetrahydrofuran, diphenylmethane diisocyanate copolymer   |               |                    |  |                   |
| Hexanedioic acid, polymer with 2,2-bis(hydroxymethyl)-1,3-propanediol, 1,3-diisocyanatomethylbenzene, methyloxirane polymer with oxirane ether with 1,2-propanediol (2:1), methyloxirane polymer with oxirane ether with 1,2,3-propanetriol (3:1), and 2,2'-oxybis[ethanol] | 104133-18-8   |                    | (C9H6N2O2.C6H10O4.C5H12O4.C4H10O3.C3H8O3.3(C3H6O.C2H4O)x.C3H6O.C2H4O)x | N/A               |
| Hexanedioic acid, polymer with 2,2-bis(hydroxymethyl)-1,3-propanediol, 1,3-diisocyanatomethylbenzene, methyloxirane, methyloxirane polymer with oxirane ether with 1,2,3-propanetriol (3:1), oxirane and 2,2'-oxybis[ethanol]   |               |                    |  |                   |

| Chemical Name in AICS<br>(Including Synonyms)  | CAS<br>Number | Structural Formula | Molecular<br>Formula                                      | Weight<br>(g/mol) |
|--|---------------|--------------------|---|-------------------|
| Hexanedioic acid, polymer with 2-ethyl-2-(hydroxymethyl)-1,3-propanediol, 1,6-hexanediol, 1,3-isobenzofurandione and 5-isocyanato-1-(isocyanatomethyl)-1,3,3-trimethylcyclohexane  | 68966-62-1    |                    | (C12H18N2O2.C<br>8H4O3.C6H14O<br>3.C6H14O2.C6H<br>10O4)x  | N/A               |
| 1,6-hexanediol polymer with 2-ethyl-2-(hydroxymethyl)-1,3-propanediol, hexanedioic acid, 1,3-isobenzofurandione and 5-isocyanato-1-(isocyanatomethyl)-1,3,3-trimethylcyclohexane   |               |                    |   |                   |
| Hexanedioic acid, polymer with 5-amino-1,3,3-trimethylcyclohexanemethanamine, 1,2-ethanediol, 5-isocyanato-1-(isocyanatomethyl)-1,3,3-trimethylcyclohexane and 2,2'-oxybis[ethanol]  | 129392-38-7   |                    | (C12H18N2O2.C<br>10H22N2.C6H10<br>O4.C4H10O3.C2<br>H6O2)x | N/A               |
| Hexanedioic acid, polymer with 5-isocyanato-1-(isocyanatomethyl)-1,3,3-trimethylcyclohexane, 2-ethyl-2-(hydroxymethyl)-1,3-propanediol, 1,3-benzenedicarboxylic acid, 2,2-dimethyl-1,3-propanediol and 2-hydroxyethyl-2-propenoate | 218448-06-7   |                    |   | N/A               |



| Chemical Name in AICS<br>(Including Synonyms)   | CAS<br>Number | Structural Formula   | Molecular<br>Formula  | Weight<br>(g/mol) |
|---|---------------|--|---|-------------------|
| Hexanedioic acid, polymer with dihydro-2,5-furandione, 1,3-diisocyanatomethylbenzene, methyloxirane, oxirane, 1,2-propanediol and 1,2,3-propanetriol 2-methyl-2-propenoate, block               | 109586-83-6   |  | (C <sub>9</sub> H <sub>6</sub> N <sub>2</sub> O <sub>2</sub> .C <sub>6</sub> H <sub>10</sub> O <sub>4</sub> .C <sub>4</sub> H <sub>6</sub> O <sub>2</sub> .C <sub>4</sub> H <sub>4</sub> O <sub>3</sub> .xC <sub>3</sub> H <sub>8</sub> O <sub>3</sub> .C <sub>3</sub> H <sub>8</sub> O <sub>2</sub> .C <sub>3</sub> H <sub>6</sub> O.C <sub>2</sub> H <sub>4</sub> O) <sub>x</sub> | N/A               |
| Isocyanic acid, polymethylenepolyphenylene ester, polymer with methyloxirane and 1,2,3-propanetriol   | 68400-69-1    |  | (C <sub>3</sub> H <sub>8</sub> O <sub>3</sub> .C <sub>3</sub> H <sub>6</sub> O) <sub>x</sub>  | N/A               |
| Isocyanic acid polymethylene polyphenylene ester polymer with methyloxirane and 1,2,3-propanetriol<br>Glycerine-PAPI-propylene oxide copolymer  |               |  | (C <sub>3</sub> H <sub>8</sub> O <sub>3</sub> .C <sub>3</sub> H <sub>6</sub> O) <sub>x</sub>  | N/A               |
| Oxirane, methyl-, polymer with oxirane, ether with 1,2-propanediol (2:1), polymer with 1,3-diisocyanatomethylbenzene and methyloxirane polymer with oxirane ether with 1,2,3-propanetriol (3:1) | 84722-19-0    |  |   |                   |
| Oxirane, methyl-, polymer with 1,3-diisocyanatomethylbenzene, methyloxirane polymer with oxirane ether with 1,2,3-propanetriol (3:1) and oxirane  |               |  |   | N/A               |
| Propanol, [(1-methyl-1,2-ethanediyl)bis(oxy)]bis-, polymer with 1,1'-methylenebis[isocyanatobenzene] and oxybis[propanol]   | 68092-58-0    |  | (C <sub>15</sub> H <sub>10</sub> N <sub>2</sub> O <sub>2</sub> .C <sub>9</sub> H <sub>20</sub> O <sub>4</sub> .C <sub>6</sub> H <sub>14</sub> O <sub>3</sub> ) <sub>x</sub>   | N/A               |

## Grouping Rationale

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 chemicals covered by this assessment are the group of polyurethanes listed in Stage One of the Inventory Multi-tiered Assessment and Prioritisation (IMAP) program where the chemical name alone does not allow determination as to whether they contain free isocyanate groups or otherwise.

## **Import, Manufacture and Use**

### **Australian**

The following Australian industrial uses were reported under previous mandatory and/or voluntary calls for information.

Some polymers in this group have reported commercial use including:

- as a construction material additive.

### **International**

The following international uses have been identified through Galleria Chemica and Substances in Preparations in Nordic Countries (SPIN) database.

Some polymers in this group have reported domestic use including:

- paints, lacquers and varnishes.

Some polymers in this group have reported commercial use including:

- as a reprographic agent; and
- in adhesive and binding agents.

Some polymers in this group have reported site-limited use including:

- as an intermediate;
- in plastics manufacture; and
- as a polyurethane pre-polymer.

## **Restrictions**

### **Australian**

Where the polymers in this group contain free isocyanate groups, these polymers are covered by the entry for 'Isocyanates', listed in the Poisons Standard (Standard for the Uniform Scheduling of Medicines and Poisons (SUSMP)) in Schedule 6 with: "ISOCYANATES, free organic, boiling below 300° C, **except** in:

- (a) viscous polyurethane adhesives; or
- (b) viscous polyurethane sealants; containing not more than 0.7 per cent of free organic isocyanates boiling below 300°C."

Schedule 6 chemicals are labelled as a "Poison". These are substances with a moderate potential for causing harm, the extent of which can be reduced by using distinctive packaging with strong warnings and safety directions on the label.

Where the polymers in this group contain free isocyanate groups, these chemicals are covered by the entry for 'Isocyanates', listed in the Safe Work Australia, Model Work Health and Safety Regulations, Hazardous chemicals (other than lead) requiring health monitoring (Safe Work Australia 2011).

### ***International***

No known restrictions have been identified.

## **Existing Hazard Classification for Worker Health and Safety**

The polymers in this group are not given classification on the Hazardous Substances Information System (HSIS) (Safe Work Australia).

### **Exposure Standards**

#### *Australian*

Where the polymers in this group contain free isocyanate groups, these chemicals have exposure standards of 0.02 mg/m<sup>3</sup> time weighted average (TWA) and 0.07 mg/m<sup>3</sup> short term exposure limit (STEL) as isocyanates, all (as-NCO).

#### *International*

The following exposure standards are identified for CAS No.: 73324-00-2 (Galleria Chemica):  
An exposure limit (TWA) of 5-10 mg/m<sup>3</sup> in different countries such as USA (Alaska, Hawaii), Canada (Yukon), Norway and Switzerland.

## **Health Hazard Information**

The free isocyanate group is extremely reactive, and its key health hazards are those identified in the NICNAS assessments of toluene diisocyanates (TDI) and methylenediphenyl diisocyanates (MDI). These are acutely toxic via the inhalation route; irritating to skin, eyes and the respiratory system; cause sensitisation by inhalation and skin contact; and carcinogenicity (NICNAS a, b). Where the polymers in this group do not contain a free isocyanate group, no significant health effects are expected, apart from in some cases, slight potential for local irritancy.

## **Risk Characterisation**

### **Critical Health Effects**

If the polymers in this group do not contain free isocyanate groups, none of these are expected to have significant health effects apart from in some cases slight potential for local irritancy.

However, where the polymers in this group contain free isocyanate groups, the critical health effect for risk characterisation is respiratory sensitisation. Other health effects include a systemic long-term effect (carcinogenicity), a systemic acute effect (acute toxicity by the inhalation route of exposure) and local effects (skin sensitisation and respiratory irritation). The chemicals of this group may also cause skin and eye irritation.

### **Public Risk Characterisation**

The uses of these polymers are not well known. Some polymers are known to be used commercially in construction in Australia and domestically overseas. Potential domestic uses are limited to paints, varnishes and lacquers.

Companies using or marketing the polymers in this group will have sufficient information available to determine whether the polymer contains free isocyanate groups. If the polymers do contain free isocyanate groups, particularly if they are low molecular weight pre-polymers, the companies using or marketing these polymers have a responsibility to ensure that they are controlled in accordance with the SUSMP and HSIS requirements.

Polymers containing free isocyanate groups are covered by the current listing on Schedule 6 of the SUSMP provided they meet the boiling point criterion. Strong warning statements, safety directions and first aid instructions apply to any domestic products containing chemicals of this group. The current controls are considered adequate to minimise the risk to public health posed by any domestic use of these chemicals.

Therefore, the risk to public health is not considered to be unreasonable.

### Occupational Risk Characterisation

During product formulation, dermal, ocular and inhalation exposure of workers to the chemicals of this group may occur, particularly where manual or open processes are used. These may include transfer and blending activities, quality control analysis, and cleaning and maintenance of equipment. Worker exposure to the chemical at lower concentrations may also occur while using formulated products containing the chemical. The level and route of exposure will vary depending on the method of application and work practices employed.

Where the polymers in this group contain free isocyanate groups, given the critical health effects, the chemicals may pose an unreasonable risk to workers unless adequate control measures to minimise dermal, ocular and inhalation exposure to the chemical are implemented. The chemical should be appropriately classified and labelled to ensure that a person conducting a business or undertaking (PCBU), e.g. employer, at a workplace, has adequate information to determine appropriate controls.

### NICNAS Recommendation

Assessment of the chemicals of this group is considered to be sufficient, provided that the appropriate classification is applied by the PCBU, and labelling and all other requirements are met under workplace health and safety and poisons legislation as adopted by the relevant state or territory.

Companies using or marketing these polymers should seek sufficient information to determine whether the polymer contains free isocyanate groups.

### Regulatory Control

#### *Public Health*

Products containing the polymers in this group with a free isocyanate group should be labelled in accordance with state and territory legislation (SUSMP).

#### *Work Health and Safety*

Where the polymers in this group do contain a free isocyanate group these are recommended for classification and labelling under the current approved criteria and adopted GHS as below. In general, for those chemicals with a free isocyanate group that do not have a specific hazard classification on HSIS the following recommendation could also apply. This does not consider classification of physical hazards and environmental hazards.

|                          | <i>Approved Criteria (HSIS)<sup>a</sup></i>  | <i>GHS Classification</i>  |
|--------------------------|--|--|
| Acute Toxicity           | Toxic by inhalation (T; R23)   | Fatal if inhaled - Cat. 2 (H330)   |
| Irritation / Corrosivity | Irritating to eyes (Xi; R36)<br>Irritating to skin (Xi; R38)<br>Irritating to respiratory system (Xi; R37) | Causes serious eye irritation - Cat. 2A (H319)<br>Causes skin irritation - Cat. 2 (H315)<br>May cause respiratory irritation - Specific target organ tox, single exp Cat. 3 (H335) |
| Sensitisation            | May cause sensitisation by inhalation (Xn, R42)<br>May cause sensitisation by skin contact (Xi; R43)       | May cause allergy or asthma symptoms or breathing difficulties if inhaled - Cat. 1 (H334)<br>May cause an allergic skin reaction - Cat. 1 (H317)                                   |
| Carcinogenicity          | Carc. Cat 3 - Limited evidence of a carcinogenic effect (Xn; R40)  | Suspected of causing cancer - Cat. 2 (H351)  |

<sup>a</sup> Approved Criteria for Classifying Hazardous Substances [NOHSC:1008(2004)].

\* Existing Hazard Classification. No change recommended to this classification.

### Advice for consumers

Products containing the chemicals of this group should be used according to label instructions.

### Advice for industry

#### *Control measures*

Control measures to minimise the risk from dermal, ocular and inhalation exposure to chemicals of this group

with a free isocyanate group should be implemented in accordance with the hierarchy of controls. Approaches to minimise risk include substitution, isolation and engineering controls. Measures required to eliminate or minimise risk arising from storing, handling and using a hazardous chemical depend on the physical form and the manner in which the chemical is used. Examples of control measures which may minimise the risk include, but are not limited to:

- using closed systems or isolating operations;
- using local exhaust ventilation to prevent the chemical from entering the breathing zone of any worker;
- health monitoring for any worker who is at risk of exposure to the chemical if valid techniques are available to monitor the effect on the worker's health;
- air monitoring to ensure control measures in place are working effectively and continue to do so;
- minimising manual processes and work tasks through automating processes;
- work procedures that minimise splashes and spills;
- regularly cleaning equipment and work areas; and
- using protective equipment that is designed, constructed, and operated to ensure that the worker does not come into contact with the chemical.

Guidance on managing risks from hazardous chemicals are provided in the *Managing Risks of Hazardous Chemicals in the Workplace—Code of Practice* available on the Safe Work Australia website.

Personal protective equipment should not solely be relied upon to control risk and should only be used when all other reasonably practicable control measures do not eliminate or sufficiently minimise risk. Guidance in selecting personal protective equipment can be obtained from Australian, Australian/New Zealand or other approved standards.

#### ***Obligations under workplace health and safety legislation***

Information in this report should be taken into account to assist with meeting obligations under workplace health and safety legislation as adopted by the relevant state or territory. This includes, but is not limited to:

- ensuring that hazardous chemicals are correctly classified and labelled;
- ensuring that (material) safety data sheets ((m)SDS) containing accurate information about the hazards (relating to both health hazards and physicochemical (physical) hazards) of the chemical are prepared; and
- managing risks arising from storing, handling and using a hazardous chemical.

Your work health and safety regulator should be contacted for information on the work health and safety laws in your jurisdiction.

Information on how to prepare an (m)SDS and how to label containers of hazardous chemicals are provided in relevant codes of practice such as the *Preparation of Safety Data Sheets for Hazardous Chemicals—Code of Practice* and *Labelling of Workplace Hazardous Chemicals—Code of Practice*, respectively. These codes of practice are available from the Safe Work Australia website.

A review of the physical hazards of the chemical has not been undertaken as part of this assessment.

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