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NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME (NICNAS)

PUBLIC REPORT

Adiprene LF1700A

This Assessment has been compiled in accordance with the provisions of the *Industrial Chemicals (Notification and Assessment) Act 1989* (Cwlth) (the Act) and Regulations. This legislation is an Act of the Commonwealth of Australia. The National Industrial Chemicals Notification and Assessment Scheme (NICNAS) is administered by the Department of Health and Ageing, and conducts the risk assessment for public health and occupational health and safety. The assessment of environmental risk is conducted by the Department of Sustainability, Environment, Water, Population and Communities.

For the purposes of subsection 78(1) of the Act, this Public Report may be inspected at our NICNAS office by appointment only at Level 7, 260 Elizabeth Street, Surry Hills NSW 2010.

This Public Report is also available for viewing and downloading from the NICNAS website or available on request, free of charge, by contacting NICNAS. For requests and enquiries please contact the NICNAS Administration Coordinator at:

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Director
NICNAS

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SUMMARY

The following details will be published in the NICNAS *Chemical Gazette:*

ASSESSMENT REFERENCE	APPLICANT(S)	CHEMICAL OR TRADE NAME	HAZARDOUS SUBSTANCE	INTRODUCTION VOLUME	USE
LTD/1588	Chemtura Australia Pty Ltd	Adiprene LF1700A	Yes	≤100 tonnes per annum	A component of polyurethane articles for use in mining and industrial applications

CONCLUSIONS AND REGULATORY OBLIGATIONS

Hazard classification
Based on the presence of the isocyanate functional group in the notified polymer, the notified polymer is classified as hazardous according to the *Approved Criteria for Classifying Hazardous Substances* (NOHSC, 2004) with the following risk phrase:

Xn; R42 May cause sensitisation by inhalation.

The classification of the notified polymer using the Globally Harmonised System for the Classification and Labelling of Chemicals (GHS) (United Nations 2009) is presented below.

	Hazard category	***Hazard statement***
Respiratory sensitisation	1	May cause allergy or asthma symptoms or breathing difficulties if inhaled

Human health risk assessment
Under the conditions of the occupational settings described, the notified polymer is not considered to pose an unreasonable risk to the health of workers.

When used in the proposed manner, the notified polymer is not considered to pose an unreasonable risk to public health.

Environmental risk assessment
On the basis of the assumed low hazard of the cured form of the notified polymer and the assessed use pattern, the notified polymer is not considered to pose an unreasonable risk to the environment.

Recommendations

REGULATORY CONTROLS
Hazard Classification and Labelling

- Use the following risk phrases for products/mixtures containing the notified polymer:
  - Conc ≥ 1%: R42

HEALTH SURVEILLANCE

- As the notified polymer contains isocyanate functional groups, employers should carry out health surveillance for any worker who has been identified in the workplace risk assessment as having a history of isocyanate sensitivity, asthma or other pulmonary condition and who may be adversely affected by isocyanate exposure.

CONTROL MEASURES
Occupational Health and Safety

- Employers should implement the following engineering controls to minimise occupational exposure to the notified polymer:
  - Good general ventilation during curing including local exhaust ventilation if necessary.

- Employers should implement the following safe work practices to minimise occupational exposure during handling of the notified polymer:
  - Avoid contact with skin and eyes
  - Clean spills immediately, taking care to avoid inhalation

- Employers should ensure that the following personal protective equipment is used by workers to minimise occupational exposure to the notified polymer:
  - Organic vapour respirator if inhalation exposure is likely to occur
  - Isocyanate resistant gloves, coveralls and goggles

  Guidance in selection of personal protective equipment can be obtained from Australian, Australian/New Zealand or other approved standards.

- A short term exposure limit (STEL) of 0.07 mg/m^3 and long term time-weighted-average (TWA) exposure limit of 0.02 mg/m^3 applies for the airborne concentration of all isocyanates in the workplace [NOHSC: 1003(1995)]. Employers should ensure that this exposure standard for isocyanates is not exceeded for all areas of the adhesive application site.

- A copy of the MSDS should be easily accessible to employees.

- If products and mixtures containing the notified polymer are classified as hazardous to health in accordance with the *Approved Criteria for Classifying Hazardous Substances* [NOHSC:1008(2004)] workplace practices and control procedures consistent with provisions of State and Territory hazardous substances legislation must be in operation.

Disposal

- The notified polymer should be disposed of to landfill.

Storage

- The following precautions should be taken regarding storage of the notified polymer:
  - Check all containers against leakage
  - Store in a ventilated area.

Emergency procedures

- Spills or accidental release of the notified polymer should be handled by physical containment, collection and subsequent safe disposal.

Regulatory Obligations

Secondary Notification
This risk assessment is based on the information available at the time of notification. The Director may call for the reassessment of the chemical under secondary notification provisions based on changes in certain circumstances. Under Section 64 of the *Industrial Chemicals (Notification and Assessment) Act (1989)* the notifier, as well as any other importer or manufacturer of the notified chemical, have post-assessment regulatory obligations to notify NICNAS when any of these circumstances change. These obligations apply even when the notified polymer is listed on the Australian Inventory of Chemical Substances (AICS).

Therefore, the Director of NICNAS must be notified in writing within 28 days by the notifier, other importer or manufacturer:

(1) Under Section 64(1) of the Act; if
  - the polymer has a number-average molecular weight of less than 1000;

- products containing the notified polymer are to be sprayed.

or

(2) Under Section 64(2) of the Act; if
- the function or use of the polymer has changed from a component of polyurethane articles for use in mining and industrial applications, or is likely to change significantly;
- the amount of polymer being introduced has increased from 100 tonnes per annum, or is likely to increase, significantly;
- the polymer has begun to be manufactured in Australia;
- additional information has become available to the person as to an adverse effect of the polymer on occupational health and safety, public health, or the environment.

The Director will then decide whether a reassessment (i.e. a secondary notification and assessment) is required.

Material Safety Data Sheet
The MSDS of the notified polymer provided by the notifier was reviewed by NICNAS. The accuracy of the information on the MSDS remains the responsibility of the applicant.

ASSESSMENT DETAILS

1. APPLICANT AND NOTIFICATION DETAILS

APPLICANT(S)
Chemtura Australia Pty Ltd (ABN: 18 005 225 507)
Unit 302, 14 Lexington Drive,
BELLA VISTA NSW 2153

NOTIFICATION CATEGORY
Limited: Synthetic polymer with Mn ≥1000 Da.

EXEMPT INFORMATION (SECTION 75 OF THE ACT)
Data items and details claimed exempt from publication: chemical name, other names, CAS number, molecular and structural formulae, molecular weight, analytical data, polymer constituents, use details, import volume, and identity of recipients.

VARIATION OF DATA REQUIREMENTS (SECTION 24 OF THE ACT)
Variation to the schedule of data requirements is claimed as follows: Boiling Point, Water Solubility, Vapour Pressure, Hydrolysis as a function of pH, Partition Coefficient, Adsorption/Desorption, Dissociation Constant, Flammability Limits, Autoignition Temperature and Explosive Properties.

PREVIOUS NOTIFICATION IN AUSTRALIA BY APPLICANT(S)
None

NOTIFICATION IN OTHER COUNTRIES
United States (1982), Canada (2007), China (2005), Korea (1996), Taiwan (2010)

2. IDENTITY OF CHEMICAL

MARKETING NAME
Adiprene LF1700A

MOLECULAR WEIGHT
Mn >1,000 Da.

ANALYTICAL DATA
Reference IR and GPC spectra were provided.

3. COMPOSITION

DEGREE OF PURITY >99.9%

HAZARDOUS IMPURITIES/RESIDUAL MONOMERS

Chemical Name	Benzene, 1,3-diisocyanatomethyl-		
CAS No.	26471-62-5	*Weight %*	<0.1%
Hazardous Properties	T; R26 Xi; R36/37/38, R42/43, R52/53		

4. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE AT 20 °C AND 101.3 kPa: White wax-like solid

Property	Value	Data Source/Justification
Melting Point (Solidification Point)	30°C	Measured
Boiling Point	Not determined	Expected to decompose before boiling
Density	1,160 kg/m^3 at 70°C	Measured
Vapour Pressure	<1.3x10^{-9} kPa	Estimated based on NAMW >1000 Da. (US EPA, 2007)
Water Solubility	Not determined	Reacts with water to form carbon dioxide and insoluble high molecular weight polymers
Hydrolysis as a Function of pH	Not determined	Contains end-groups that readily react with water to form carbon dioxide and insoluble high molecular weight polymers. Also contains functionality that is expected to hydrolyse very slowly in the environmental pH range (4-9).
Partition Coefficient (n-octanol/water)	Not determined	Could not be determined as the notified polymer is expected to react with water and octanol. It is not expected to be bioavailable based on its high molecular weight.
Adsorption/Desorption	Not determined	Not tested due to hydrolytic instability. Likely to adsorb to sludge, soil and sediment due to its high molecular weight.
Dissociation Constant	Not determined	Does not contain any dissociable functionality
Particle Size	Not determined	Waxy solid
Viscosity	4800 cPs at 70°C	Measured
Flash Point	>204°C	Measured
Flammability	Not determined	Not expected to be flammable
Autoignition Temperature	Not determined	Not expected to autoignite under normal conditions of use, based on flashpoint
Explosive Properties	Not determined	Not expected to be explosive based on structure
Oxidising Properties	Not determined	Not expected to be oxidising based on structure

DISCUSSION OF PROPERTIES
For full details of tests on physical and chemical properties, refer to Appendix A.

Reactivity
The notified polymer is expected to be stable while stored in sealed vessels with no exposure to the atmosphere. On contact with water the isocyanate groups within the polymer will hydrolyse to an amine which will undergo crosslinking with other isocyanate groups within the polymer.

Dangerous Goods classification
Based on the submitted physical-chemical data in the above table the notified polymer is not classified according to the Australian Dangerous Goods Code (NTC, 2007). However, the data above do not address all Dangerous Goods endpoints. Therefore, consideration of all endpoints should be undertaken before a final decision on the Dangerous Goods classification is made by the introducer of the polymer.

5. INTRODUCTION AND USE INFORMATION

MODE OF INTRODUCTION OF NOTIFIED CHEMICAL (100%) OVER NEXT 5 YEARS
The notified polymer will be imported neat (>99% purity) in solid form as the product Adiprene LF1700A.

MAXIMUM INTRODUCTION VOLUME OF NOTIFIED CHEMICAL (100%) OVER NEXT 5 YEARS

Year	*1*	*2*	*3*	*4*	*5*
Tonnes	10-100	10-100	10-100	10-100	10-100

PORT OF ENTRY
Sydney

IDENTITY OF RECIPIENTS
Chemtura Australia Pty Ltd

TRANSPORTATION AND PACKAGING
The notified polymer will be imported neat (>99%) in 200 kg and 20 L steel containers by sea and transported by road to a warehouse in Sydney before being transported by road to end user sites in NSW, QLD, VIC and WA.

USE
The notified polymer will be used to form polyurethane articles for use in the mining and industrial sectors.

OPERATION DESCRIPTION
The notified polymer will be transported to industrial customers for moulding. Import containers of the notified polymer will be heated unopened at 60-80ºC for 16-24 hrs in an oven. The moulding process will vary between sites. At some sites, the notified polymer will be poured manually from the import containers into heated tanks before being automatically dosed into a mixing system where it is mixed manually with a curative. The heated mix containing the notified polymer will then be poured into heated moulds and cured in an oven.

At other sites, the notified polymer will be charged by vacuum into heated tanks before being automatically dosed into closed and automated mixing and moulding systems.

Once cured, the finished polyurethane articles will be removed from their moulds and distributed to end users in the mining and industrial sectors.

6. HUMAN HEALTH IMPLICATIONS

6.1. Exposure Assessment

6.1.1. Occupational Exposure

CATEGORY OF WORKERS

Category of Worker	*Exposure Duration (hours/day)*	*Exposure Frequency (days/year)*
Port	8	4
Warehouse	1	52
Transport	1	52
Moulding site	8	24

EXPOSURE DETAILS
Workers involved with transport and warehousing may come into dermal and ocular contact with the notified polymer through accidental leaks and spillages. These workers are expected to wear protective clothing and boots to minimise exposure.

Workers involved with moulding may experience dermal and ocular exposure to drips and spills of the notified polymer during transfer from import containers to tanks, charging of the mixer or during filling of moulds. The potential for exposure will be greatest where these processes are not carried out in automated and closed systems. These workers are expected to wear protective clothing, safety glasses and gloves to minimise dermal and ocular exposure.

Inhalation exposure to the notified polymer is not expected to be significant due to its estimated low vapour pressure ($<1.3x10^{-9}$ kPa). However, exhaust ventilation in areas where mixing and moulding is carried out would further minimise the potential for inhalation exposure.

Once moulded into polyurethane components, the notified polymer will be trapped in a high molecular weight polymer matrix and exposure is not anticipated.

6.1.2. Public Exposure
Neither the notified polymer nor products made using the notified polymer are expected to be available to the public. If the public experienced dermal contact with articles made using the notified polymer exposure would not be anticipated because it will be trapped in a high molecular weight polymer matrix.

6.2. Human Health Effects Assessment
No toxicity data were submitted.

The notified polymer is not expected to be absorbed across biological membranes to a significant extent, based on its high molecular weight (Mn > 1000 Da).

The notified polymer contains isocyanate functional groups that are of concern for irritation, dermal and respiratory sensitisation and pulmonary toxicity (Barratt 1994, US EPA 2010, Kirk-Othmer 1995).

The US EPA specifies that structures with isocyanate equivalent weights of ≥5,000 are presumed not to pose a hazard under any conditions. In addition, concerns are generally confined to species with molecular weights <1,000. The isocyanate functional group equivalent weight of the notified polymer is <5,000, however, its molecular weight is >1,000. The proportion of low molecular weight species present in the notified polymer is very low.

Polymeric isocyanates tend to be non-volatile and are therefore expected to be less of an inhalation hazard compared to non-polymeric isocyanates. However, polymeric isocyanate aerosols may cause respiratory sensitisation similar to monomer vapours, and reports have shown that inhalation of relatively non-volatile isocyanates in the form of dusts and spray-mists could cause adverse respiratory effects (HSIS, 2008). Isocyanates may also cause respiratory sensitisation by skin contact (US EPA, 2010).

Health hazard classification
According to the Approved Criteria (NOHSC 2004), substances containing isocyanate functional groups should be classified as hazardous if there is no evidence to indicate that the substance does not cause respiratory hypersensitivity. Thus, the following risk phrase should be applied to the notified polymer:

R42 May cause sensitisation by inhalation.

6.3. Human Health Risk Characterisation

6.3.1. Occupational Health and Safety
Toxicological data was not supplied for the notified polymer. On the basis of the presence of isocyanate functional groups, the notified polymer may cause irritation, dermal and respiratory sensitisation and pulmonary toxicity.

The potential for dermal and ocular exposure to the notified polymer is expected to be minimised given the use of PPE (including protective clothing, safety glasses and gloves) during manual handling of the notified

polymer (neat). In cases where automated and closed processes are in place to transfer the notified polymer through the various stages of heating, mixing, pouring into moulds and curing, the potential for exposure will be minimised further.

The potential for inhalation exposure to the notified polymer (neat) is expected to be minimised given the estimated low vapour pressure of the notified polymer $<1.3x10^{-9}$ kPa. However, exhaust ventilation should be implemented in areas where mixing and moulding is carried out to further minimise the potential for inhalation exposure which may lead to respiratory sensitisation even at low levels of exposure.

In summary, the risk to workers associated with exposure to the notified polymer is not considered unreasonable assuming that the stated engineering controls, safe work practices and appropriate PPE are used.

6.3.2. Public Health

The notified polymer (neat) will only be used at a limited number of industrial sites for forming moulds used in the mining and industrial sectors. On the basis that the public will not experience exposure to the notified polymer, the risk is not expected to be unreasonable.

7. ENVIRONMENTAL IMPLICATIONS

7.1. Environmental Exposure & Fate Assessment

7.1.1. Environmental Exposure

RELEASE OF CHEMICAL AT SITE

The notified polymer is not manufactured in Australia; therefore there are no releases from this activity. In the event of a spill during transport, distribution or storage the notified polymer should be treated with a decontaminating solution that promotes the reaction with water. The cured notified polymer should be collected and disposed of in accordance with local regulations. The imported product containing the notified polymer at >99% is solid at room temperature. The potential for aquatic exposure as a result of spills is low based on the physical form of the notified polymer.

RELEASE OF CHEMICAL FROM USE

The notified polymer is heated and mixed with curative agents immediately prior to moulding into articles in Australia. During the moulding processes, up to 0.1% of the import quantity of notified polymer is estimated to enter waste streams as a result of spills, with a further 0.5% remaining as residues in import containers. Notified polymer in these waste streams are expected to react with moisture to form solid inert polyureas which are expected to be disposed of to landfill. Any flashings or trimmings from moulded articles are likely to be disposed of to landfill. Release of the notified polymer to the aquatic environment is not expected as a result of the moulding process.

RELEASE OF CHEMICAL FROM DISPOSAL

The majority of the notified polymer will be irreversibly incorporated in the inert polyurethane matrix of cured articles that are expected to be disposed of to landfill at the end of their useful life.

7.1.2. Environmental Fate

The vast majority of the notified polymer will be incorporated into inert polyurethane articles. Any residues or wastes of the notified polymer are expected to have reacted with water in the atmosphere and/or waste stream to form an inert (solid) urea-capped polyether. The notified polymer is expected to be irreversibly incorporated within an inert polymer matrix of cured articles when disposed of to landfill. In this form it is not expected to be mobile or bioavailable. The notified polymer is not expected to be readily biodegradable but due to its high molecular weight it is not expected to bioaccumulate. It is expected to eventually degrade by biotic and abiotic processes in landfill to form water and oxides of carbon and nitrogen.

7.1.3. Predicted Environmental Concentration (PEC)

The notified polymer is not expected to persist in the aquatic compartment due to its hydrolytic instability. Further, it is not expected to be disposed of to the aquatic compartment in significant quantities based on the reported use and likely disposal pathway. Therefore, the predicted environmental concentration (PEC) was not calculated as very limited aquatic exposure is expected for the notified polymer or its hydrolysis products.

7.2. Environmental Effects Assessment

No ecotoxicological data were submitted. The notified polymer is not expected to persist in water due to its hydrolytic instability. It is expected to crosslink and solidify on reaction with water. In the unlikely event that the notified polymer is released to the aquatic compartment, it is not likely to be bioavailable. Therefore, the notified polymer is expected to be of low concern to the aquatic environment.

7.2.1. Predicted No-Effect Concentration

A predicted no-effect concentration (PNEC) was not calculated as low potential for aquatic exposure is expected, based on the reported use pattern.

7.3. Environmental Risk Assessment

The Risk Quotient, Q (= PEC/PNEC), has not been calculated since a PEC is not available.

The notified polymer will be used in the manufacturing of polyurethane articles. There is low potential for exposure to the aquatic environment from the reported use pattern. The majority of the notified polymer is expected to be irreversibly incorporated within an inert polymer matrix of manufactured articles. It is not expected to be mobile or bioavailable in this form. On the basis of the expected low hazard of the cured form of the notified polymer and assessed use pattern, the notified polymer is not expected to pose an unreasonable risk to the environment.

APPENDIX A: PHYSICAL AND CHEMICAL PROPERTIES

Melting Point (Solidification Point) 30°C

Method No details provided
Test Facility Chemtura Corporation (2011a)

Density 1,160 kg/m^3 at 70°C

Method Pycnometer method
Test Facility Chemtura Corporation (2011b)

Flash Point >204°C

Method Closed cup method
Test Facility Chemtura Corporation (2011c)

Viscosity 4800 cPs at 70°C
2100 cPs at 80°C
1000 cPs at 100°C

Method Brookfield viscometer
Test Facility Chemtura Corporation (2011d)

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