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**NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME
(NICNAS)**

PUBLIC REPORT

Polymer in Technomelt PUR 4663

This Assessment has been compiled in accordance with the provisions of the *Industrial Chemicals (Notification and Assessment) Act 1989* (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 conducts the risk assessment for public health and occupational health and safety. The assessment of environmental risk is conducted by the Department of the Environment and Energy.

This Public Report is 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:

Street Address:	Level 7, 260 Elizabeth Street, SURRY HILLS NSW 2010, AUSTRALIA.
Postal Address:	GPO Box 58, SYDNEY NSW 2001, AUSTRALIA.
TEL:	+ 61 2 8577 8800
FAX:	+ 61 2 8577 8888
Website:	www.nicnas.gov.au

**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 CHEMICAL	INTRODUCTION VOLUME	USE
LTD/2099	Henkel Australia Pty Ltd	Polymer in Technomelt PUR 4663	Yes	< 90 tonnes per annum	Component of industrial hot melt adhesives

CONCLUSIONS AND REGULATORY OBLIGATIONS

Hazard Classification

Based on the available information, the notified polymer is a hazardous chemical according to the *Globally Harmonised System of Classification and Labelling of Chemicals (GHS)*, as adopted for industrial chemicals in Australia. The hazard classification applicable to the notified polymer is presented in the following table.

<i>Hazard Classification</i>	<i>Hazard Statement</i>
Respiratory sensitisation (Category 1)	H334 – May cause allergy or asthma symptoms or breathing difficulties if inhaled

Human Health Risk Assessment

Provided that the recommended controls are being adhered to, 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 and the reported use pattern, the notified polymer is not considered to pose an unreasonable risk to the environment.

Recommendations

REGULATORY CONTROLS

Hazard Classification and Labelling

- The notified polymer should be classified as follows:
 - Respiratory sensitisation (Category 1): H334 – May cause allergy or asthma symptoms or breathing difficulties if inhaled

The above should be used for products/mixtures containing the notified polymer, if applicable, based on the concentration of the notified polymer present.

Health Surveillance

- As the notified polymer is a potential respiratory sensitiser, employers should carry out health surveillance for any worker who has been identified in the workplace risk assessment as having a significant risk of sensitisation.

CONTROL MEASURES

Occupational Health and Safety

- A person conducting a business or undertaking at a workplace should implement the following engineering controls to minimise occupational exposure to the notified polymer during application:
 - Enclosed/automated processes if possible
 - Ventilation system including local exhaust ventilation during application, and good general ventilation during curing
- A person conducting a business or undertaking at a workplace should implement the following safe work practices to minimise occupational exposure during handling of the notified polymer:
 - Avoid contact with skin and eyes
 - Avoid inhalation of vapours, mist or aerosols
- A person conducting a business or undertaking at a workplace should ensure that the following personal protective equipment is used by workers to minimise occupational exposure to the notified polymer during application and cleaning activities:
 - Impervious gloves
 - Protective clothing
 - Safety glasses or goggles
 - Respiratory protection if inhalation exposure may occur

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

- Atmospheric monitoring should be conducted to measure workplace concentrations of isocyanates during use of products containing the notified polymer. Employers should ensure that the exposure standard for isocyanates (SWA, 2018) is not exceeded for all areas where the notified polymer will be handled.
- A person conducting a business or undertaking at a workplace should follow the Safe Work Australia *Guide to Handling Isocyanates* (SWA, 2015) when handling products containing the notified polymer.
- A copy of the SDS should be easily accessible to employees.
- If products and mixtures containing the notified polymer are classified as hazardous to health in accordance with the *Globally Harmonised System of Classification and Labelling of Chemicals (GHS)* as adopted for industrial chemicals in Australia, workplace practices and control procedures consistent with provisions of State and Territory hazardous substances legislation should be in operation.

Storage

- The handling and storage of the notified polymer should be in accordance with the Safe Work Australia Code of Practice for *Managing Risks of Hazardous Chemicals in the Workplace* (SWA, 2012) or relevant State or Territory Code of Practice.

Emergency procedures

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

Disposal

- Where reuse or recycling are not appropriate, dispose of the notified polymer in an environmentally sound manner in accordance with relevant Commonwealth, state, territory and local government legislation.

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 g/mol;
 - adhesive products containing the notified polymer become available to the public;
 - adhesive products containing the notified polymer become available for use in food packaging applications.

or

- (2) Under Section 64(2) of the Act; if
 - the function or use of the polymer has changed from component of industrial hot melt adhesive or is likely to change significantly;
 - the amount of polymer being introduced has increased, 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.

Safety Data Sheet

The SDS of the product containing the notified polymer provided by the notifier was reviewed by NICNAS. The accuracy of the information on the SDS remains the responsibility of the applicant.

ASSESSMENT DETAILS

1. APPLICANT AND NOTIFICATION DETAILS

APPLICANT(S)

Henkel Australia Pty Ltd (ABN: 82 001 302 996)
135 – 141 Canterbury Road
KILSYTH VIC 3137

NOTIFICATION CATEGORY

Limited: Synthetic polymer with $M_n \geq 1,000$ g/mol

EXEMPT INFORMATION (SECTION 75 OF THE ACT)

Data items and details exempt from publication include: chemical name, other names, CAS number, molecular and structural formulae, molecular weight, analytical data, degree of purity, polymer constituents, residual monomers, impurities and additives/adjuvants.

VARIATION OF DATA REQUIREMENTS (SECTION 24 OF THE ACT)

Schedule data requirements are varied for all physical and chemical properties.

PREVIOUS NOTIFICATION IN AUSTRALIA BY APPLICANT(S)

None

NOTIFICATION IN OTHER COUNTRIES

None

2. IDENTITY OF CHEMICAL

MARKETING NAMES

Technomelt PUR 4663 (product containing the notified polymer at > 95% concentration)
PURMELT QR 4663 (product containing the notified polymer at > 95% concentration)

MOLECULAR WEIGHT

Number average molecular weight (M_n) is > 1,000 g/mol.

ANALYTICAL DATA

Reference FTIR and GPC spectra were provided.

3. COMPOSITION

DEGREE OF PURITY

> 95%

4. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE AT 20 °C AND 101.3 kPa: Solid, off-white colour

<i>Property</i>	<i>Value</i>	<i>Data Source/Justification</i>
Melting Point*	100 °C	Measured (report unavailable)
Boiling Point	Not determined	Expected to decompose prior to boiling
Density*	1,050 kg/m ³ at 20 °C	SDS
Vapour Pressure	Not determined	Expected to be low based on high molecular weight
Water Solubility	Not determined	Reacts with water to form insoluble, crosslinked polymers
Hydrolysis as a Function of pH	Not determined	Contains readily hydrolysable functional groups (isocyanates, carbamates) and is expected to hydrolyse in contact with water
Partition Coefficient (n-octanol/water)	Not determined	Not applicable due to hydrolytic instability

Property	Value	Data Source/Justification
Adsorption/Desorption	Not determined	Expected to strongly adsorb to soils and sediments through Van der Waals interactions
Dissociation Constant	Not determined	Contains dissociable functional groups (carboxylic acids) and is expected to be anionic in the environmental pH range (pH 4 to 9)
Particle Size	Not determined	Introduced as solid blocks
Flash Point*	> 162 °C (open cup)	SDS
Flammability	Not determined	Not expected to be highly flammable
Autoignition Temperature	Not determined	Not expected to autoignite at ambient temperature
Explosive Properties	Not determined	Not expected to have explosive properties based on chemical structure
Oxidising Properties	Not determined	Not expected to have oxidative properties based on chemical structure

* Properties of the product containing the notified polymer at > 95% concentration

DISCUSSION OF PROPERTIES

Reactivity

The notified polymer is expected to be stable under normal conditions.

The notified polymer contains reactive isocyanate groups that react readily with moisture and other organic nucleophiles to form polyurethanes. The hot melt adhesive product containing the notified polymer (at > 95% concentration) should be kept away from open flames, alcohols, amines, strong acids and oxidants.

When heated to decomposition, the product containing the notified polymer will emit hazardous fumes including oxides of carbon and nitrogen, isocyanates, and hydrogen cyanide.

Physical Hazard Classification

Based on the submitted physico-chemical data depicted in the above table, the notified polymer is not recommended for hazard classification according to the *Globally Harmonised System of Classification and Labelling of Chemicals (GHS)*, as adopted for industrial chemicals in Australia.

5. INTRODUCTION AND USE INFORMATION

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

The notified polymer will not be manufactured in Australia. It will be imported at > 95% concentration as a component of a polyurethane based, moisture curing hot melt adhesive.

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

<i>Year</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>Tonnes</i>	< 50	< 70	< 70	< 90	< 90

PORT OF ENTRY

Melbourne and Sydney

TRANSPORTATION AND PACKAGING

The hot melt adhesive containing the notified polymer will be packaged in aluminium laminated flexible peelable bags. The bags will then be packed into steel pails containing 20 kg or open head steel drums containing 190 kg. The adhesive will be imported by sea transport and transferred to various warehouses by road.

USE

The notified polymer is for industrial use only. The notified polymer will not be available to the public. The notified polymer will be used at > 95% concentration as a component of a polyurethane reactive hot melt adhesive for use in surface and assembly bonding in lamination, general assembly bonding, assembly bonding of wooden parts, and gluing of textiles and plastics.

OPERATION DESCRIPTION

There will be no reformulation or repackaging in Australia related to products containing the notified polymer. At end-use sites, the import containers will be placed directly into a bulk melter unit after removing the lids and sealing films. The bulk melter unit will heat the product containing the notified polymer to the set temperature and dose heated rollers which apply the melted adhesive to the substrate. The material to be bonded will be applied manually onto the glued substrate and the assembly will then go through a roller process to secure the pieces together. Pressure will be applied until the adhesive is cooled. Curing process will continue for a few days. The notifier stated that the melter unit and the application rollers will have mechanical fume extraction where fumes will be ducted away from work areas and workers.

6. HUMAN HEALTH IMPLICATIONS

6.1. Exposure Assessment

6.1.1. Occupational Exposure

CATEGORY OF WORKERS

<i>Category of Worker</i>	<i>Exposure Duration (hours/day)</i>	<i>Exposure Frequency (days/year)</i>
Warehouse	0.5	15
Transport	4	4 - 10
Process Workers	0.25 - 2	150 - 240
Disposal Workers	< 1	1 - 10

EXPOSURE DETAILS

Transport and Storage

Transport and storage workers are not expected to be exposed to the notified polymer except in the unlikely event of an accident.

Application

Dermal or ocular exposure to the notified polymer at > 95% concentration may occur when opening the containers and application of the adhesive containing the notified polymer. Inhalation exposure to hazardous fumes may occur when the adhesive is heated to melt. According to the notifier, worker exposure will be minimised by the use of PPE including gloves, safety glasses or face shield, coveralls and respirators if necessary. The notifier also stated that the application process will be conducted under appropriate fume extraction equipment which will minimise fume generation and accumulation from heating the adhesive.

Workers may also be exposed to residues of the adhesive containing the notified polymer during cleaning and maintenance of application equipment. According to the notifier, worker exposure will be minimised by the use of PPE including gloves, safety glasses or face shield, coveralls, and respiratory protection if necessary.

6.1.2. Public Exposure

The adhesive containing the notified polymer is intended for industrial use only and will not be available to the public. Once the adhesive is cured, the notified polymer will be reacted into the adhesive polymeric matrix and will not be available for exposure from articles treated with the notified polymer.

6.2. Human Health Effects Assessment

No toxicity data were submitted.

No information on the toxicokinetics of the notified polymer was provided. For dermal absorption, molecular weights below 500 g/mol are favourable for absorption and molecular weights above 1,000 g/mol do not favour absorption (ECHA, 2017). Absorption of the notified polymer through the skin, gastrointestinal tract and respiratory tract is not expected to occur to a significant extent based on its high molecular weight (> 1,000 g/mol). The notified polymer contains a relatively low percentage (< 3%) of low molecular weight species (< 500 g/mol) that may be absorbed. If absorbed, the notified polymer may be metabolised in the body to eventually form carbon dioxide and urea.

The notified polymer contains isocyanate functional groups that are of concern for irritation, dermal and respiratory sensitisation, and pulmonary toxicity (Barrett 1994, US EPA 2010, Kirk-Othmer 1995). The USEPA specifies that structures with isocyanate equivalent weights of $\geq 5,000$ g/mol are presumed not to pose a hazard under any

conditions. In addition, concerns are generally confined to species with molecular weights < 1,000 g/mol which the notified polymer may contain a proportion at < 5%. However, the notified polymer may contain excessive amount of isocyanate functional groups for crosslinking purposes during end use and therefore the risks for irritation, dermal and respiratory sensitisation, and pulmonary toxicity cannot be ruled out.

Polymeric isocyanates tend to be non-volatile and are therefore expected to be less of an inhalation hazard compared to non-polymeric isocyanates. However, based on the proposed end use scenarios the notified polymer may generate fumes when it is heated. Air-borne polymeric isocyanate 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 (HCIS, 2008). Isocyanates may also cause respiratory sensitisation by skin contact (US EPA, 2010).

Considering respiratory sensitisation is possible from polymeric isocyanates, the notified polymer warrants hazard classification for respiratory sensitisation.

Due to the presence of benzene, 1,1'-methylenebis[4-isocyanato (MDI) in the notified polymer, the notifier provided following hazard statements in the SDS for the notified polymer:

- H317 – May cause an allergic skin reaction
- H334 – May cause allergy or asthma symptoms or breathing difficulties if inhaled
- H351 – Suspected of causing cancer
- H373 – May cause damage to organs through prolonged or repeated exposure

Health Hazard Classification

Based on the available information, the notified polymer is a hazardous chemical according to the *Globally Harmonised System of Classification and Labelling of Chemicals (GHS)*, as adopted for industrial chemicals in Australia. The hazard classification applicable to the notified polymer is presented in the following table.

Hazard Classification	Hazard Statement
Respiratory sensitisation (Category 1)	H334 – May cause allergy or asthma symptoms or breathing difficulties if inhaled

According to the Safe Work Australia *Guide to Handling Isocyanates* (SWA 2015), products containing isocyanates must be labelled with:

- H317 – May cause an allergic skin reaction
- H334 – May cause allergy or asthma symptoms or breathing difficulties if inhaled
- H319 – Causes serious eye irritation
- H315 – Causes skin irritation
- H335 – May cause respiratory irritation
- H351 – Suspected of causing cancer

Polymeric isocyanates may still be toxic even when they do not contain free isocyanate monomers.

6.3. Human Health Risk Characterisation

6.3.1. Occupational Health and Safety

The notified polymer contains isocyanate functional groups that are of concern for eye and skin irritation, skin and respiratory sensitisation and pulmonary toxicity. Dermal and ocular exposure to the notified polymer at > 95% concentration during transfer and application of the adhesive is expected to be limited by the use of PPE. Due to the expected low volatility of the notified polymer and given the expected use of appropriate extractive equipment when heating the adhesive such as exhaust ventilation, inhalation exposure is anticipated to be minimal.

Provided that the recommended controls are being adhered to, under the conditions of the occupational settings described, the notified polymer is not considered to pose an unreasonable risk to the health of workers.

6.3.2. Public Health

The notified polymer is intended for use in industrial applications only. The public may be exposed to products manufactured using the adhesive containing the notified polymer. Once the adhesive is cooled and cured, the notified polymer will be reacted into a polymeric matrix and will not be available for exposure.

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

7. ENVIRONMENTAL IMPLICATIONS

7.1. Environmental Exposure & Fate Assessment

7.1.1. Environmental Exposure

RELEASE OF CHEMICAL AT SITE

The notified polymer will be imported into Australia as a component of a moisture-curing hotmelt adhesive; no reformulation or repackaging will occur in Australia. Adhesive containing the notified polymer is solid at ambient temperature. Therefore, spills or accidental release of the adhesive containing the notified polymer during import, storage, and transport are expected to be physically collected and disposed of to landfill in accordance with local government regulations.

RELEASE OF CHEMICAL FROM USE

Solid adhesive containing the notified polymer will be added directly to a bulk melter unit in industrial settings (with no DIY use). The melter unit will heat the adhesive and heated rollers will apply the molten adhesive directly to the substrate. The material to be bonded to the substrate will be applied onto the glued substrate and pressure will be applied as the adhesive cools and cures (crosslinks). Minimal release is expected during this process. Any adhesive which is released by spillage will cure upon exposure to air to form a crosslinked polymer which will not be water soluble or bioavailable. This solid waste is expected to be collected and disposed of to landfill.

RELEASE OF CHEMICAL FROM DISPOSAL

Most of the notified polymer is expected to share the fate of the articles to which it has been applied and be disposed of to landfill at the end of their useful lives. Residual notified polymer in empty end-use containers is expected to be cured into an insoluble solid matrix and be disposed of to landfill along with the empty containers.

7.1.2. Environmental Fate

No environmental fate data were submitted. Based on its reported use pattern, most of the notified polymer is expected to share the fate of the substrates/articles to which it has been applied and be disposed of to landfill. The notified polymer will be irreversibly crosslinked into a solid polymer matrix as part of its normal use pattern and is therefore not expected to be mobile or bioavailable. In landfill, the notified polymer is expected to eventually degrade via biotic and abiotic processes to form water and oxides of carbon and nitrogen.

7.1.3. Predicted Environmental Concentration (PEC)

The predicted environmental concentration (PEC) has not been calculated as release of the notified polymer to the aquatic environment will be limited based on the reported use pattern.

7.2. Environmental Effects Assessment

No ecotoxicity data were submitted. The notified polymer contains dissociable functional groups (carboxylic acids) which are expected to be deprotonated (anionic) in the aquatic environmental pH range (4 to 9). Anionic polymers are generally of low toxicity to fish and daphnia. However they are known to be moderately toxic to algae. The mode of toxic action is over-chelation of nutrient elements needed by algae for growth. The highest toxicity occurs when the acid is on alternating carbons of the polymer backbone, leading to chelation of essential nutrients (Boethling & Nabholz, 1997). However, this does not apply to the notified polymer and it is therefore not considered to be an over-chelation hazard to algae. Based on the available information, the notified polymer is assumed to be of low hazard to the environment.

7.2.1. Predicted No-Effect Concentration

The Predicted No-Effect Concentration (PNEC) has not been calculated as no significant release of the notified polymer to the aquatic environment is expected based on the reported use pattern.

7.3. Environmental Risk Assessment

The Risk Quotient (PEC/PNEC) for the aquatic compartment has not been calculated as release of the notified polymer to the aquatic environment will be limited.

The majority of the notified polymer will be disposed of to landfill as a cured polymer matrix along with the articles to which it has been applied. In landfill, the notified polymer is bound to these articles and is unlikely to be bioavailable or mobile. On the basis of the assessed use pattern, the notified polymer is not considered to pose an unreasonable risk to the environment.

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