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NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME (NICNAS)

FULL PUBLIC REPORT

Polymer in Acrylic Polymer 4245J

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FULL PUBLIC REPORT

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1. APPLICANT AND NOTIFICATION DETAILS

APPLICANT(S)
Orica Ltd (ABN 24 004 145 868)
1970 Princes Highway
Clayton, Victoria 3168.

NOTIFICATION CATEGORY
Limited: Polymer with NAMW ≥ 1000 (greater than 1 tonne per year).

EXEMPT INFORMATION (SECTION 75 OF THE ACT)
Data items and details claimed exempt from publication:
Chemical name
CAS number
Molecular formula
Structural formula
Polymer constituents
Details of use
Introduction volume
Molecular weight
Purity and identity of impurities

VARIATION OF DATA REQUIREMENTS (SECTION 24 OF THE ACT)
No variation to the schedule of data requirements is claimed.

PREVIOUS NOTIFICATION IN AUSTRALIA BY APPLICANT(S)
None

NOTIFICATION IN OTHER COUNTRIES
None

2. IDENTITY OF CHEMICAL

MARKETING NAME(S)
Polymer in Acrylic Polymer 4245J

METHODS OF DETECTION AND DETERMINATION

METHOD	The notified polymer can be characterised by IR spectroscopy. A reference spectrum was provided.
TEST FACILITY	Dulux R&D facility, Clayton, Melbourne (2005).

3. COMPOSITION

DEGREE OF PURITY
> 98%

HAZARDOUS IMPURITIES/RESIDUAL MONOMERS
All hazardous impurities and residual monomers are present at below the relevant cut offs for classification of the notified polymer solution as a hazardous substance.

DEGRADATION PRODUCTS
The hydrolysis of the acrylate units will yield a poly(acrylic acid) and an alcohol. Other functional groups in the polymer lead to non-volatile by-products upon reaction with strong base, which are not expected to have adverse health effects.

LOSS OF MONOMERS, OTHER REACTANTS, ADDITIVES, IMPURITIES
The polymer solution contains a small amount of residual monomer, which may be lost as a vapour.

4. INTRODUCTION AND USE INFORMATION

MODE OF INTRODUCTION OF NOTIFIED CHEMICAL (100%) OVER NEXT 5 YEARS
The notified polymer will be manufactured as a < 30% solution in propylene glycol.

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

Year	*1*	*2*	*3*	*4*	*5*
Tonnes	3–10	10–30	10–30	10–30	30–100

USE
The chemical will be used as an additive in the manufacture of waterborne latex. The preferred level is 0.5–5 wt%.

5. PROCESS AND RELEASE INFORMATION

5.1. Distribution, transport and storage

PORT OF ENTRY
The notified polymer will not be imported.

IDENTITY OF MANUFACTURER/RECIPIENTS
The notified polymer will be manufactured in Melbourne, Victoria and transported to latex manufacturing plants in north-eastern Victoria and south-eastern Queensland.

TRANSPORTATION AND PACKAGING
The material will be stored in 200 litre drums or 1000 litre pallecons (bulk containers) and transported by road freight. The likely quantity transported will be approximately 3–10 tonnes of < 30% solution.
The chemical will be stored in outside bunded storage areas at either the site of manufacture or site of use. It is not expected that the chemical will be stored for lengthy periods of time.

5.2. Operation description

Overview of processes involved:

Polymer manufacture ► Filling & reactor cleaning

► Transport to latex manufacturer ► Use in latex preparation

(a) Manufacture of Acrylic Polymer 4245J

The reactants are charged to a batch reactor and heated in order to manufacture the notified polymer. The raw materials are added as solids or pumped in as liquids from 200 L drums. All raw materials are added to the reactor under local exhaust ventilation via a manhole cover at the top of the reactor. The reactor is equipped with an agitator and a chilled water condenser. Temperature control is achieved by application of steam or chilled water to a jacket surrounding the reactor. This process will produce Acrylic Polymer 4245J as a < 30% solution in propylene glycol.

(b) Filling and reactor cleaning

Once the reaction is complete the polymer solution is cooled and 200 L steel drums or 1000 L pallecons/bulk containers are filled at a filling station. Workers connect a hose from the reactor, open valves and supervise filling of drums/bulk containers. Once packed in drums/bulk containers the polymer solution is transported to the site of latex manufacture. The time taken from the start of the process to the end of the filling step is approximately 10 hours.

The reactor is then cleaned by washing the reactor walls with sodium hydroxide solution. These washings, along with any accidental spillages on site, will be stored in containers and passed on to a Waste Management Authority for disposal (such as by incineration).

(c) Latex manufacture

In a typical procedure a 5000 L batch reactor will be used for the manufacture of the latex via emulsion polymerisation at approximately 80°C. Acrylic Polymer 4245J will be included as an additive in the latex manufacturing process. Once the latex has been made there will be no notified polymer remaining as it will have become irreversibly incorporated into the polymer latex. The total process time for latex manufacture is approximately 8 hours.

5.3. Occupational exposure

Number and Category of Workers

Category of Worker	*Number*	*Exposure Duration*	*Exposure Frequency*
Manufacture:			
Reactor operator	1	10 hours/day	20 days/year
Maintenance personnel	1	1-2 hours/day	20 days/year
Laboratory personnel	1	2 hours/day	20 days/year
Transport personnel	2	5 hours/day	20 days/year
Use in latex manufacture:			
Reactor operator	1	1 hour/day	20 days/year

Exposure Details

Dermal and ocular exposure may potentially occur during certain processes involving the notified polymer, including sampling and analysis, packing out and reactor cleaning. However, exposure to significant amounts of the notified polymer will be limited due to the engineering controls (local exhaust ventilation) used and personal protective equipment (gloves, coveralls and safety glasses) worn by workers. Inhalation exposure is unlikely due to the low volatility of the notified polymer.

Less than 1% of residual hazardous monomer is present in this mixture. While this mixture is not classified as hazardous it will have a strong odour. Inhalation, dermal and ocular exposure to the hazardous residual monomer could occur during transfer or sampling and analysis of the notified polymer. These processes are expected to take place in well ventilated areas or in the presence of local exhaust ventilation (LEV). The workers exposed are expected to wear PPE including goggles, gloves and coveralls.

5.4. Release

RELEASE OF CHEMICAL AT SITE

During manufacture of the polymer, the sources of release are process equipment (including reactors and hoses) cleaning and spills during material handling and transfer to drums/bulk containers. These would account for up to 2% of the manufactured volume of notified polymer annually. Less than 1% will remain in the drums/bulk containers when they are emptied into the latex reactor vessels. The washings from the polymer manufacture equipment and the empty containers (with any residual polymer) will be disposed of via a licensed waste contractor, who will dispose of the material either by incineration or to landfill after treatment.

RELEASE OF CHEMICAL FROM USE

Once the latex has been formed the notified polymer will be fully incorporated so it will not be available for release. Therefore there will be no release of the notified polymer from any formulations or products that use the latex.

5.5. Disposal

Wastes, containing the notified polymer generated during polymer manufacture will be disposed of either by incineration or landfill via licensed waste contractors.

It is likely that the formulations or products using the latex will ultimately be disposed of to landfill at the end of their useful life.

5.6. Public exposure

The notified polymer is intended only for use in industry. During the latex manufacture the notified polymer is irreversibly reacted into the latex, so that there will be no public exposure to the notified polymer during use of the latex products.

6. PHYSICAL AND CHEMICAL PROPERTIES

Appearance at 20°C and 101.3 kPa Yellow oily solid (expected)
NB: The solid polymer is never isolated and is always used as a < 30% solution in propylene glycol. This solution has a clear yellow appearance.

Melting Point/Freezing Point T_g –27°C (calculated glass transition temperature)

METHOD The above value is the calculated T_g using the Fox–Flory equation.

Boiling Point

Remarks Not determined. The notified polymer is never isolated from the manufacturing solution.

Density 1095 kg/m^3 at 20°C

METHOD A specific gravity flask was used to obtain the weight of a known volume (25.146 mL at 20.2°C) of the < 30% solution of the polymer in propylene glycol. Based on the density of propylene glycol the density of the neat polymer was then calculated.
TEST FACILITY Dulux (2005a).

Vapour Pressure Not determined

Remarks The notified polymer is never isolated from the manufacturing solution. Based on the high molecular weight of the polymer the vapour pressure is expected to be low.

Water Solubility < 0.0045 g/L at 20°C

METHOD In-house method.
Remarks 30 mg of a < 30% solution in propylene glycol was added to 2 L water. After 3 days stirring insoluble material was still present.
TEST FACILITY Dulux (2005b).

Hydrolysis as a Function of pH Not determined

Remarks The polymer is insoluble in water. It is unlikely to hydrolyse under normal environmental conditions.

Partition Coefficient (n-octanol/water) Not determined

Remarks The polymer is insoluble in water. Due to its low water solubility, the notified polymer would be expected to stay primarily in the organic phase.

Adsorption/Desorption Not determined

Remarks The polymer is insoluble in water. Its low water solubility suggests that it would have high affinity for the organic component of soils and sediments. It is therefore not expected to be mobile in these media.

Dissociation Constant Not determined

Remarks The polymer is insoluble in water. The polymer does contain a functional group which has the potential to dissociate, but only weakly in water.

Particle Size Not determined

Remarks The polymer is never isolated from solution and doesn't form discrete particles in propylene glycol.

Flash Point Not determined

Remarks The notified polymer is never isolated from the manufacturing solution. Based on the expected low volatility of the polymer, the notified polymer is not expected to form a flammable air/vapour mixture.

Flammability Limits Not determined

Remarks The notified polymer is never isolated from the manufacturing solution. Based on the expected low volatility of the polymer it would also be expected to have limited flammability.

Autoignition Temperature Not determined

Remarks The notified polymer is never isolated from the manufacturing solution. The notified polymer is not expected to autoignite under normal conditions of use.

Explosive Properties

Remarks Expected to be stable under normal conditions of use. The notified polymer contains no functional groups that would infer explosive properties.

Reactivity

Remarks The polymer is stable under normal environmental and operating conditions. It will react with strong bases, as is the case for acrylic acid-based polymers.

7. TOXICOLOGICAL INVESTIGATIONS

No toxicity data were submitted.

8. ENVIRONMENT

8.1. Environmental fate

No environmental fate data were submitted.

8.2. Ecotoxicological investigations

No ecotoxicity data were submitted.

9. RISK ASSESSMENT

9.1. Environment

9.1.1. Environment – exposure assessment

Up to 3% of the manufactured notified polymer could be released during manufacture, storage, handling and as residuals in empty containers. Spilt material will be contained and collected, placed into sealable containers and stored for disposal by a licensed waste contractor to landfill. The equipment cleaning effluent and empty containers containing the notified polymer will be disposed of by licensed waste contractors, either by incineration or to landfill. Incineration of the notified polymer would generate water and oxides of carbon and sulphur.

The notified polymer is insoluble in water and as such should not be mobile in either aquatic or terrestrial compartments. Therefore in landfill, the notified polymer will associate with soil and sediment and slowly degrade through biological and abiotic processes.

9.1.2. Environment – effects assessment

No ecotoxicity data were provided. However, the notified polymer has a high molecular weight and is unlikely to be released to the aquatic compartment, suggesting that its potential for bioaccumulation is low.

9.1.3. Environment – risk characterisation

A risk quotient cannot be estimated. However, due to the limited environmental release and exposure, the risk associated with the manufacture and use of the notified polymer is expected to be low.

9.2. Human health

9.2.1. Occupational health and safety – exposure assessment

Dermal or ocular exposure to the notified polymer during manufacturing processes, such as sampling and analysis, packing out and reactor cleaning, is expected to be low due to the engineering controls and personal protective equipment in use. Inhalation of the notified polymer is unlikely due to its expected high vapour pressure.

9.2.2. Public health – exposure assessment

The exposure of the public during polymer manufacture and use is expected to be negligible.

9.2.3. Human health – effects assessment

No toxicological data have been provided for the notified polymer and therefore the substance cannot be classified in accordance with the NOHSC *Approved Criteria for Classifying Hazardous Substances* (NOHSC, 2004).

The notified polymer contains a high concern functional group, which is structurally related to a functional group that is a structural alert for sensitisation (Barratt, 1994). The notified polymer has a molecular weight > 1000 and only a small percentage of low molecular weight species, which would reduce the possibility of its being absorbed across biological membranes, and therefore the hazard is expected to be low. Systemic toxicity is also unlikely based on the

expected low absorption. Based on the experiences of the notifier in handling the polymer it is not expected to be a skin or eye irritant, however slight skin and eye irritation cannot be ruled out.

The notified polymer contains a residual monomer that is classified as a sensitiser and irritant, however this is present at less than 1% in the mixture introduced.

9.2.4. Occupational health and safety – risk characterisation

The notified polymer is expected to be of low toxicity due to the high molecular weight and small percentage of low molecular weight species, however irritation and sensitisation effects have not been ruled out. The exposure is expected to be low due to the engineering controls and PPE in use. Due to this expected low exposure, as well as the expected low toxicity, the risk to occupational health and safety is considered to be low. As a precaution workers should wear appropriate PPE due to the potential for irritation and sensitisation effects.

9.2.5. Public health – risk characterisation

The exposure of the public to the polymer is expected to be negligible; therefore the risk to public health is negligible.

10. CONCLUSIONS – ASSESSMENT LEVEL OF CONCERN FOR THE ENVIRONMENT AND HUMANS

10.1. Hazard classification

No toxicological data have been provided for the notified polymer and therefore the substance cannot be classified in accordance with the NOHSC *Approved Criteria for Classifying Hazardous Substances* (NOHSC, 2004)

and

Classification of notified polymer using the Globally Harmonised System for the Classification and Labelling of Chemicals (GHS) (United Nations 2003) cannot be undertaken as no toxicological or ecotoxicological data were available. This system is not mandated in Australia and carries no legal status but is presented for information purposes.

10.2. Environmental risk assessment

The chemical is not considered to pose a risk to the environment based on its reported use pattern.

10.3. Human health risk assessment

10.3.1. Occupational health and safety

There is Low Concern to occupational health and safety under the conditions of the occupational settings described.

10.3.2. Public health

There is Negligible Concern to public health when used in the proposed manner.

11. MATERIAL SAFETY DATA SHEET

11.1. Material Safety Data Sheet

The MSDS of the notified chemical provided by the notifier was in accordance with the NOHSC *National Code of Practice for the Preparation of Material Safety Data Sheets* (NOHSC 2003). It is published here as a matter of public record. The accuracy of the information on the MSDS remains the responsibility of the applicant.

11.2. Label

The label for the notified chemical provided by the notifier was in accordance with the NOHSC *National Code of Practice for the Labelling of Workplace Substances* (NOHSC 1994). The accuracy of the information on the label remains the responsibility of the applicant.

12. RECOMMENDATIONS

CONTROL MEASURES

Occupational Health and Safety

- Employers should implement the following safe work practices to minimise occupational exposure during handling of the notified polymer as introduced:
  - Avoid skin and eye contact

- Employers should ensure that the following personal protective equipment is used by workers to minimise occupational exposure to the notified polymer as introduced:
  - Chemical resistant gloves
  - Protective clothing
  - Safety goggles

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

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

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

Environment

- The following control measures should be implemented by the manufacturer to minimise environmental exposure during manufacture of the notified polymer:

  - Handle only in sealed (eg cemented) areas which are bunded and with no access to storm drains or watercourses.

Disposal

- The notified polymer should be disposed of by release to landfill and incineration.

Emergency procedures

- Spills/release of the notified polymer should be handled by containment, and adsorption with material such as sand. Contaminated material (including sand) should then be collected, placed into sealable labelled container and disposed of to landfill. Do not allow notified polymer to enter drains or watercourses.

12.1. Secondary notification

The Director of Chemicals Notification and Assessment must be notified in writing within 28 days by the notifier, other importer or manufacturer:

(1) Under Section 64(2) of the Act:

– if any of the circumstances listed in the subsection arise.

The Director will then decide whether secondary notification is required.

No additional secondary notification conditions are stipulated.

13. BIBLIOGRAPHY

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