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NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

Polymer in Neorez R9699

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Director
Chemicals Notification and Assessment

FULL PUBLIC REPORT

Polymer in Neorez R9699

1. APPLICANT

Orica Australia Pty Ltd of 1 Nicholson Street MELBOURNE VIC 3000 has submitted a notification statement in support of their application for an assessment of a synthetic polymer of low concern, 'Polymer in Neorez R9699'.

2. IDENTITY OF THE CHEMICAL

The following requests for exempt information were accepted:

chemical name;
molecular and structural formulae;
polymer composition; and
residual monomers.

Other Names:	Polyester Polyurethane Acrylic Graft Copolymer; Neorez R9699 (40% dispersion in water)
Chemical Abstracts Service (CAS) Registry No.:	not assigned
Number-Average Molecular Weight (NAMW):	94 407
Weight-Average Molecular Weight (WAMW):	387 680
Maximum Percentage of Low Molecular Weight Species	
Molecular Weight < 500:	0%
Molecular Weight < 1 000:	0%
Polydispersity:	4.11
Charge Density	primarily anionic
Method of Detection	infrared (IR) spectrum

and Determination:

Spectral Data:	data from IR spectrum have been provided for the polymer

3. PHYSICAL AND CHEMICAL PROPERTIES

Appearance at 20°C and 101.3 kPa:	milky white, see comments below
Boiling Point:	not applicable
Specific Gravity:	1.15; 1.06 (product), see comments below
Hydrolysis:	no data, see comments below
Charge Density:	contains cationic and anionic groups, see comments below
Water Solubility:	< 1 mg/L at 25°C
Particle Size Distribution:	not applicable
Flammability Limits:	not applicable
Autoignition Temperature:	not applicable
Explosive Properties:	polymer is stable and does not have explosive properties
Reactivity/Stability:	stable, see comments below

Comments on Physico-Chemical Properties

The data provided for the notified polymer satisfies the criteria of Regulation 4A of the Industrial Chemicals (Notification and Assessment) Regulations for the notification category of Synthetic Polymer of Low Concern.

The polymer is supplied as a dispersion in water which is stabilised by the negatively charged carboxylate groups which terminate the polyurethane backbone, and by the possible presence of surfactants. The high molecular weight of the polymer particles indicates low water solubility. The notifier indicates that water solubility is < 1 mg/L. While no water solubility study was submitted, it is accepted that the true water solubility will be low.

The notifier indicates that the stability of the emulsion is pH dependant, and that at pH <5 the emulsion forms a gel. This is presumably due to destabilisation resulting from protonation of the terminal carboxylate functionalities.

The notified polymer is designed to be chemically and environmentally inert having a high molecular weight. While the new polymer appears to contain pendant ester linkages which may be inherently susceptible to hydrolytic cleavage, the polymer will be intimately bound into a cured resin matrix in the paint. This will preclude contact between the potentially reactive functionalities and water (as well as other reactants in the environment), and hence the possibility for hydrolysis or other reactions would be extremely small.

The polymer carries negative charges resulting from the terminal carboxylate groups on the polurethane polyester backbone. The functional group equivalent weight (FGEW) is approximately 3 150 g/mol. The negative charges assist in stabilising the polymer emulsion. The solid content of the polymer is high, around 40% w/w. There will also be a small percentage of amino groups in the polymer resulting from hydrolysis of the small proportion of isocyanate groups which did not react with chain propagating constituents of the polymer; however, the notifier claims that the FGEW of the terminating amine groups will be very large. Considering that the primary terminating groups are carboxylic acid functionalities with FGEW of approximately 3 150 g/mol, the FGEW of any terminal amino groups would be highly unlikely to be less than 5 000 g/mol. This satisfies the current NICNAS criteria for Polymers of Low Concern (PLC).

4. PURITY OF THE CHEMICAL

Degree of Purity: 40% dispersion in water

5. USE, VOLUME AND FORMULATION

The notified polymer will not be manufactured in Australia. It will be imported as a polymer dispersion in water at a concentration of 40%.

The notified polymer will be used as a component of film forming polymer in industrial paints, inks and adhesives. It will be blended with other ingredients to form a finished paint product containing 30% of the notified polymer. The notifier indicates that the polymer emulsion as imported (40% of notified polymer) may also be used for coating steel.

Import volume for the notified polymer is 100 tonnes per annum, which equates to 250 tonnes of polymer emulsion per annum.

6. OCCUPATIONAL EXPOSURE

The polymer emulsion, Neorez R9699 (containing 40 % of the notified polymer in water), will be imported in 200L plastic lined steel drums. The steel drums containing the polymer emulsion will be transported to paint manufacturers for reformulation into paint products. The notifier indicates that small proportion of paint containing the polymer emulsion as imported will be sold to building contractors.

There are two main groups of workers who will be exposed to the notified polymer: a) workers involved in paint manufacture and b) workers involved in paint application.

a) Paint Manufacture

During paint manufacture, the polymer emulsion will be blended with pigments and other components to produce the formulated paint product for end use. The mixture is blended at high speed, filtered and pumped into 200 L plastic lined steel drums or in 20L pails. The formulated paint product is transported and stored at the warehouse ready for distribution to customers.

Approximately 130 workers will be involved in paint manufacture.

No. of worker	Nature of work done	Exposure
40	high speed dispersing	4 hrs/day, 30 days/year
40	batch operations	2 hrs/day, 30 days/year
10	quality control testing	8 hrs/day, 30 days/year
40	filling into containers	8 hrs/day, 30 days/year

There is a potential for dermal and eye exposure to workers during blending, sampling, quality control testing and drumming of the paint product containing the notified polymer. Workers will use impervious gloves, coveralls and goggles as a minimum protection when handling the polymer emulsion and the formulated paint product. The notifier indicates that local exhaust ventilation will be employed during these activities to capture any volatiles at source. A regular maintenance program of exhaust ventilation is employed to ensure that the airflow is acceptable. All quality control testing of paint product involving spray painting is performed in an approved booth subject to regular maintenance procedures.

The internal transport and storage personnel would not be exposed to the notified polymer during the normal course of work, as they will be handling only the drummed paint products.

The notifier also states that employers conduct internal training courses for all employees who are likely to handle the notified chemical. The training is conducted initially at commencement of employment then at regular intervals during the year.

b) Paint application

Prior to paint application, the paint product is mixed thoroughly by stirring. The stirred paint product is pumped into a coater tray. From the coater tray, the paint is applied by dipping, spraying or rolling techniques. The coated metal is heat cured and becomes a finished article. The notifier did not provide information on the heat curing processes involved.

At the paint applicator site, approximately 60 workers will be involved in paint application.

No. of worker	Nature of work done	Exposure
10	addition to coater trays	8 hrs/day, 200 days/year
20	spray painting	8 hrs/day, 200 days/year
30	cleaning of equipment	2 hrs/day, 200 days/year

There is potential for dermal and eye exposure to workers during paint application. The notifier states that the industrial application of paint using spray, roller coating and dipping equipment is carried under a filtered exhaust system. Where the paint is applied by spraying, cartridge type respirators are to be worn to prevent inhalation exposure to the paint product. Spray painting will also be performed within a spray booth. Workers involved in the application of the paint product containing the notified polymer will use impervious gloves, coveralls and goggles as a minimum protection. The notifier also states that industrial users of the paint product containing the notified polymer are to instruct their workers on the safe handling of the product using the MSDS as a reference.

7. PUBLIC EXPOSURE

The notified polymer will not be sold to the public but will be applied by industrial customers only. There is little potential for public exposure to the notified polymer during transport, reformulation, coating operations and disposal. Minor public exposure may result from accidental spillage during transport. If spillage occurs as a result of a transport accident, it is expected that the material would be disposed in accordance with local and State regulations.

Although the public will make dermal contact with the articles coated with products containing the notified polymer, exposure to the notified polymer will be negligible because of the high number-average molecular weight and the cured state of the notified polymer when incorporated into articles.

8. ENVIRONMENTAL EXPOSURE

Release

The notifier indicates that during paint production approximately 500 kg (0.5% of import quantity) may be lost. Since paint production and other film forming polymer activities will take place in a few large dedicated facilities, the released polymer will be recovered into industrial waste sludge and be either incinerated or placed into landfill.

Major use will be confined to large industrial facilities where the polymer dispersion will be applied using dipping (for rolls of coiled steel), spraying or rolling techniques (for structural girders etc). The dipping technique for coiled steel is very efficient, with only small losses of paint, but spray techniques are often wasteful of paint with up to 60% loss through overspray. The notifier indicates that around 5 tonnes of the polymer may be released as a result of paint application. The majority of the release would probably be as a result of overspray during spray application. However, most application activity will be performed in large industrial facilities where spray painting could be expected to be performed in dedicated spray booths or in other areas where the overspray would be collected through vacuum extraction or into groundsheets. Furthermore, the release of dried paint would be collected and disposed of by incineration, or be placed into landfill by licenced contractors. Some paint residues will remain in the 20 L or 200 L drums. The notifier did not indicate the amount of residues; however, it is estimated that this could be approximately 1% of polymer import, or approximately 1 000 kg per annum, assuming a maximum annual import of 100 tonnes. Overall it is expected that around 7% (annually 7 tonnes) of the polymer could be released each year, and this would be incinerated or placed in landfill.

Fate

The majority of the notified polymer will be used as a film forming material in industrial coatings for structural steel. Consequently, the fate of the polymer will be similar to that of the coated steel articles. At the end of their useful lives, articles coated with the polymer are likely to be either recycled for steel reclamation or be placed into landfill. When recycled, the polymer would be destroyed in the blast furnaces and converted to water vapour and oxides of carbon and nitrogen. When deposited into landfill with used paint tins or on discarded panels, the organic components of the cured paint including the new polymer would be inert and immobile, but could be expected to be slowly degraded through the biological and abiotic processes operative in these facilities.

Spilled polymer emulsion or paint containing the polymer will be soaked up by soils. Once assimilated into the soil matrix, the relatively large size of the polymer particles would mitigate high mobility of the material. Microbiological processes are then likely to slowly degrade the polymer.

Biological membranes are not permeable to polymers of very large molecular size therefore bioaccumulation of the notified polymer would not be expected, if quantities were to be released into the water compartment.

9. EVALUATION OF TOXICOLOGICAL DATA

No toxicity data were submitted. This is acceptable for polymers of NAMW greater than 1000, according to the Act.

10. ENVIRONMENTAL EFFECTS

No ecotoxicity data were submitted. This is acceptable for polymers of NAMW greater than 1000, according to the Act.

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

It is possible that more than 5% (ie more than 5,000 kg per annum) of the notified polymer could be released as a consequence of losses during paint production and application. However, the majority of this would be incorporated into a semi-solid film or in particles of dried paint. In this form, the notified polymer is expected to be inert. The majority of the material would be encapsulated in a cured polymer matrix on structural steel where it would also be expected to be insoluble and inert. At the end of their useful lives, steel articles coated with the polymer are likely to be either recycled or placed into landfill. When recycled the polymer would be destroyed in the blast furnace and converted to water vapour and oxides of carbon and nitrogen. When deposited into landfill with used paint tins or discarded steel articles, the organic components of the cured paint including the new polymer would be inert and immobile, but could be expected to be slowly degraded through the biological and abiotic processes operative in these facilities.

The main environmental hazard would arise whereby spillage, for example from transport accidents, may release small quantities of the polymer to drains and waterways. However, it is likely that the polymer would quickly become immobile on association with the soil and sediments, and be slowly degraded through natural mechanisms. It is noted that the emulsion contains approximately 1% of free triethylamine, which would remain in the aqueous phase. Amines are known to be moderately toxic to aquatic organisms. Consequently, spills of the polymer emulsion or paint into waterways could represent some environmental hazard.

The low environmental exposure of the notified polymer as a result of the proposed use indicates that the overall environmental hazard would be low.

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

The notified polymer has a high NAMW of greater than 1 000 and has low water solubility (<1 mg/L), which should preclude transport across biological membranes. There are no low molecular weight species (NAMW less than 500) present in the notified polymer. All of the residual monomers are all below the concentration cut off level for classification as hazardous (National Occupational Health and Safety Commission, 1994a); hence, no toxicity is expected from this source. The notifier states that the notified polymer is not volatile and has low vapour pressure based on findings with similar polymers. On the information provided, the notified polymer is not considered hazardous and unlikely to pose a health risk to workers.

The occupational health risk for transport and storage workers is low, as exposure is not expected to occur under normal circumstances.

Workers involved in batch operations, quality control testing and drumming of the paint product may experience dermal and eye exposure to the notified chemical. The notifier did not specify whether or not the above activities are conducted using enclosed or open processes. Further, no details of drumming operations are provided. The notifier states that that local exhaust ventilation will be employed during these activities to capture any volatiles at source. As the notified polymer is non-volatile, inhalation exposure is expected to be low. The use of impervious gloves, coveralls and goggles is a minimum requirement when handling the polymer emulsion.

The paint product containing the notified polymer will be applied using spray, roller coating and dipping techniques. When using these application techniques, workers may experience dermal, eye and inhalation exposure to paint products containing the notified polymer. The notifier states that workers will wear impervious gloves, coveralls and goggles as a minimum requirement during these activities. Where paint is applied by spraying, cartridge type respirators in addition to the above protective equipment are to be worn to prevent inhalation exposure to the paint product. The notifier states that all spraying activities are carried out in an approved spray booth.

Workers involved in cleaning of equipment may also experience dermal and ocular exposure to the notified polymer. Workers are to wear impervious gloves, coveralls and goggles as a minimum requirement during these activities.

Spillage of the notified polymer can occur during mixing, batch operations and quality control testing. Spillage can also occur during stirring and pumping paint products into coater trays before paint application. Spills from these sources will be contained into the plant through bunding.

Public exposure to the notified polymer is expected to be negligible since its application will be restricted to industry. Public exposure to the notified polymer will be limited to contact with finished articles where it is under an overcoat layer and in a cured state.

13. RECOMMENDATIONS

To minimise occupational exposure to the polymer in Neorez R9699 the following guidelines and precautions should be observed:

- Respirators should be selected and fitted in accordance with Australian/New Zealand Standard (AS/NZS) 1715 (Standards Australia/Standards New Zealand, 1994a) and AS/NZS 1716 (Standards Australia/Standards New Zealand, 1994b);

- Safety goggles should be selected and fitted in accordance with Australian Standard (AS) 1336 (Standards Australia, 1994) to comply with AS/NZS 1337 (Standards Australia/Standards New Zealand, 1992);

- Industrial clothing should conform to the specifications detailed in AS 2919 (Standards Australia, 1987) and AS 3765.1 (Standards Australia, 1990);

- Impermeable gloves or mittens should conform to AS 2161.2 (Standards Australia, 1998);

- Spillage of the notified chemical should be avoided. Spillages should be cleaned up promptly with absorbents which should then be put into containers for disposal;
- Good personal hygiene should be practised to minimise the potential for ingestion;
- Spray painting booths should conform to AS/NZS 4114.1 and AS/NZS 4114.2 (Standards Australia/Standards New Zealand, 1995a), (Standards Australia/Standards New Zealand, 1995b); and
- A copy of the MSDS should be easily accessible to employees.

14. MATERIAL SAFETY DATA SHEET

The MSDS for the notified chemical was provided in accordance with the *National Code of Practice for the Preparation of Material Safety Data Sheets* (National Occupational Health and Safety Commission, 1994b).

This MSDS was provided by the applicant as part of the notification statement. It is reproduced here as a matter of public record. The accuracy of this information remains the responsibility of the applicant.

15. REQUIREMENTS FOR SECONDARY NOTIFICATION

Under the Act, secondary notification of the notified chemical shall be required if any of the circumstances stipulated under subsection 64(2) of the Act arise. No other specific conditions are prescribed.

16. REFERENCES

National Occupational Health and Safety Commission (1994a) List of Designated Hazardous Substances [NOHSC:10005(1994)]. Australian Government Publishing Service, Canberra.

National Occupational Health and Safety Commission (1994b) National Code of Practice for the Preparation of Material Safety Data Sheets [NOHSC:2011(1994)]. Australian Government Publishing Service, Canberra.

Standards Australia (1987) Australian Standard 2919-1987, Industrial Clothing. Standards Association of Australia, Sydney.

Standards Australia (1990) Australian Standard 3765.1-1990, Clothing for Protection against Hazardous Chemicals Part 1 Protection against General or Specific Chemicals. Standards Association of Australia, Sydney.

Standards Australia (1994) Australian Standard 1336-1994, Eye protection in the Industrial Environment. Standards Association of Australia, Sydney.

Standards Australia (1998) Australian Standard 2161.2:1998, Occupational Protective Gloves, Part 2: General Requirements. Standards Association of Australia, Sydney.

Standards Australia/Standards New Zealand (1992) Australian/New Zealand Standard 1337-1992, Eye Protectors for Industrial Applications. Standards Association of Australia/Standards Association of New Zealand, Sydney/Wellington.

Standards Australia/Standards New Zealand (1994a) Australian/New Zealand Standard 1715-1994, Selection, Use and Maintenance of Respiratory Protective Devices. Standards Association of Australia/Standards Association of New Zealand, Sydney/Wellington.

Standards Australia/Standards New Zealand (1994b) Australian/New Zealand Standard 1716-1994, Respiratory Protective Devices. Standards Association of Australia/Standards Association of New Zealand, Sydney/Wellington.

Standards Australia/Standards New Zealand (1995a) Australian/New Zealand Standard 4114.1-1995, Spray Painting Booths - Design, Construction and Testing. Standards Association of Australia/Standards Association of New Zealand, Sydney/Wellington.

Standards Australia/Standards New Zealand (1995b) Australian/New Zealand Standard 4114.2-1995, Spray Painting Booths - Selection, Installation and Maintenance. Standards Association of Australia/Standards Association of New Zealand, Sydney/Wellington.