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NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

Polymer In Acrylic Resin RC-22-6336

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Director
Chemicals Notification and Assessment

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1. APPLICANT

PPG Industries Australia Pty Ltd of McNaughton Rd, CLAYTON, VIC 3169 has submitted a limited notification statement in support of their application for an assessment certificate for Polymer in Acrylic Resin RC-22-6336.

2. IDENTITY OF THE CHEMICAL

The chemical name, CAS number, molecular and structural formulae, molecular weight, spectral data and details of the polymer composition have been exempted from publication in the Full Public Report and the Summary Report.

Marketing Name:	Acrylic Resin RC-22-6336
Method of Detection and Determination:	The polymer is characterised by GPC and identified by IR spectroscopy. A reference spectrum has been provided.

3. PHYSICAL AND CHEMICAL PROPERTIES

The polymer is manufactured as an approximately 61 % (w/v) solution in xylene, acetone and methyl n-amyl ketone. It is never isolated. The properties reported below are variously those of the polymer solution and of the notified polymer, as stated.

Appearance at 20°C and 101.3 kPa:	Clear viscous liquid
Boiling Point:	56 - 143°C for the solution; the polymer is not expected to be volatile
Specific Gravity:	1.00 for the solution; 1.09 (calculated) for the polymer
Vapour Pressure:	1.0 kPa at 20°C (for the solvent xylene)
Water Solubility:	The notifier states that the polymer is expected to be of low water solubility (see comments below)
Hydrolysis as a Function of pH:	No groups are expected to be hydrolysed under normal environmental conditions

Partition Co-efficient (n-octanol/water):	Not determined (see comments below)
Absorption/Desorption:	Not determined (see comments below)
Dissociation Constant:	Not determined (see comments below)
Particle Size:	Not applicable as the polymer is not isolated from solution
Flash Point:	19°C for the solution
Flammability Limits:	Upper Explosive Limit = 7 % Lower Explosive Limit = 1 % (for the solvent xylene)
Autoignition Temperature:	500°C for the solution (similar to the solvent xylene)
Explosive Properties:	The polymer is not expected to be explosive
Reactivity/Stability:	The polymer is expected to be stable

3.1 Comments on Physico-Chemical Properties

By analogy with similar polymers and due to its high molecular weight, the notified polymer is not considered to be volatile.

There is no water solubility data for the polymer as it is never isolated from the polymer solution in which it is manufactured. It is expected that the water solubility will be low since the polymer is non-ionic, has a high molecular weight and contains hydrophobic aromatic and aliphatic functional groups.

No hydrolysis data was available for the polymer because it is never isolated from the polymer solution. Hydrolysis is the most likely means of abiotic degradation as the polymer contains ester groups, but this is unlikely to occur in the environmental pH range due to the low water solubility of the notified polymer.

Partition Co-efficient was not determined due to the low solubility of the notified polymer in water. The polymer is expected to partition into n-octanol rather than water due to its low water solubility. Adsorption/desorption was also not determined for the same reason. However, due to its low solubility the polymer is expected to bind readily to, or be associated with, soil or sediments.

Dissociation constant was not determined and the notifier stated that there are no structural units that would dissociate. The polymer contains a small percentage of carboxylic acid functionality, however, and would be expected to have typical acidity.

The polymer would be expected to be combustible, however, the polymer solution is flammable due to the solvent content, and is classified as a Class 3 dangerous good.

4. PURITY OF THE CHEMICAL

Degree of Purity:	> 99 %; manufactured as a 61 % solution in xylene, acetone and methyl n-amyl ketone.
Maximum Content of Residual Monomers:	All residual monomers are present at 0.2 % (or less), and all are present at below the cutoff levels for classification of the polymer as hazardous.
Toxic or Hazardous Impurities:	none

Additives/Adjuvants:

Chemical name:	xylene (mixed isomers)
CAS No.:	1330-20-7
Weight percentage:	23.4 % in polymer resin solution
Toxic properties:	R20/21 Harmful by inhalation and in contact with skin R38 Irritating to skin (NOHSC, 1999a)
Regulatory controls:	NOHSC exposure standard 80 ppm TWA, 150 ppm STEL (NOHSC, 1995)

Chemical name:	heptan-2-one
Synonym:	methyl n-amyl ketone
CAS No.:	110-43-0
Weight percentage:	< 30 % in polymer resin solution
Toxic properties:	R22 Harmful if swallowed (NOHSC, 1999a)
Regulatory controls:	NOHSC exposure standard 50 ppm TWA (NOHSC, 1995)

Chemical name:	acetone
CAS No.:	67-64-1
Weight percentage:	< 10 % in polymer resin solution
Toxic properties:	skin and eye irritant (American Conference of Government Industrial Hygienists, 1998)
Regulatory controls:	NOHSC exposure standard 500 ppm TWA, 1000 ppm STEL (NOHSC, 1995)

The notified polymer will initially be imported in pre-prepared paints, and will have a large number of adjuvants such as stabilisers, pigments and solvents.

5. USE, VOLUME AND FORMULATION

The notified polymer will initially be imported as a component an automotive refinish clearcoat at < 30 % (w/w). It will be imported at a volume of 1 tonne of polymer in the first year. The polymer solution, RC-22-6336, containing approximately 61 % (w/w) notified polymer, will later be imported for local reformulation into coatings. After the first year, the import volume of notified polymer is expected to be in the range of 1 – 10 tonnes per annum.

6. OCCUPATIONAL EXPOSURE

Pre-prepared paints containing the notified polymer will be imported in 1 L and 5 L steel cans. The notifier has provided no detail on the type of packaging for the overall shipment of imported individual containers or the handling involved in breaking up the shipment into individual containers for dispatch by road to the customer sites. The individual product containers are not expected to be opened before arrival at the end use site and the likelihood of a spill is low.

The polymer solution, RC-22-6336, will be imported in 200 L steel drums.

Waterfront, transport and warehouse workers are not expected to be exposed to the notified polymer except in the case of an accident involving spillage of the paint or resin solution.

The laboratory development, polymer manufacture and reformulation into coatings, along with the warehouse storage, will all be carried out at a single site within Australia.

Laboratory Development
The notifier indicated that three laboratory workers would be involved in the manufacture and testing of paint. The potential exposure would be for up to 8 hours per day, for up to 20 days per year. Exposure would be by skin contact during the handling of small quantities of the polymer solution and paint. The use of appropriate laboratory ventilation facilities and personal protective equipment such as a laboratory coat and safety glasses would be expected.

Reformulation (Paint Manufacture)
The reformulation of polymer solution into paint components, when commenced, will involve 9 workers for up to 8 hours per day, 30 days per year. Three groups of workers will be involved in the process; in paint mixing, quality control and drum or can filling. The mixers used for preparing the paint will be enclosed and fitted with local exhaust ventilation. Dermal exposure to the polymer will be possible at several points throughout the process; charging the polymer solution into the mixer, removal and testing of quality control samples, and drips and spills during the paint filtration and filling. The formation of aerosols during the high speed mixing will be unlikely because of the viscosity of the mixture.

The mixing and filling will be carried out under local exhaust ventilation to prevent exposure to the solvents. Workers will wear impervious gloves, coveralls and goggles, with additional

personal protective equipment being used as required.

End Use
The notifier estimates that as many as 1000 spray painters in up to 1000 establishments across Australia could be exposed to the notified polymer. The exposure is estimated to be for up to 4 hours per day, for up to 220 days per year.

The spray painters who will be exposed to the notified chemical will be fully TAFE trained. Typically the spray painter will measure the appropriate amounts of the different components required in a particular formulation into an open container and pour this mixture into a spray gun. The spraying of the automobile will be carried out in a laminar flow downdraft spray booth which is designed to rapidly remove aerosol particles and solvent vapour from the atmosphere. Several possible booth designs may be used. In a dry floor booth, the overspray will be collected in filters contained in the floor of the booth; any unremoved particulates will reach the exhaust stack with the solvent vapours. In a wet floor booth, overspray will collect in a pool of water below the grill floor or in a wet scrubber in the exhaust and will be removed with a filter. The residual solids will be disposed of to secure landfill. The spray booths are subject to AS/NZS/4114.1:1995 *Spray Painting Booths – Design, Construction and Testing* (Standards Australia/Standards New Zealand, 1995a) and AS/NZS/4114.1:1995 *Spray Painting Booths – Selection, Installation and Maintenance* (Standards Australia/Standards New Zealand, 1995b). After application of the paint, the automobile may be heated to cure the coating.

Residual paint mixture will be washed from the equipment manually, using recycled paint solvent, and the washings will be disposed of by solvent recyclers.

Once residual final paint mixture has dried, the notified polymer will be irreversibly bound within the cured matrix and not separately available for either exposure to workers, or for dermal absorption.

Spray painters will wear appropriate personal protective equipment at all times; impervious gloves, eye protection, anti-static footwear and anti-static flame retardant overalls while mixing the paint, and, in addition, a full face shield and respirator conforming to AS/NZS1715 and AS/1716 while inside the spray booth.

7. PUBLIC EXPOSURE

There is little potential for public exposure to the notified polymer arising from manufacture, transport, occupational use and disposal. The notified polymer will enter the public domain only in the form of cured paint films on automobiles. This paint film will contain the polymer in a crosslinked unreactive form which will not be bioavailable.

8. ENVIRONMENTAL EXPOSURE

8.1 Release

There is potential for release during paint formulation and application. The manufacturing and formulation processes will take place at the notifier's plant and any spills that occur will be contained by the plant bunding. During the manufacturing and formulation processes, the notifier estimates that up to 100 kg per year of waste polymer would be generated at the plant. This waste will be incinerated or treated by a process known as the Dusol process in which the waste resin and paint are dissolved and the residue converted to an inert solid, which can be disposed of to landfill.

The notifier has estimated that approximately 0.5 % (i.e. 50 kg per year) of the notified polymer will remain in the emptied import containers. These containers will be collected and disposed of by licensed contractors.

The paint is applied to motor vehicles with approximately 30 % efficiency in a spray booth with control measures, such as a filtering system and masking materials, in place. The waste material generated by the cleaning of the spray gun, mixing equipment and booths (including the filters) will be collected, treated and disposed of to landfill by licensed contractors. It is estimated that up to 7 tonne of waste polymer would be generated in this way.

Approximately 2 % of the drum contents will remain as residue after the drum has been emptied. This material will be allowed to dry and then will be disposed of to landfill. This equates to a maximum of approximately 200 kg of waste polymer per year.

Further release of the polymer may occur in the form of either inert flakes of cross linked coating or on objects painted with the new polymer when panels are consigned to metal reclamation or landfill.

8.2 Fate

The final fate of the polymer will be the same as the coated article, ie either recycled or sent to landfill. During the recycling process the coating (incorporating the notified polymer) will either be removed and become part of a solid/sludge waste that will go to landfill or incineration, or it will be destroyed in a process such as smelting. Incineration of the coating film would emit noxious fumes including oxides of carbon and nitrogen.

The solid waste generated in the manufacturing, formulation and application of the coating will be disposed of to landfill. This includes the sludge formed after solvent recovery. Leaching of the polymer from landfill is unlikely due to its water solubility and potential likely affinity for soil.

The polymer is not expected to cross biological membranes due to its high molecular weight and moderate solubility, therefore should not bioaccumulate (Connell, 1990).

9. EVALUATION OF TOXICOLOGICAL DATA

No toxicology data were submitted. The polymer is stable with low volatility. Polymers of high molecular weight and low water solubility do not readily cross biological membranes. The notifier states that no occupational or public health issues have been reported for polymers of similar composition in Australia.

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

No ecotoxicological data were provided.

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

Once the coating is applied, the polymer will be incorporated in an inert film and consequently should not present a hazard. Any chips, flakes or fragments formed by mistreatment or general wear and tear will be inert. The coating will slowly deteriorate due to exposure to UV light and the other elements, but this will be insignificant.

The majority of waste containing the polymer will be generated during the manufacture (up to 150 kg/year) and use of the coatings (up to 7.2 tonnes/year). This waste will ultimately be disposed of to landfill, with incineration being an alternative. The polymer is unlikely to leach from a landfill due to its solubility and likely affinity for soil. The majority of the polymer will be present within the cured inert coating matrix, and therefore will be unavailable for leaching.

The notified polymer is not likely to present a hazard to the environment when it is stored, transported and used in the proposed manner.

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

No toxicological information has been provided for the notified polymer and therefore the substance cannot be assessed against the NOHSC *Approved Criteria for Classifying Hazardous Substances* (NOHSC, 1999b). However, the polymer solution RC-22-6336 is a hazardous substance because of the high concentration of xylene. It is also classed as a Class 3 dangerous good (flammable liquid) because of the solvent content. The MSDS for the polymer solution RC-22-6336 lists a number of potential health effects, namely headaches, dizziness, nausea, vomiting, skin, eye and respiratory irritation, irritant contact dermatitis, central nervous system depression and chronic central nervous system disorders. These relate mainly to the solvents, xylene, acetone and methyl n-amyl ketone, rather than the notified polymer.

Occupational Health and Safety
There is little potential for significant occupational exposure to the notified polymer in the transport and storage of the paint components containing this polymer. There will be exposure during the local production of the paint components (when commenced), and in the use and disposal of the paints.

During the reformulation processes, the main exposure route for the notified polymer will be dermal. The paints and polymer solutions will be viscous, and ready formation of aerosols is not expected. The polymer is not expected to be hazardous by dermal exposure as the high molecular weight will preclude absorption through the skin. Protective measures used to prevent exposure to the hazardous solvents should provide sufficient protection against the

notified polymer.

The final paint mix, including the pre-prepared paint containing the notified polymer, could contain a wide variety of additional ingredients once fully mixed. This is likely to introduce human health hazards because, apart from a range of potentially toxic solvents, there may be components containing resins with pendant isocyanate groups. The spraying procedure also produces a dense aerosol of paint particles which would adversely affect human health even in the absence of additional hazardous components. It is also probable that professionals involved in the spray painting industry will use a number of different paint formulations.

For these reasons, the notified polymer must be assessed for the contribution it makes to the hazards associated with use of the spray paints. The presence of many potential and actual hazardous substances in the formulations requires the use of stringent engineering controls, such as a correctly constructed and maintained spray booth, and of a high level of personal protective equipment, such as impermeable overalls and gloves and a full face shield and respirator. The use of the paint containing the notified polymer should be in accordance with the NOHSC *National Guidance Material for Spray Painting* (NOHSC, 1999c). The level of protection from exposure afforded by the standard protective measures will provide adequate protection from the notified polymer, which is likely to be less intrinsically toxic than most of the solvents, pigments and other paint resins.

Once the applied final paint mix has hardened, the polymer will not be separately available for exposure or absorption.

There are NOHSC exposure standards for xylene, acetone and n-amyl ketone, identified as ingredients in the polymer solution RC-22-6336. The employer is responsible for ensuring that these exposure standards, and exposure standards pertaining to other final paint mix additives, are not exceeded in the workplace.

The paint components containing the notified polymer are flammable due to their solvent content. Precautions must be taken to avoid sources of ignition, e.g. use of earthing leads. Operators should wear antistatic overalls and footwear.

Similar considerations apply in the disposal of the polymer. The wastes containing the notified polymer may be hazardous substances on the basis of the solvent and other resin content, and the precautions used on the basis of these additional materials should be adequate for protection from the notified polymer. In addition, much of the polymer will be crosslinked, hardened and immobilised by the time of disposal.

Public Health
There is negligible potential for public exposure to the notified polymer arising from use in paints. There may be public contact with the notified polymer on the painted surfaces of motor vehicles, but its adhesion to the substrate and the physico-chemical properties of the cured paint will be sufficient to preclude absorption across the skin or other biological membranes. Therefore, based on its use pattern and physico-chemical characteristics, the notified polymer will not pose a significant hazard to public health.

13. RECOMMENDATIONS

To minimise occupational exposure to Acrylic Resin RC-22-6336 the following guidelines and precautions should be observed:

- Use of the paint containing the notified polymer should be in accordance with the NOHSC *National Guidance Material for Spray Painting* (NOHSC, 1999c);
- Employers should ensure that NOHSC exposure standards for all of the components of the final paint mix are not exceeded in the workplace;
- Safety goggles should be selected and fitted in accordance with Australian Standard (AS) 1336 (Standards Australia, 1994) to comply with Australian/New Zealand Standard (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 3765.2 (Standards Australia, 1990); impermeable gloves or mittens should conform to AS 2161 (Standards Australia/ Standards New Zealand, 1998); all occupational footwear should conform to AS/NZS 2210 (Standards Australia/ Standards New Zealand, 1994);
- 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;
- A copy of the MSDS should be easily accessible to employees.

If the conditions of use are varied from the notified use (as a coating for automobile bodies), greater exposure of the public may occur. In such circumstances, secondary notification may be required to assess the hazards to public health.

14. MATERIAL SAFETY DATA SHEET

The MSDS for the solution of the notified polymer was provided in accordance with the *National Code of Practice for the Preparation of Material Safety Data Sheets* (NOHSC, 1994).

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

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