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NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

Polymer in Acrylate-PU Dispersion LC-81-2260

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Telephone: (61) (02) 9577 9514 FAX (61) (02) 9577 9465

Director
Chemicals Notification and Assessment

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FULL PUBLIC REPORT

Polymer in Acrylate-PU Dispersion LC-81-2260

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 Acrylate-PU Dispersion LC-81-2260.

2. IDENTITY OF THE CHEMICAL

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

Marketing Name:	Polymer in Acrylate-PU Dispersion LC-81-2260
Method of Detection and Determination:	infrared spectroscopy

3. PHYSICAL AND CHEMICAL PROPERTIES

The notified polymer is produced in aqueous dispersion. As the notified polymer is never isolated, limited data on the physical and chemical properties are available. The properties given below are variously those of the 42.4 % aqueous dispersion and of the notified polymer, as stated.

Appearance at 20°C and 101.3 kPa:	milky white liquid, with little odour
Melting Point:	not determined (see comments below)
Specific Gravity:	1.058 for the dispersion; 1.132 (calculated) for the notified polymer
Vapour Pressure:	not volatile
Water Solubility:	< 1 mg/L at 25°C (see comments below)
Particle Size:	not relevant, as the notified polymer is manufactured and used in an aqueous dispersion

Partition Co-efficient (n-octanol/water):	not determined (see comments below)
Dissociation Constant:	not determined (see comments below)
Flammability Limits:	not flammable
Explosive Properties:	not expected to be explosive
Reactivity/Stability:	expected to be stable under normal environmental conditions

3.1 Comments on Physico-Chemical Properties

The water solubility was not determined, but the notifier states that the polymer is expected to be of low solubility (< 1 mg/L). The notifier has provided literature references (Blackley, 1975; Everett, 1988) that supports this case for the insolubility of the final emulsion polymer and how it must be stabilised against separation from the aqueous phase by adding surfactant. In the presence of these additives, the notified polymer is dispersible in water.

The polymer contains ester and carbamate linkages that could be expected to undergo hydrolysis under extreme pH conditions. However, due to the low water solubility, hydrolysis is unlikely in the environmental pH range of between 4 and 9.

The determination of partition coefficient and adsorption/desorption could not be undertaken as the notified polymer is expected to be insoluble in water and will largely partition into n-octanol rather than water. Due to its low water solubility, the polymer is expected to become associated with the organic component of soils and sediments.

No dissociation constant data was provided as the notifier claims that it is unlikely to occur in the environmental pH range due to the water insolubility and once cross-linked in the final coating product the polymer has no units likely to dissociate. The carboxylic acid functionality present is partially in the salt form.

4. PURITY OF THE CHEMICAL

Degree of Purity:	> 99 %
Maximum Content of Residual Monomers:	residual monomer identities and concentrations have been exempted from publication; concentrations of residual monomers are all below the relevant cutoffs for the notified polymer to be classified as hazardous

5. USE, VOLUME AND FORMULATION

The notified polymer will be used as a component of a waterborne automotive basecoat for

Original Equipment Manufacture (OEM). The basecoat will be applied by robot or hand spraying prior to the final assembly of the vehicles.

The notified polymer will be imported as a resin dispersion, LC-81-2260, containing 42.4 % notified polymer (w/w) in water and surfactants. The resin dispersion will be reformulated at one site in Australia to produce the paint component, containing up to 20 % (w/w) notified polymer. The resin dispersion will be imported in 200 L steel drums.

The notifier estimates that the import volume will be between 1 and 20 tonnes notified polymer in the first year of importation, and 32 tonnes notified polymer per annum during the next four years.

6. OCCUPATIONAL EXPOSURE

Transport and Storage
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. Unloading containers will involve 4 – 6 workers for 6 hours per day, 10 days per year. Transport to the reformulation site will involve 4 workers for 4 hours per day, 10 days per year.

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 80 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 will involve 24 workers for up to 4 hours per day on a daily basis. Three groups of workers will be involved in the process; in paint mixing, quality control and drum 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 solvents. Workers will wear impervious gloves, coveralls and goggles, with additional personal protective equipment being used as required.

End Use
The notified polymer will be used at two vehicle manufacturing sites in Australia. The paint will be predominantly applied using a robotic system, but manual touchups will be necessary. The notifier indicates that 18 workers will be involved in adding paint to the circulation tank of the robot spraying system (2 hour per day), and 60 workers will apply the paint by hand

spray (8 hours per day). A further 18 workers are expected to be involved in cleaning the spray equipment (2 hours per day). All exposures will be on a daily basis.

The paint containing the notified polymer will be transferred by drum pump from the 200 L drum to a 400 L circulation tank, and then pumped through an enclosed 350 L pipework circulation system. The paint lines will supply both the robotic sprayers and also the manual spray equipment. Robotic spraying will be carried out in a downdraft spray booth, and no worker exposure is expected during the spraying procedure. There is potential for dermal exposure to the notified polymer for workers installing the drum pumps for transfer to the circulation tank.

Paint mixing will be carried out in a ventilated paint kitchen. Workers will wear impervious gloves, anti-static coveralls, anti-static footwear and eye protection. 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. Workers will wear nylon overalls, calico hoods, nylon gloves and cartridge type respirators while inside the spray 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 will be heated to cure the coating.

Residual paint mixture will be washed from the equipment manually.

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.

7. PUBLIC EXPOSURE

There is little potential for public exposure to the notified polymer arising from paint manufacture, transport, occupational use and disposal. The polymer in the form of uncured paint will remain within the industrial domain.

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 the paint formulation and the paint application. The formulation processes will take place at the notifier's plant and any spills that occur will be contained by the plant bunding. During the paint reformulation processes, the notifier

estimates that approximately 2 % (maximum of 640 kg/annum) of waste polymer would be generated at the plant. This includes the waste generated by equipment cleaning (collected by a licensed contractor and incinerated) and residues remaining in the 'empty' drums (sent to a licensed drum reconditioner and incinerated).

The paint is applied to motor vehicles with approximately 35 % efficiency for hand spray and 80 % for the automated method. The average transfer efficiency is estimated by the notifier as 75% ie approximately 25 % (8 tonnes/annum) of the import volume of the notified polymer will be wasted via overspray. This waste polymer will be collected by the spray booth control measures, such as a filtering system and masking materials. The waste will be collected by licensed contractors and incinerated. Cleaning of the spray gun and mixing equipment will generate waste that will be collected and disposed of in the same manner as wastewater from the spray booth, approximately 800 kg/annum.

Some residue will also remain in the 'empty' containers after use. It is estimated that up to 800 kg/annum will remain as residue in the containers and will be incinerated by licensed drum reconditioners.

8.2 Fate

Once applied to the metal panels of vehicles, the notified polymer will be incorporated in a hard, durable, inert film and would not present a significant hazard. Any fragments, chips and flakes of the lacquer will be of little concern as they are expected to be inert. The metal panels coated with the polymer are likely to be either recycled for steel reclamation or be placed into landfill at the end of their useful life. When recycled the polymer would be destroyed in the blast furnaces and converted to water vapour and oxides of carbon.

The solid waste generated in the formulation and application of the coating will be incinerated by licensed contractors. The polymer is recovered as an insoluble solid from the wastewater used for cleaning and also incinerated. The containers and their residue will also be disposed in this manner. Any of the polymer that may be released to the environment through spills would be expected to become associated with the soils and sediments be slowly degraded through abiotic and bacteriological processes. It would not be likely to remain mobile in the aquatic environment and is not expected to cross biological membranes, due to the low solubility and high molecular weight, and as such should not bioaccumulate (Connell, 1990).

9. EVALUATION OF TOXICOLOGICAL DATA

No toxicology data were submitted. Polymers of low reactivity and high molecular weight do not readily cross skin or other biological membranes, and the toxicity of the notified polymer is therefore expected to be low.

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

No ecotoxicology data were submitted.

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

The polymer cross-links with other paint components to form a very high molecular weight and stable film that adheres firmly to the primer layer to which it is applied. The polymer, as part of this surface coating will, therefore, share the fate of the vehicle panel. The paint will slowly deteriorate under the action of UV light, but this is negligible over the life of the motor vehicle. When the vehicle panel is recycled, the polymer would be destroyed through incineration.

The majority of notified polymer associated with waste from the application of the coating to the automotive surface should not enter the environment as it is expected to be incinerated by licensed contractors. Approximately 10.2 tonnes/annum of the polymer is expected to be destroyed as waste in this way.

In the event of accidental spillage of the polymer solution into waterways, the polymer is not expected to disperse into the water, but settle out onto sediments. If the polymer is spilt on land, either during usage or transport, it is expected that the polymer would become immobilised in the soil layer. Contaminated soil can then be collected and disposed to landfill.

Given the above, environmental exposure and the overall environmental hazard is expected to be low.

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

Hazard Assessment
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). The polymer solution LC-81-2260 is not a hazardous substance. The Material Safety Data Sheet (MSDS) for the polymer solution LC-81-2260 indicates that the solution may be a skin, eye and respiratory irritant.

Occupational Health and Safety
There is little potential for significant occupational exposure to the notified polymer in the transport and storage of the polymer dispersion or of paint components containing the notified polymer. There will be exposure during production of the paint components and in the use and disposal of the paints.

During the reformulation processes and the addition of paint to the circulation tank in the end use facility, 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, although the dispersion may be a skin and eye irritant.

During paint application, workers will be exposed to the notified polymer in the form of a paint aerosol. The final paint mix, including the pre-prepared paint containing the notified polymer, could contain a wide variety of additional ingredients once fully mixed. Waterborne paints are likely to be of lower hazard than solvent based paints, and 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 should provide sufficient protection against the notified polymer and the remainder of the paint components. The use of the paint containing the notified polymer should be in accordance with the NOHSC *National Guidance Material for Spray Painting* (NOHSC, 1999c).

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

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 Polymer in Acrylate-PU Dispersion LC-81-2260 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 containing the notified polymer was provided in a format consistent 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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