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**NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION
AND ASSESSMENT SCHEME**

FULL PUBLIC REPORT

Polymer in Acrylic Resin HC-91-5835

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Director
Chemicals Notification and Assessment

FULL PUBLIC REPORT**Polymer in Acrylic Resin HC-91-5835****1. APPLICANT**

PPG Industries Australia Pty Ltd of McNaughton Road, Clayton, Victoria 3169 has submitted a limited notification statement in support of their application for an assessment certificate for Polymer in Acrylic Resin HC-91-5835.

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 HC-91-5835

**Number-Average
Molecular Weight (NAMW):** >1000

**Maximum Percentage of Low
Molecular Weight Species
Molecular Weight < 1000:** <10%

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 (National Occupational Health and Safety Commission, 1999b).

3. PHYSICAL AND CHEMICAL PROPERTIES

Unless otherwise stated, the physical and chemical properties below are those for the polymer solution which contains 63.9% w/w polymer in aromatic hydrocarbons.

**Appearance at 20°C
and 101.3 kPa:** Viscous, clear, slightly yellow liquid

Boiling Point: Not determined (see comments below).

Specific Gravity:	1.112 (calculated) for the polymer.
Vapour Pressure:	Not determined (see comments below).
Water Solubility:	The polymer is expected to be of low water solubility (see comments below).
Partition Co-efficient (n-octanol/water):	Not determined (see comments below).
Hydrolysis as a Function of pH:	Not determined (see comments below).
Adsorption/Desorption:	Not determined (see comments below).
Dissociation Constant:	Not determined (see comments below).
Particle Size:	Not applicable as polymer exists only in solution.
Flash Point:	27°C for the polymer solution, due to the presence of xylene solvent.
Flammability Limits:	Upper Explosive Limit = 7.0% Lower Explosive Limit = 0.8% (for the polymer solution containing solvents).
Autoignition Temperature:	> 450°C (for the polymer solution containing solvents).
Explosive Properties:	Not determined, but the polymer is expected to be non-explosive.
Reactivity/Stability:	Polymer and polymer solution are stable.

Comments on Physico-Chemical Properties

By analogy with similar polymers, the notified polymer should not be volatile under normal conditions of use. The polymer solution is expected to possess a vapour pressure similar to xylene solvent (1 kPa) and boil initially at the boiling point of xylene solvent (138°C).

Water solubility was not determined as the polymer is not isolated from solution. Based on solubility data for polymers of similar structure and molecular weight, the water solubility is expected to be less than 1mg/L. The presence of largely non-polar groups also suggests water solubility would be low.

Hydrolysis was not determined. The ester groups within the notified chemical may undergo hydrolysis under certain temperatures and pH conditions (i.e. outside the environmental temperature and pH range). Any remaining epoxide group present in the notified chemical will also react with water. Both reactions would be expected to be slow at ambient

environmental conditions.

Partition coefficient and adsorption/desorption were not determined due to the low solubility of the notified polymer in water. The high hydrocarbon content of the notified polymer suggests that it would have a high partition coefficient and a strong affinity for soil and sediments.

The polymer contains free carboxylic acid functionality expected to have typical functionality.

In accordance with the *Australian Code for the Transport of Dangerous Goods by Road and Rail*, (Federal Office of Road Safety, 1998) the polymer solution is classified as a Class 3 dangerous good (flammable liquid) based on the flammability of the solvents.

4. PURITY OF THE CHEMICAL

Degree of Purity: > 99%

Additives/Adjuvants:

The material safety data sheet (MSDS) identifies a number of components of the polymer solution including the following solvents which are classified as hazardous substances.

<i>Chemical name:</i>	Aromatic hydrocarbon mixture
<i>CAS No.:</i>	64742-95-6
<i>Weight percentage:</i>	<30% (< 0.1% benzene) in polymer solution.
<i>Toxic properties:</i>	R65 Harmful: may cause lung damage if swallowed.
<i>Chemical name:</i>	Xylene
<i>CAS No.:</i>	1330-20-7
<i>Weight percentage:</i>	<12.5% in polymer solution.
<i>Regulatory controls:</i>	NOHSC exposure standard 80ppm (350mg/m ³) TWA, 150ppm (655mg/m ³) STEL (National Occupational Health and Safety Commission, 1995).
<i>Chemical name:</i>	2-propanone
<i>CAS No.:</i>	67-64-1
<i>Weight percentage:</i>	<1% in polymer solution.
<i>Regulatory controls:</i>	NOHSC exposure standards 500ppm (1185mg/m ³) TWA, 1000ppm (2375mg/m ³) STEL (National Occupational Health and Safety Commission, 1995).

Other non-hazardous additives/adjuvants are present and these have been exempted from publication in the Full Public Report and Summary Report.

5. USE, VOLUME AND FORMULATION

The notified polymer will be used as a component of an automotive paint clearcoat at up to 10% w/w. It will be applied over basecoat coatings on the external surfaces of motor vehicle bodies and parts. The polymer will be imported initially but then manufactured in Australia at a later stage. Between 1 and 20 tonnes will be imported/manufactured in the first year increasing to 50 tonnes per year for the subsequent 4 years.

6. OCCUPATIONAL EXPOSURE

Import, Transport and Storage

The notified polymer in resin solution and the final paint containing the polymer will be manufactured at the notifier's plant. Prior to plant scale up for local manufacture, the polymer in resin will be imported from the USA and/or Europe. Import and storage will be in 200L drums. Approximately 4 to 6 dockside personnel each working a total of 24 hours per year and 4 transport personnel each working a total of 16 hours per year may be exposed to the notified polymer. However, since the polymer is imported in sealed drums, exposure to the notified polymer during import and storage would be considered low and would only be envisaged following accidental puncture of the drums.

Manufacture of Polymer Solution

Several groups of workers may be exposed to the notified polymer after initial import and during manufacture. During manufacture of the polymer, 9 workers may be exposed each for 6 hours per day for 10 days per year. The polymer is produced initially in a closed reactor and so occupational exposure during this process would be considered unlikely.

However, filtration and storage of the original polymer solution (63.9% w/w polymer in solvents) is required as part of the manufacturing process and the filling of drums and cleaning of equipment may lead to exposure of workers to the notified polymer and solvents through inadvertent spillage. To control exposure to the notified polymer and solvents at this stage, these procedures will be conducted under local exhaust ventilation and workers will wear impervious gloves, anti-static coveralls, anti-static footwear and eye protection conforming to the relevant Australian Standards.

Manufacture of Paints

During manufacture of paints comprising up to 10% of the notified polymer, workers potentially may be exposed each for 4 hours per day for 30 days per year. Blending, filtration and storage of intermediate and final paints in 200L drums are required at these stages and these procedures are also conducted under local exhaust ventilation. The dilution of the polymer with other paint ingredients, the nonvolatile nature of the polymer and the engineering controls used to limit exposure makes inhalation exposure at this stage unlikely. However, there is the potential for spillage during decanting and mixing procedures and occupational exposure to the notified polymer may occur, predominantly via the skin. To control this exposure, workers will wear impervious gloves, anti-static coveralls, anti-static

footwear and eye protection conforming to the relevant Australian Standards.

Laboratory Testing

Laboratory development and testing occur with both the polymer solution and paints and during these handling stages a total of 6 workers may be exposed each for 8 hours per day for 20 days per year. Worker exposure to the notified polymer and other paint ingredients in the laboratory environment is controlled through the use of ventilated fume cupboards and personal protective equipment consisting of coveralls/laboratory coats, impervious gloves and eyewear.

End Use (Paint Application)

The final paint coating will be sold and shipped in 200L drums by road transport to 2 automotive original equipment manufacturers (OEMs) who will apply the coating by manual and automatic electrostatic atomised spray application techniques. The notifier has identified 4 workers involved in adding the final paint coating to an open circulation tank who are potentially exposed for 2 hours per day for 200 days per year. For spray painting, 20 workers each spending 8 hours per day for 200 days per year are expected to be involved in applying the coating and 6 workers for 2 hours per day for 200 days per year will be involved in cleaning spray equipment. Given transfer efficiencies of approximately 35% and 80% for manual and automatic electrostatic spray applications respectively, it is at this point of manual application and cleaning of spray equipment that occupational exposure to the notified polymer (at up to 10% w/w) and polymer solvents may be considered most likely.

The spray painters who potentially will be exposed to the notified polymer will be fully TAFE trained and coating of automobile components will be conducted 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, overspray will be collected in filters contained in the floor of the booth and 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 floors or in a wet scrubber in the exhaust and will be removed in a filter. The residual solids will be disposed of to secure landfill. The spray booths are subject to Australian/New Zealand Standards (AS/NZS/4114.1: 1995 Spray Painting Booths – Design, Construction and Testing (Standards Australia/Standards New Zealand, 1995a) and AS/NZS/4114.2: 1995 Spray Painting Booths – Selection, Installation and Maintenance (Standards Australia/Standards New Zealand, 1995b).

Spray painters will wear personal protective equipment consisting of impervious nylon overalls, calico hoods, cartridge type respirators and nylon gloves conforming to the relevant Australian Standards.

After application of the paint coating, the automotive components are heated to cure the coating to form a stable film. After this stage, the notified polymer is essentially immobilised within a resin matrix and not available for exposure to workers.

7. PUBLIC EXPOSURE

The notified polymer is incorporated as a component of an automotive solvent borne

clearcoat at up to 10% by weight. The clearcoat is used over waterborne basecoat coatings on the external primed surfaces of car bodies and parts. During a heat curing process, the notified polymer reacts with other components in the paint formulation to form an integral part of the paint film. As the general public is exposed to the polymer only in a stable paint film, public exposure to the notified polymer is considered to be low.

8. ENVIRONMENTAL EXPOSURE

Release

Initially the notified polymer will be fully imported. When manufactured in Australia, there is additional potential for release. Spillage of the polymer solution may occur during filtration, transfer and packaging. The notifier has not indicated the volume of spillage which may occur during manufacture. However, it is anticipated this will be low (approximately 4% of manufactured volume). These release volume estimates are expected to replace the release volume associated with reformulation once local manufacture commences.

During reformulation of fully imported polymer solution there is potential for release (approximately 4%). This may occur during filtration, blending, transfer activities, and in the course of cleaning transfer and mixing equipment. Release may also occur as residues remaining in empty polymer import and storage drums. Based on the maximum import level of 50 tonnes, this equates to approximately 2 tonnes of the notified polymer released per annum.

For both manufacture and reformulation, all spills/waste will be contained within the plant through bunding and collected by a licensed waste contractor. The notifier has stated that established procedures and good work practices will minimise the risk of spillage.

Internal and external paint wastes can be treated by suspension, steam stripping and solvent extraction to extract organic polar and non polar solvents. The remaining residues (granule) can then be readily disposed of to landfill without the requirement of incineration. This solvent extraction method is known as the Dusol Process.

Approximately 90% of the paint will be applied by the automatic method and 10% by manual method. Transfer efficiencies will be approximately 80% and 35% respectively. Overall, during spray application, an average of 25% of the notified polymer will be released as overspray which is captured in spray booth filtering systems. Based on the maximum import volume of 50 tonnes, this represents a release of 12.5 tonnes per annum. Dry non-leachable solid polymer is disposed of to landfill.

It is anticipated a further 1.5% (750 kg) of release will occur as a result of cleaning of spray and mixing equipment. The notifier indicates that paint and solvent residues removed from spray equipment would be collected and reprocessed by a solvent reclamation company. Entrained polymer solids in the solvent would be recovered during this process and sent to landfill or incinerated.

Waste generated as a result of cleaning activities will be collected by licensed waste contractors and either disposed of to landfill or incinerated. Residues will also remain in the 'empty' coating containers after use. It is estimated that up to 2% (1 tonne) of the notified

polymer will remain as residue in the containers which will be disposed of to landfill as a dry solid.

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

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 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 and nitrogen.

The solid waste generated during manufacturing, formulation and application of the coating will be disposed to landfill or incinerated. The polymer is recovered as an insoluble solid from either cleaning wastewater or solvent reclamation and is disposed of to landfill. The containers and their residues will also be disposed of in this manner. Leaching of the polymer from landfill from these sites is unlikely, given the expected low solubility of the substance and crosslinking in paint matrix. Polymer disposed of in this way could be expected to degrade slowly.

The polymer is not expected to cross biological membranes, due to the low solubility and high molecular weight, and as such should not bioaccumulate (Connell, 1989).

9. EVALUATION OF TOXICOLOGICAL DATA

No toxicological data were submitted. The notified chemical is a stable polymer with low volatility and high molecular weight. Polymers of high molecular weight and low water solubility do not readily cross biological membranes. The notifier reports that no significant occupational health issues have been described for similar polymers currently in use in Australia.

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

No ecotoxicological data were provided.

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

The polymer cross-links with other paint components to form a very high molecular weight, stable film. The polymer, as part of this surface coating, will therefore share the fate of the vehicle panel. The paint is expected to slowly deteriorate under UV light, but this is likely to be 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 until it is disposed of to landfill. Movement of the polymer by leaching from landfill sites is not expected due to its estimated low water solubility and anticipated high binding affinity to soil or cross-linking in the cured coating. Polymer disposed of to landfill is expected to degrade slowly as a result of biotic and abiotic processes.

In the event of accidental spillage of the polymer solution into waterways, the polymer is not expected to disperse into the water, but to settle out onto sediments. If the polymer is spilt on land, either during usage or transport, it is expected to become immobilised in the soil layer. Contaminated soil can then be collected and disposed of 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 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 (National Occupational Health and Safety Commission, 1999a). However, the systemic toxicity of the notified polymer is likely to be low, given its high molecular weight and consequent low bioavailability.

The majority of the monomers from which the polymer is produced are hazardous substances with associated health effects such as dermal and respiratory irritation and dermal sensitisation. However, the residual monomers are present at low concentrations (all <0.1% w/w) and so are expected not to contribute to a health risk.

The polymer solution containing the notified polymer is a hazardous substance due to the presence of aromatic hydrocarbons and xylene (National Occupational Health and Safety Commission, 1999b). For the same reasons, the polymer solution is an S5 scheduled poison (Australian Health Ministers' Advisory Council, 1998). In accordance with the *Australian Code for the Transport of Dangerous Goods by Road and Rail* (Federal Office of Road Safety, 1998), it is also a Class 3 dangerous good (flammable liquid) due to the presence of these solvents. The Material Safety Data Sheet (MSDS) for the solution containing the notified polymer details a number of health effects, including skin and eye irritation, headaches, nausea, vomiting and central nervous system depression leading to loss of co-ordination and impaired judgment. These effects relate to the solvents rather than to the notified polymer itself.

Occupational Health and Safety

Both the notified polymer in solution and the final paint containing the polymer/resin will be manufactured at the notifier's plant. However, prior to plant scale up for local manufacture, the polymer solution will be imported. Import and storage will be in 200L drums. Occupational exposure to the notified polymer during import and storage would only be envisaged following accidental puncture of the drums. Therefore, the health risk is low.

Following one year of import, the polymer solution will be manufactured locally. The polymer will be produced in a closed reactor and so occupational exposure at this point would be considered unlikely. Manufacture of paints incorporating the notified polymer is to occur locally. During filtration and storage of the polymer solution containing approximately 64% of the notified polymer and blending, filtration and storage of intermediate and final paints containing 10% of the notified polymer, there exists potential for spillage and occupational exposure predominantly via the skin. Mixing and filling are conducted using exhaust ventilation and these measures combined with the involatile nature of the polymer makes inhalation exposure unlikely. There is potential for exposure to the notified polymer during manufacture and paint manufacture, but given the expected low toxicity of the notified polymer, the health risk to workers would be assessed as low. Dermal exposure will be minimised by the use of personal protective equipment required for handling the solvents.

The final paint coating will then be sold and shipped in 200L drums by road transport to 2 automotive OEMs who will apply the coating by manual and automatic electrostatic atomised spray application techniques. Given transfer efficiencies of approximately 35% and 80% for manual and automatic electrostatic spraying respectively, it is at this point of manual application that occupational exposure to the notified polymer may be considered most likely. The spraying procedure produces a dense aerosol of paint particles which would likely impact on human health even in the absence of additional hazardous solvents, stabilisers and other components.

During final paint preparation and spray painting procedures, worker exposure needs to be limited through a combination of engineering controls such as exhaust ventilated paint kitchens and laminar spray booths and personal protective equipment consisting of impervious nylon overalls, calico hoods, cartridge type respirators and nylon gloves. These controls are to conform to the relevant Australian Standards. Under these circumstances, given the low toxicity of the notified polymer and the equipment used to control exposure, the health risk is considered low.

It should be noted that the final applied paint product contains extra ingredients including potentially toxic solvents such as xylene and other aromatic hydrocarbons and it is important that appropriate measures are taken to include control of exposure to these components. These solvents with their relevant exposure standards (National Occupational Health and Safety Commission, 1995) are listed previously under additives/adjuvants. Thus, it is important that the final paint is applied and overspray controlled in a manner conforming to appropriate occupational health and safety regulations such as the *NOHSC Spray Painting Guidance Material* (National Occupational Health and Safety Commission, 1999c) and that employers ensure that the exposure standards for these solvents are adhered to in the workplace.

Following curing of the paint, the polymer will be cross-linked with other paint components to form a high molecular weight stable film. In this form, the polymer is essentially unavailable for absorption and thus the health risk to workers from the notified polymer after paint curing would be negligible.

Public Health

The public will come into contact with the notified polymer after it has been applied to and become an integral part of a hard durable coating on motor vehicles. This coating is formed

by the reaction of this polymer and others in the paint with a cross-linking resin under the action of heat to form a stable, high molecular weight paint film. Therefore, the health risk to the public induced by the notified polymer is considered to be low.

13. RECOMMENDATIONS

To minimise occupational exposure to Polymer in Acrylic Resin HC-91-5835, the following guidelines and precautions should be observed:

- The paints containing the notified polymer should be applied in accordance with the National Guidance Material for Spray Painting (National Occupational Health and Safety Commission, 1999c);
- Employers should ensure that NOHSC exposure standards for the polymer solution and the paint mixes 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 3765.1 (Standards Australia, 1990); impermeable gloves should conform to AS/NZS 2161.2 (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 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.

14. MATERIAL SAFETY DATA SHEET

The MSDS for the notified chemical was provided in a format consistent with the *National Code of Practice for the Preparation of Material Safety Data Sheets* (National Occupational Health and Safety Commission, 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 may be required if any of the circumstances stipulated under section 64 of the Act arise. No other specific conditions are prescribed.

16. REFERENCES

Australian Health Ministers' Advisory Council (1998) Standard for the Uniform Scheduling of Drugs and Poisons, No. 12. Australian Government Publishing Service, Canberra.

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Standards Australia/Standards New Zealand (1998) Australian/New Zealand Standard 2161.2-1998, Occupational protective gloves, Part 2: General requirements. Standards Association of Australia, Sydney.