

File No: NA/763

November 1999

**NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION  
AND ASSESSMENT SCHEME**

**FULL PUBLIC REPORT**

**Polymer in Acrylic Resin HC-74-3333**

This Assessment has been compiled in accordance with the provisions of the *Industrial Chemicals (Notification and Assessment) Act* 1989 (the Act) and Regulations. This legislation is an Act of the Commonwealth of Australia. The National Industrial Chemicals Notification and Assessment Scheme (NICNAS) is administered by the National Occupational Health and Safety Commission which also conducts the occupational health & safety assessment. The assessment of environmental hazard is conducted by the Department of the Environment and the assessment of public health is conducted by the Department of Health and Aged Care.

For the purposes of subsection 78(1) of the Act, copies of this full public report may be inspected by the public at the Library, National Occupational Health and Safety Commission, 92-94 Parramatta Road, Camperdown NSW 2050, between the following hours:

Monday - Wednesday	8.30 am - 5.00 pm
Thursday	8.30 am - 8.00 pm
Friday	8.30 am - 5.00 pm

Copies of this full public report may also be requested, free of charge, by contacting the Administration Coordinator on the fax number below.

For enquiries please contact the Administration Coordinator at:

*Street Address:* 92 Parramatta Rd Camperdown, NSW 2050, AUSTRALIA

*Postal Address:* GPO Box 58, Sydney 2001, AUSTRALIA

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

Director  
Chemicals Notification and Assessment

**FULL PUBLIC REPORT****Polymer in Acrylic Resin HC-74-3333****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 HC-74-3333.

**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-74-3333

**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 in solution and is never isolated. The properties reported below are variously those of the paint component containing the notified polymer in mixed organic solvents and of the notified polymer itself, as stated. Little data on the physico-chemical properties of the notified polymer or of the polymer solution or paint component were provided by the notifier.

**Appearance at 20°C and 101.3 kPa:** opaque mauve liquid

**Boiling Point:** not determined (see comments below)

**Specific Gravity:** 1.08 (calculated) for the polymer

**Vapour Pressure:** the notified polymer is not expected to be volatile

**Water Solubility:** the notifier states that the polymer is expected to be of low water solubility (see comments below)

<b>Hydrolysis as a Function of pH:</b>	no groups are expected to be hydrolysed under normal environmental conditions
<b>Partition Co-efficient (n-octanol/water):</b>	not determined (see comments below)
<b>Adsorption/Desorption:</b>	not determined (see comments below)
<b>Dissociation Constant:</b>	not determined (see comments below)
<b>Particle Size:</b>	not applicable as the polymer is not isolated from solution
<b>Flash Point:</b>	12°C for the solution (due to the solvent n-butyl acetate)
<b>Flammability Limits:</b>	Upper Explosive Limit = 7.6 % Lower Explosive Limit = 1.7 % (for the solvent n-butyl acetate)
<b>Autoignition Temperature:</b>	425°C for the solution (similar to the solvent n-butyl acetate)
<b>Explosive Properties:</b>	the polymer is not expected to be explosive
<b>Reactivity/Stability:</b>	the polymer is expected to be stable

### **Comments on Physico-Chemical Properties**

The notifier claims that by analogy with similar polymers, the polymer is not expected to be volatile under the conditions of use. The polymer solution is expected to boil at the boiling point of the solvent.

The water solubility was not determined as the polymer is not isolated from solution, but the notifier states that the polymer is expected to be of low solubility by analogy with similar polymeric structures since it is non-ionic, of high molecular weight and contains a high level of aliphatic and hydrophobic groups. The notified polymer does however contain a large proportion of amine functionalised side chains, which may be protonated and result in significant water solubility.

The polymer contains ester linkages that could be expected to undergo hydrolysis under extreme pH conditions. This is the most likely means of abiotic degradation for the polymer. However, due to the low water solubility, this 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, although the polymer contains a tertiary amine nitrogen expected to have typical basicity. Protonation of the polymer is likely to be slow due to steric hindrance and the low solubility of the polymer.

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:** > 99.5 %; imported as a paint in solution in mixed organic solvents at 15 % (w/v)

**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. The monomers include a number of hazardous substances, including skin sensitisers.

**Hazardous Impurities:** none

#### Additives/Adjuvants:

The Material Safety Data Sheet (MSDS) identifies a number of components of the final paint component, including the following solvents which have national exposure standards.

<i>Solvent</i>	<i>CAS number</i>	<i>Weight %</i>	<i>NOHSC Exposure standard</i>	<i>Risk phrases</i>
n-butyl acetate	123-86-4	< 29	150 ppm TWA, 200 ppm STEL	
xylene (mixed isomers)	1330-20-7	< 9	80 ppm TWA, 150 ppm STEL	R20/2 1 R38
acetone	67-64-1	< 9	500 ppm TWA, 1000 ppm STEL	
ethyl acetate	141-78-6	< 9	400 ppm TWA	
toluene	108-88-3	< 9	100 ppm TWA, 150 ppm STEL	R20

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

#### 5. USE, VOLUME AND FORMULATION

The notified polymer will be imported in an automotive refinish primer coating at 15 % (w/w). It will be imported at a volume of 1 to 10 tonnes of polymer in the first five years. No reformulation will occur in Australia.

## 6. OCCUPATIONAL EXPOSURE

Pre-prepared paints containing the notified polymer will be imported in 1 L and 4 L steel cans. Containers will be transported by road to the notifier's warehouse for dispatch 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 notifier has indicated that an 2 to 5 waterside workers, 2 to 5 transport workers and 4 to 8 storage workers will handle the product containing the notified polymer 10 to 50 times per year, for 2 to 3 hours per day.

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.

### *End Use*

The notifier estimates that as many as 1000 spray painters 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 200 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; eye protection, impervious gloves and anti-static flame retardant overalls and footwear while mixing the paint, and, in addition, an air fed breathing mask 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. In the event of an accidental spill, the polymer will remain part of the paint, which the notifier states should be scraped up and placed in suitable containers for disposal. The polymer would not be expected to partition into the aqueous compartment, but rather to associate with the sediments, as detailed below. Waste from the industrial use of the polymer will be disposed of through a licensed waste disposal contractor in approved landfill. The polymer in the form of uncured paint will therefore remain within the industrial domain, and public exposure due to the environmental spread of the polymer is unlikely.

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. In addition, as the notified polymer is part of a primer coating, it is likely to be covered by a top coat of paint.

## **8. ENVIRONMENTAL EXPOSURE**

### **Release**

Should spills occur prior to delivery to the customer, the product will be contained within the warehouse through bunding and wastes collected by a licensed waste contractor. The notifier has stated that established procedures and good work practices will minimise the risk of spillage.

There is potential for release during transfer, mixing and application of the primer, during cleaning of spray painting and mixing equipment, and as residues remaining in empty primer cans.

Release as a result of mixing and transfer (spillage) is expected to be in the vicinity of 1 %. Based on the maximum import level of 10 tonnes, this equates to approximately 100 kg per annum.

During spray application, overspray of approximately 70 % will occur. This equates to a maximum of 7000 kg of waste polymer being released per annum. Overspray is captured in spray booth filtering systems. This waste will be collected by licensed waste disposal contractors, treated and sent to landfill.

It is estimated that approximately 150 kg (1.5 % of the imported volume) of waste will be generated during 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. Solid 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' containers after use. It is estimated that up to 200 kg (2 % of the container contents) of the notified polymer will remain as residue in the containers and 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 cross linked

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 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 and nitrogen.

The solid waste generated in the manufacturing, formulation and application of the coating will be disposed of to landfill or by incineration. The polymer is recovered as an insoluble solid from the wastewater used for cleaning and also disposed of to landfill. The containers and their residue will also be disposed of in this manner. Leaching of the polymer from landfill from these sites is unlikely, given the low solubility of the substance, which should be slowly degraded through abiotic and bacteriological processes.

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, 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**

The polymer cross-links with other coating 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 coating 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 until it is disposed of to landfill.

Movement of the polymer by leaching from landfill sites is not expected because of its lack of mobility due to both its low water solubility and high binding affinity to soil and 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 settle out onto sediments. If the solution 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 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**

No toxicological information has 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, 1999b). However, the systemic toxicity of the polymer is likely to be low due to its high molecular weight and consequent low bioavailability. The polymer is produced from monomers which are hazardous substances, with health effects such as severe irritation and skin sensitisation. However, all residual monomer levels are less than 0.2 %, and the residual monomers are unlikely to contribute significantly to the health risk.

The polymer solution HC-74-3333 is a hazardous substance due to the concentration of xylene and toluene. It is also a Class 3 dangerous good (flammable liquid) due to the solvent content. The MSDS for the polymer solution HC-74-3333 lists a number of potential health effects, namely headaches, dizziness, nausea, vomiting, skin, eye and respiratory irritation, central nervous system depression and chronic central nervous system disorders. These relate mainly to the solvents, n-butyl acetate, xylene, acetone, ethyl acetate and toluene, 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 use and disposal of the paints.

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 n-butyl acetate, xylene, acetone, ethyl acetate and toluene, identified as ingredients in the polymer solution HC-74-3333. 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. In addition, the notified polymer will be contained in a primer layer which will be covered by additional paint layers. Therefore, based on its use pattern, physico-chemical characteristics and likely low toxicity, the notified polymer will not pose a significant hazard to public health.

### **13. RECOMMENDATIONS**

To minimise occupational exposure to Acrylic Resin HC-74-3333 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 notified chemical 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**

American Conference of Government Industrial Hygienists (1998). TLVs and Other Occupational Exposure Values.

Connell D. W. (1990) General characteristics of organic compounds which exhibit bioaccumulation. In Connell D. W., (Ed) Bioaccumulation of Xenobiotic Compounds. CRC Press, Boca Raton, USA.

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

National Occupational Health and Safety Commission (1999a) List of Designated Hazardous Substances [NOHSC:10005(1999)]. Australian Government Publishing Service, Canberra.

National Occupational Health and Safety Commission (1999b) Approved Criteria for Classifying Hazardous Substances [NOHSC:1008(1994)]. Australian Government Publishing Service, Canberra.

National Occupational Health and Safety Commission (1999c) National Guidance Material for Spray Painting. Australian Government Publishing Service, Canberra.

Sax NI & Lewis RJ (1996) Dangerous Properties of Industrial Materials. Van Nostrand Reinhold, New York.

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

Standards Australia (1990) Australian Standard 3765.2-1990, Clothing for Protection against Hazardous Chemicals Part 2 Limited protection against specific chemicals. Standards Association of Australia.

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

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.

Standards Australia/Standards New Zealand (1994) Australian/New Zealand Standard 2210-1994, Occupational Protective Footwear. Standards Association of Australia/Standards Association of New Zealand.

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.

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.

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