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April 1999

**NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION  
AND ASSESSMENT SCHEME**

**FULL PUBLIC REPORT**

**Polymer in Polyester Resin HP-39-4676**

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Director  
Chemicals Notification and Assessment

**FULL PUBLIC REPORT****Polymer in Polyester Resin HP-39-4676****1. APPLICANT**

PPG Industries Australia Pty Ltd of McNaughton Road CLAYTON VIC 3168 has submitted a limited notification statement in support of their application for an assessment certificate for Polymer in Polyester Resin HP-39-4676.

**2. IDENTITY OF THE CHEMICAL**

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

**Trade Name:** 771358 Polyester Resin  
Polyester Resin HP-39-4676 (70% of notified chemical)

**Number-Average  
Molecular Weight (NAMW):** > 1 000

The notified polymer is in a solution of solvents comprising xylene and 2-methoxy-1-methylethyl acetate.

**3. PHYSICAL AND CHEMICAL PROPERTIES**

Physical and chemical data were derived from Polyester Resin HP-39-4676, the product containing the notified polymer at 70%, as the polymer is not isolated from its solvent solution.

**Appearance at 20°C  
and 101.3 kPa:** colourless viscous liquid

**Boiling Point:** 138-146°C - see comment below

**Specific Gravity:** 1.12 (1.17 calculated for pure polymer)

<b>Vapour Pressure:</b>	0.49 kPa - see comment below
<b>Water Solubility:</b>	not determined - see comment below
<b>Partition Co-efficient (n-octanol/water):</b>	not determined - see comment below
<b>Hydrolysis as a Function of pH:</b>	not determined - see comment below
<b>Adsorption/Desorption:</b>	not determined - see comment below
<b>Dissociation Constant:</b>	not determined - see comment below
<b>Particle Size:</b>	not applicable
<b>Flash Point:</b>	52°C (solvent)
<b>Flammability Limits:</b>	1-7% (solvent)
<b>Autoignition Temperature:</b>	333°C (solvent)
<b>Explosive Properties:</b>	stable under use conditions
<b>Reactivity/Stability:</b>	stable, but like other organic compounds should be segregated from oxidising agents

#### **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 also expected to boil at the temperature of the solvent, while the vapour pressure of the polymer is predicted to be very low with the value given above that of the main solvent (2-methoxy-1-methylethyl acetate). The water solubility was not determined, but the notifier states that the polymer is expected to be of low solubility since it is non-ionic, of high molecular weight and contains a high level of aliphatic and hydrophobic groups. Dissociation constant data were not provided as the notifier claims that the polymer has no units likely to dissociate.

The polymer contains ester linkages which could be expected to undergo hydrolysis under extreme pH conditions. However, due to the very 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 very low water solubility, the polymer is expected to

become associated with the organic component of soils and sediments. Since it is of high molecular weight it is not expected to cross biological membranes and will not bioaccumulate.

The polymer solution is flammable due to the solvent content. It is a Class 3 Dangerous Good.

#### 4. PURITY OF THE CHEMICAL

**Degree of Purity:** > 90%

**Additives/Adjuvants:**

<i>Additives</i>	<i>CAS Number</i>	<i>% Weight</i>
xylene	1330-20-7	1-9
2-methoxy-1-methylethyl acetate	108-65-6	10-29

**Degradation Products:** stable under normal conditions of use.

**Loss of Monomers, Additives, Impurities:** solvents may be gradually lost from the solvent solution, however, no loss of monomers will occur

#### 5. USE, VOLUME AND FORMULATION

The notified polymer is a component of paint which will be applied to motor vehicles.

The notified polymer will initially be imported in solution from Europe in paint product containing up to 50% of polymer. It is expected that after 2 years the polymer solution (a 70% solution in a mixture of solvents) will be either be imported from Europe or manufactured at the notifier's resin plant in Australia. It is expected that beyond year 2, up to 80% of the polymer will be exported as paint. Estimated import/manufacture volumes for the notified polymer will be 10-100 tonnes in year 1 and 100-1 000 tonnes during years 2-5.

#### 6. OCCUPATIONAL EXPOSURE

Pre-prepared paints containing the notified polymer will be imported in 3.5, 4, 15 and 20 L tinplate 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 to the customer sites. The individual product containers are not expected to be opened before arrival at the end use site and that the likelihood of a spill is low.

The polymer solution, Polyester Resin HP-39-4676, will initially be imported in 200 L steel drums. At a later date, this polymer solution may be locally manufactured then transferred for reformulation 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.

For all scenarios, skin contamination will be the main route of exposure to the notified polymer. During handling of the polymer to the notified solution, the generation of mists leading to possible inhalational exposure is unlikely due to the highly viscous nature of the polymer solution. However, inhalational exposure may occur during spray painting.

#### *Laboratory Development*

The notifier indicated that 6 laboratory workers would be involved in trials for the manufacture of the polymer and 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 laboratory coat and safety glasses would be expected.

#### *Polymer Manufacture*

The polymer manufacture, when commenced, will involve 9 workers for up to 8 hours per day, 10 days per year. The reactants and solvents will be added to an enclosed reactor, and the resultant polymer solution will be filtered and filled into 200 L steel drums. During the filling process, there is potential for dermal exposure to the polymer solution in the form of drips and spills. As the polymer solution will be viscous, the formation of aerosols is unlikely.

The 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.

#### *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: 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 6 000 spray painters in up to 3 000 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* and AS/NZS/4114.1:1995 *Spray Painting Booths – Selection, Installation and Maintenance*. 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 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**

Paint will only be applied by professional spray painters, therefore public contact will only occur from touching the dried film on automobiles. The paint film consists of polymer that has crosslinked with other paint components to form a high molecular weight, stable paint film. The notifier states that there is no loss of monomers, additives or impurities during the life of the coating on the motor vehicle, and no significant occupational health problems have been associated with the use of similar polymers in Australia. Consequently, the potential

for public exposure to the notified polymer during all phases of its life cycle, is considered to be negligible.

## **8. ENVIRONMENTAL EXPOSURE**

### **Release**

There is potential for release during the polymer manufacture, the coating formulation and the coating application. The manufacturing and formulation processes will take place at the PPG plant and any spills that occur will be contained by the plant bunding. The coating 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 resulting surface coat may be heat cured. Cleaning of the spray gun and mixing equipment will generate waste which will be collected and disposed of in the same manner as waste water from the spray booth.

During the manufacturing and formulation processes, the notifier estimates that up to 20 tonnes per year of waste polymer would be generated at the PPG plant. During coating application it is expected that 70 tonnes of polymer waste during the first year and 140 tonnes of waste during subsequent years will be produced.

Some residue (2% of the container contents) will also remain in the 'empty' containers after use. It is estimated that 2 tonnes in the first year and 4 tonnes annually in subsequent years will remain as residue in the containers.

### **Fate**

The polymer, as part of the automotive surface coating, will share the fate of the vehicle panel, potentially being recycled as scrap. Incineration of the coating would emit noxious fumes including oxides of carbon.

The solid waste generated in the manufacturing, formulation and application of the coating will be disposed to landfill (although incineration is an option). It is assumed that 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 in this manner. Leaching of the polymer from landfill from these sites is unlikely, given the low solubility of the substance.

Hydrolysis is theoretically possible because of the presence of ester groups in the polymer, but is unlikely given the mild environmental pH range (pH 4 to 9). 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 provided.

## **10. ASSESSMENT OF ENVIRONMENTAL EFFECTS**

No ecotoxicology 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 would 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 because of the low water solubility and high binding affinity to soil or cross-linking in the cured coating.

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 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**

The notified polymer has a high molecular weight and is unlikely to cross biological membranes and cause local or systemic health effects. The level of individual residual monomers is low. The level of low molecular weight species is high and the toxicological hazards of these low molecular species were not investigated by the notifier. However, when embedded in the cured paint coating on motor vehicles they are unlikely to be bioavailable. On the limited available data, the notified polymer would not be classified as a hazardous substance according to the NOHSC *Approved Criteria for Classifying Hazardous Substances* (National Occupational Health and Safety Commission, 1994a).



The main solvent, 2-methoxy-1-methylethyl acetate, in the polymer solution is an eye irritant and the polymer solution Polyester Resin HP-39-4676 is a hazardous substance. The polymer solution is also classed as a dangerous good (flammable liquid) because of the solvent content. The MSDS for the polymer solution lists a number of potential health effects, namely nausea, vomiting, skin, eye and respiratory irritation, central nervous system depression and chronic central nervous system disorders. These relate to the solvents, 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 manufacture and reformulation of the polymer, during the local production of the paint components, and in the use and disposal of the paints.

During the manufacture and reformulation processes, the main exposure route for the notified polymer will be dermal. The paints and polymer solutions will be viscous, and 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 chemical.

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, other hazardous ingredients may be present. 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 *Draft National Code of Practice for Spray Painting* (National Occupational Health and Safety Commission, 1991). 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 ingredients.

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

There is a NOHSC exposure standard for xylene, identified as an ingredient in Polyester Resin HP-39-4676. The employer is responsible for ensuring that the exposure standard, 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*

Based on its use pattern and physico-chemical characteristics, the notified chemical will not pose a significant hazard to public health when used in the proposed manner.

### **13. RECOMMENDATIONS**

To minimise occupational exposure to the Polymer in Polyester Resin HP-39-4676 the following guidelines and precautions should be observed:

- 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, 1994b);
- Respirator should conform to AS/NZS 1715 (Standards Australia/Standards New Zealand, 1994a);
- 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.

#### **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, 1994b).

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

#### **15. REQUIREMENTS FOR SECONDARY NOTIFICATION**

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

#### **16. REFERENCES**

National Occupational Health and Safety Commission (1991) Draft National Code of Practice for Spray Painting. Canberra, Australian Government Publishing Service.

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

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

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

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

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

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

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

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

Standards Australia/Standards New Zealand (1998) AS/NZS 2161.2:1998 Occupational protective gloves, Part 2: General requirements, Standards Australia/Standards New Zealand.