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**NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION
AND ASSESSMENT SCHEME**

FULL PUBLIC REPORT

Polymer in WR-33-1837

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FULL PUBLIC REPORT**Polymer in WR-33-1837****1. APPLICANT**

PPG Industries Australia Pty Ltd of McNaughton Road, Clayton, Victoria, 3168 (ACN 055 500 939) has submitted a limited notification statement in support of their application for an assessment certificate for the new synthetic polymer in WR-33-1837.

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 Names: WR-33-1837
E6237, E6176

3. PHYSICAL AND CHEMICAL PROPERTIES

The following data relate to the notified polymer at a concentration of 36 % w/w dispersed in water, or for the notified polymer itself, as indicated. The polymer itself is never isolated from the *in situ* manufactured resin solution.

Appearance at 20°C and 101.3 kPa: light amber, slightly viscous turbid liquid (dispersion)

Boiling Point: not determined

Specific Gravity: 1.036 (dispersion)

Vapour Pressure: the notified polymer is not volatile

Water Solubility: > 161 g/L at pH 1
> 142 g/L at pH 7
> 116 g/L at pH 10 and 20°C (notified polymer)

n-octanol Solubility: 92.6 g/L (notified polymer)

Partition Co-efficient (n-octanol/water): Log P_{ow} = -0.19 (notified polymer)

Hydrolysis as a Function not determined (see comments below)

of pH:

Adsorption/Desorption:	not determined (see comments below)
Dissociation Constant:	not determined (see comments below)
Particle Size:	not applicable as the polymer is never isolated from solution
Flash Point:	not flammable (dispersion)
Autoignition Temperature	does not autoignite (notified polymer)
Explosive Properties:	not explosive
Reactivity/Stability:	stable at ambient temperatures

3.1. Comments on Physico-Chemical Properties

Testing for water solubility at pH 1, pH 7 and pH 10 was undertaken in accordance with OECD Guideline 105 (standard flask method) using GPC/UV detection (Dix, 1999a).

Testing for solubility in n-octanol was undertaken in accordance with OECD Guideline 105 (standard flask method) using GPC/UV detection (Dix, 1999b). The solubility of the notified polymer in n-octanol was determined as 92.6 ± 3.36 g/L. Given the water solubility at pH 7 of 142 g/L, the ratio P_{ow} is calculated to be 0.65 ($\text{Log } P_{ow} = -0.19$). This indicates that the polymer has high affinity for both aqueous and oil phases.

Adsorption/desorption data was not provided. As the polymer is more soluble in water than n-octanol, it may be mobile in the soil environment. However in the environment, mobility may be reduced due to the weak association of the positive charges in the polymer with the surface of negatively charged clay minerals and the carboxylate groups of humic material in soil.

In the polymer dispersion, the neutralising acid partially protonates the base polymer sufficiently to stabilise it as a micelle. No pK_a data were provided but the amine groups could be expected to behave as typical aliphatic tertiary amines and be appreciably basic. Consequently the amine groups would be protonated and carry positive charge in the usual environmental pH range.

The polymer contains no hydrolysable groups and is expected to be stable in the environmental pH range (4 - 9).

4. PURITY OF THE CHEMICAL

Degree of Purity:	> 85 %
Maximum Content of Residual Monomers:	all residual monomers are present at below the cutoff levels for classification of the polymer as hazardous; other reactants used in forming the final polymer dispersion are also below the respective cutoff levels for classification of the polymer as hazardous
Toxic or Hazardous Impurities:	none present apart from residual monomers
Non-hazardous Impurities (> 1% by weight):	none
Additives/Adjuvants:	
<i>Chemical name:</i>	acetic acid
<i>CAS No.:</i>	64-19-7
<i>Weight percentage:</i>	< 5 % in polymer solution; exact concentration is exempt information
<i>Toxic properties:</i>	corrosive, eye and skin irritant (NOHSC, 1999a)
	NOHSC exposure standard 10 ppm TWA, 15 ppm STEL (NOHSC, 1995)

5. USE, VOLUME AND FORMULATION

The notified polymer will not be manufactured in Australia. It will be imported as part of an aqueous coating resin formulation at less than 5 % (w/v). The formulated product will be diluted by approximately a factor of two prior to end use. The coating resin formulation will be imported mainly in 20000 L isotanks, but 208 L drums or 1041 L tote tanks will be used for around 10 % of the imported volume.

The polymer will be used as a flexibiliser resin in an electrodepositable coating composition used as a primer coating for automobile bodies in an immersion bath. The polymer will only be used in automobile assembly plants.

The import volume within the first five years will be a maximum of 19 tonnes per annum.

6. OCCUPATIONAL EXPOSURE

Transport and Storage

The notified polymer as part of a formulated aqueous coating resin product will be transported from the docks to the notifier's warehouse, where it will be distributed to the customer sites. The notifier expects that 2 - 6 waterside workers and 2 - 4 warehouse workers, along with an unspecified number of transport drivers, will handle the containers of the coating formulation containing the notified polymer, for approximately 6 hours, 100 times a

year. The original containers will not be opened, so it is unlikely that these workers will be exposed, except in the event of an accident involving the rupture of a drum or tank.

Primer Application

The notified polymer is used in a section of the automated production line in automobile assembly plants. The electrodeposition process involves the use of a potentially dangerous electric current in a wet environment, so the plant operators and the bath containing the notified polymer are physically separated during the normal operation of the production line.

The notifier estimates that a total of 12 plant operators, 12 plant technical operators and 4 laboratory workers will be exposed to the notified polymer. The exposure is estimated to be for 2 hours per shift, 250 times per year for plant operators, 4 hours per shift, 250 times per year for plant technical operators and 6 hours per shift, 100 times per year for laboratory workers.

The product containing the notified polymer will be transferred by plant operators from the import tanks to a storage tank using a coupling hose. There is possibility of dermal exposure to drips and spills when the containers are exchanged and the transfer hoses are disconnected and reconnected.

The formulation containing the notified polymer is dispensed into a large water bath from the storage tank via a fixed automated transfer system.

The automobile bodies are lowered into the water bath by the production line conveyor until completely submerged; a negative voltage is then applied and the electrostatically charged paint is deposited onto the body. The conveyor then lifts the automobile body out of the bath and excess polymer solution is washed off back into the bath with water; the concentration of the bath is maintained as the wash water is recirculated from the bath through an ultrafiltration system. The automobile body is then transferred by conveyor to a baking oven, where the crosslinking reaction occurs. After this process, the polymer coating is crosslinked and the notified polymer is no longer separately available for exposure.

There is a need for periodic sampling and testing of the bath contents to ensure that the concentrations of all of the paint components, including the notified polymer, are maintained. Dermal exposure of plant technical operators to the bath contents is possible during sampling. The testing is performed by laboratory personnel. Dermal exposure to small quantities of the bath contents of these workers is also possible.

Exposure may also occur during bath cleaning. The process is continuous with topping up of the electrocoat concentration through the automated system, but bath cleaning will occur every one to two years. The notifier states that the bath contents will be pumped into a storage tank through fixed piping, along with water used to rinse the walls of the tank. Residual washings and sludge will be removed by waste disposal contractors who may have dermal exposure to low concentrations of the notified polymer.

The bath containing the notified polymer is enclosed and local exhaust ventilation is used to remove any solvent vapours which may be present. The baking oven will be vented to the atmosphere through an afterburner at 760°C, which will remove any oven fumes.

Workers in the electrocoat sections of the car plants would be expected to wear gloves,

protective eyewear and clothes, and other personal protective equipment as required.

7. PUBLIC EXPOSURE

The notified polymer will only be used by industrial automobile manufacturers, and is not available to the public. Once applied to the automobile body, the notified polymer is bound in an insoluble polymeric matrix, and not separately available for exposure. In addition, it will be covered by several layers of paint. Consequently, the potential for public exposure to the notified polymer through all phases of its life cycle is considered to be extremely low.

8. ENVIRONMENTAL EXPOSURE

8.1. Release

Due to the transfer efficiency and material recovery systems inherent to the electrodeposition process, release of the notified polymer is not expected during the coating operation.

Accidental spillage from material transfer processes at customer sites may be a source of release. Any spills would be contained to the plant by bunding, collected and removed by licensed waste contractors. The notifier predicts that the maximum amount of spillage would be 1 % per year, which is equivalent to 190 kg of the notified polymer.

Large import containers containing residual polymer will be returned to the USA. Polymer released from the washing of small import containers is expected to be up to 3 % of the volume in these containers, equivalent to 60 kg per year (based on 10 % of the total import volume arriving in smaller containers). The notifier states that licensed waste contractors would dispose of this liquid waste, presumably in a similar manner to waste from spills.

Samples withdrawn for quality testing will result in release to the environment of approximately 5 kg/year of the polymer. Licensed waste contractors will remove the waste.

The notifier indicated that electrodeposition baths are cleaned approximately every one or two years. The process involves transferring the bath contents to a fully enclosed storage tank via permanent piping and washing the internal walls of the bath with water as the contents are being transferred. Licensed waste contractors will remove the residual washings and sludge from the bottom of the tank. After collection, the waste is treated by flocculation, filtration and centrifugation to separate the solid polymeric material from the water. The water is discharged to the sewer and the sludge is dried and sent to secure landfill. The notifier did not indicate the volume of new polymer likely to be released as a consequence of these operations, but it is estimated that this would be unlikely to exceed 5 % of total imports. This equates to a maximum annual release of around 950 kg of the new polymer. It is likely that waste from accidental spillage, quality testing and washing of drums would undergo similar treatment and release to secure landfill.

After the polymer has been cross linked into the paint matrix, there is little possibility for release. Any release would be in the form of inert flakes of cured paint.

8.2. Fate

Most of the notified polymer becomes part of a durable paint film on the metal surfaces of motor vehicles, and consequently the fate of the majority of the material and the car bodies themselves will be shared. This is likely to be either recycling for metal recovery, or deposition into landfill. In landfill, the cured paint film containing the notified polymer would be expected to very slowly degrade by microbiological processes with release of gases such as carbon dioxide, methane, ammonia and nitrogen. During metal recovery, the organic paint coatings would be destroyed in the high blast furnace temperatures, and the polymer would be decomposed to water vapour and oxides of carbon and nitrogen.

In landfill, the notified polymer after treatment is unlikely to be mobile, as it will be securely contained within a conglomerate of solid, dried solid waste.

If the uncured polymer was released to the soil as result of accidental spills, the polymer may be mobile in the soil environment due to its water solubility. However, movement may be reduced due to the weak association of the positive charges in the polymer with the surface of negatively charged clay minerals and carboxylate groups in the humic material of soil. While not readily biodegradable, the polymer may degrade through the action of biological and abiotic processes during prolonged residence in landfill.

The potential for biodegradation of the notified polymer in water was determined by the Carbon Dioxide Evolution Modified Sturm Test method (OECD TG 301B) (McLaughlin, 1999). The polymer did not undergo biodegradation to CO₂ during the time frame of the study, and results indicated that the polymer was slightly toxic to the activated sludge microbes.

Direct release of the polymer to the water compartment is not expected, except in the case of a transport accident. In the event of such an accident, the polymer could be expected to rapidly disperse and dissipate slowly through adsorption and degradation. It would not be expected to cross biological membranes due to its high molecular weight and should not bioaccumulate (Connell, 1990).

9. EVALUATION OF TOXICOLOGICAL DATA

Toxicity data are available for the notified polymer as a 36 % aqueous dispersion. The dose was corrected for the concentration of active ingredient. No other toxicity data are available.

9.1 Acute Toxicity

9.1.1 Oral Toxicity (Kern, 1999)

Species/strain: rat/Crl:CD[®](SD)IGS BR

Number/sex of animals: 5/sex

<i>Observation period:</i>	14 days
<i>Method of administration:</i>	gavage; 36 % aqueous dispersion
<i>Dose:</i>	single dose, 2000 mg/kg notified polymer
<i>Test method:</i>	OECD TG 401
<i>Mortality:</i>	there were no deaths during the study
<i>Clinical observations:</i>	for seven animals, various discoloured areas due to discharges (wet or dried red or yellow, around the eyes, nose, hind limbs, base of tail, anogenital or urogenital areas); abnormal defecation (mucoid faeces, soft faeces or decreased defecation) was observed for five animals; no other clinical signs of toxicity were observed during the study
<i>Body weights:</i>	one female lost weight during the second week of the study
<i>Morphological findings:</i>	there were no gross pathological changes observed
<i>LD₅₀:</i>	> 2000 mg/kg
<i>Result:</i>	the notified polymer was of very low acute oral toxicity in rats

9.2 Overall Assessment of Toxicological Data

The acute oral toxicity of the notified polymer is very low. No studies of dermal or inhalation toxicity or skin irritation or sensitisation were provided by the notifier, and the notified polymer cannot be classified for these health effects.

Polymers of high molecular weight do not readily cross the skin or other biological membranes, and the overall toxicity is expected to be low. The notified polymer will have surfactant properties and is a possible skin and eye irritant due to its defatting properties.

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

The notifier provided the following ecotoxicity data in support of their application.

<i>Test</i>	<i>Species</i>	<i>Results (nominal)</i>	<i>Reference</i>
acute toxicity (static) [OECD TG 203]	rainbow trout (<i>Oncorhynchus mykiss</i>)	96 hr LC ₅₀ = 1 mg/L NOEC = 0.27 mg/L	Machado, 1999a

acute immobilisation *Daphnia magna*
(static)
[OECD TG 202]

48 hr EC₅₀ = 42 mg/L Machado, 1999b
NOEC = 8.2 mg/L

LC₅₀ : the concentration of the test substance in dilution water which causes mortality of 50 % in the exposed test population after a fixed period of time.

EC₅₀ : the concentration of the test substance in dilution water which causes immobilisation of 50 % in the exposed test population after a fixed period of time.

NOEC : No Observed Effect Concentration

Fish

Rainbow trout were exposed for 96 hours to six concentrations of the notified polymer, with ten fish exposed at each concentration. The concentrations used were 0.055, 0.12, 0.27, 0.61, 1.4 and 3.0 mg/L. A control containing no test substance was also used. Analysis to determine the concentration of the notified polymer in the solutions was not undertaken due to the problems in quantifying concentrations in the daphnia study. Therefore the reported effects are based on nominal concentrations. After 24 hours, 100 % mortality was observed at 3.0 mg/L. After 96 hours, 90 % mortality was observed at 1.4 mg/L and no mortality was observed at lower concentrations (0.055, 0.12, 0.27 and 0.61 mg/L) or the control. Sublethal effects (ie lethargy, complete loss of equilibrium) were observed in the surviving fish at 0.61 and 1.4 mg/L. The LC₅₀ was estimated by non-linear interpolation to be 1.0 mg/L and the No Observed Effect Concentration (NOEC) was determined to be 0.27 mg/L.

Aquatic invertebrates

Daphnia magna were exposed for 48 hours to seven concentrations of the notified polymer, with four replicates of five animals exposed at each test level. The concentrations used were 1.7, 3.7, 8.2, 18, 41, 90 and 200 mg/L. A control containing no test substance, consisting of 20 daphnids (four replicates of five), was maintained under the same conditions as the test solutions. The concentration of notified polymer could not be accurately measured in the test solutions, and the salt content of the hard reconstituted water used during the study was thought to cause variable recovery from the test solutions. Therefore the reported effects are based on nominal concentrations. After 48 hours, immobilisation of 20, 60, 70 and 90 % was observed among daphnids exposed to 18, 41, 90 and 200 mg/L, respectively. Sublethal effects (ie lethargy) were observed in several of the surviving daphnids in the 41, 90 and 200 mg/L groups. Based on these results and the nominal concentrations tested, the 48 hour EC₅₀ was calculated by moving average analysis to be 42 mg/L and the No Observed Effect Concentration (NOEC) was determined to be 8.2 mg/L.

Micro-organisms

As noted previously, a study was performed to determine the potential for biodegradation of the notified polymer by activated sewage sludge microbes using the CO₂ Evolution Modified Sturm Test method (OECD TG 301B) (McLaughlin, 1999). Results indicated that the notified polymer at nominal concentration 18 mg/L was slightly toxic to the activated sewage sludge microbes, judged by decreased CO₂ production in comparison to the blank controls and the theoretical value from the toxicity control.

Conclusion

Ecotoxicity data for the notified polymer indicate that based on the conditions of the individual tests, the notified polymer is highly toxic to fish and slightly toxic to daphnia. Results from a biodegradation test indicate that it may also be slightly toxic to activated sewage sludge microbes.

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

Most of the polymer will remain as part of a highly cross-linked paint coating on the metal surfaces of vehicle bodies. At the end of their serviceable lives, vehicle bodies coated with primer containing the notified polymer would be either recycled for metal recovery, or placed into landfill. During the smelting of old vehicle bodies for metal recovery the polymer would be decomposed to water vapour and oxides of carbon and nitrogen. Any polymer incinerated as a result of industrial waste disposal practices would decompose in a similar manner. Notified polymer released as a component of treated waste from spillage, coating baths, container residues and quality testing (estimated to be < 1.7 tonnes/annum, equivalent to < 9 % of annual import) will be placed in secure landfill by licensed waste contractors. Although the polymer is not biodegradable, it is expected that over a prolonged period the polymer would slowly degrade by abiotic and biological processes, producing water and oxides of carbon and nitrogen.

Ecotoxicity data indicate the notified polymer is highly toxic to fish [96 hr LC_{50} = 1 mg/L (nominal) with a NOEC = 0.27 mg/L] and slightly toxic to *Daphnia magna* [48 h EC_{50} = 42 mg/L (nominal) with a NOEC = 8.2 mg/L]. Results from a biodegradation test indicate that it may be slightly toxic to activated sewage sludge microbes. However, it is unlikely that the polymer will be released into the water compartment in a non cross-linked form. Consequently, the risk to the aquatic environment from normal use of the polymer is assessed as low.

Although the polymer may be mobile in the soil compartment due to it being more soluble in water than n-octanol, it is unlikely to bioaccumulate.

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

Little toxicological data has been provided and the notified polymer cannot be assessed against the NOHSC *Approved Criteria for Classifying Hazardous Substances* (NOHSC, 1999b). The notified polymer is of very low oral toxicity. Polymers of high molecular weight do not readily cross the skin or other biological membranes, and the overall toxicity is expected to be low. The polymer has surfactant properties and could be a skin and eye irritant due to defatting properties. The Material Safety Data Sheets (MSDS) for the imported products ED-6650 and E-6176 Electrocoats indicate that these are possible skin and eye irritants. The MSDS for the imported products list a number of potential health effects due to inhalation, namely nausea, headaches, dizziness, mucous membrane and respiratory irritation and central nervous system depression. These relate mainly to the solvents present in the products 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 primer components containing this polymer.

The system by which the primer component is dispensed and used is enclosed, and exposure to the notified polymer is only likely when containers are coupled and uncoupled from the

production line, when samples of the electrodeposition bath are removed for testing to allow the concentration of polymer in the bath to be maintained, and during electrodeposition bath cleaning. In normal operation, the electrodeposition bath containing the notified polymer will be completely enclosed due to the electrocution hazard associated with the electrodeposition process.

Plant operators and laboratory staff who may come into contact with the notified chemical should take adequate precautions, including the wearing of protective clothing, eyewear and gloves to prevent dermal or ocular exposure.

After the car bodies coated with the primers including the notified polymer have been baked and overcoated with additional paint layers, the notified polymer will not be available for exposure.

Public Health

There is little potential for public exposure to the notified polymer arising from use in automobile primers. There is little chance of public contact with the notified polymer in the lower paint layers of motor vehicles, and its adhesion to the substrate and the physico-chemical properties of the cured primer 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 risk to public health.

13. RECOMMENDATIONS

To minimise occupational exposure to Polymer in WR-33-1837 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, chemical resistant industrial clothing and footwear and impermeable gloves should be used while handling the product containing the notified polymer; where engineering controls and work practices do not reduce vapour and particulate exposure to safe levels, an air fed respirator should also be used;
- 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;
- A copy of the MSDS should be easily accessible to employees.

If products containing the notified chemical are hazardous to health in accordance with the NOHSC *Approved Criteria for Classifying Hazardous Substances* (NOHSC, 1999b), workplace practices and control procedures consistent with State and Territory hazardous substances regulations must be in operation.

Guidance in selection of goggles may be obtained from Australian Standard (AS) 1336 (Standards Australia, 1994) and Australian/New Zealand Standard (AS/NZS) 1337 (Standards Australia/Standards New Zealand, 1992); for industrial clothing, guidance may be found in AS 2919 (Standards Australia, 1987) and AS 3765.2 (Standards Australia, 1990); for

impermeable gloves or mittens, in AS 2161 (Standards Australia/ Standards New Zealand, 1998); for occupational footwear, in AS/NZS 2210 (Standards Australia/ Standards New Zealand, 1994a); for respirators, in AS/NZS 1715 (Standards Australia/ Standards New Zealand, 1994b) and AS/NZS 1716 (Standards Australia/ Standards New Zealand, 1994c) and other internationally acceptable standards.

14. MATERIAL SAFETY DATA SHEET

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

The MSDS for E-6176 Electrocoat 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, the director must be informed if any of the circumstances stipulated under subsection 64(2) of the Act arise, and secondary notification of the notified chemical may be required. No other specific conditions are prescribed.

16. REFERENCES

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