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NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

Polymer in WE-44-2295

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.

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Director
Chemicals Notification and Assessment

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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 WE-44-2295.

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: WE-44-2295
E6274B

3. PHYSICAL AND CHEMICAL PROPERTIES

The following data relate to the notified polymer or an analogue of the notified polymer (with some differences in molecular weight and, in some cases, proportions of monomers and pre-polymers) at a concentration of 32 % w/w dispersed in water or 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: 1.056 (dispersion)
1.190 (notified polymer, calculated)

Vapour Pressure: the notified polymer is not volatile

Water Solubility: < 10 mg/L at pH 1, 7 and 10 (notified polymer)

n-octanol Solubility: < 9.7 mg/L (notified polymer)

Partition Co-efficient (n-octanol/water): Log P_{ow} ~ 1 (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:	93ºC (dispersion)
Autoignition Temperature	not determined
Explosive Properties:	not explosive
Reactivity/Stability:	stable at ambient temperatures

3.1. Comments on Physico-Chemical Properties

The water solubility was determined following the preliminary test detailed in OECD TG 105 (PPG 1999a). The solubility of the notified polymer was determined at pH 1, pH 7 and pH 10 by visual estimation. This method indicated that the solubility of the notified polymer at each pH tested is < 10 mg/L.

The partition coefficient has not been determined due to the low water solubility of the notified polymer. However, the notifier provided a test report which showed that the *n*-octanol solubility of a structurally similar polymer is less than 10 mg/L (PPG 1999b).

The notified polymer contains linkages that could be expected to undergo hydrolysis under extreme pH conditions. However, in the environmental pH range of 4 to 9, significant hydrolysis is unlikely to occur.

The notifier indicates that no adsorption/desorption tests were conducted for this notification because of the notified polymer's limited solubility in water. As a consequence of its cationic nature and low water solubility, the notified polymer is expected to associate with the soil matrix and sediments and as such will be immobile in soil.

The notified polymer is fully ionised due to the presence of quaternary ammonium groups. The notified polymer contains no functional groups which are expected to show pH dependent dissociation under normal environmental conditions.

As the notified polymer is imported and used in aqueous dispersion, it is not expected to be flammable.

4. PURITY OF THE CHEMICAL

Degree of Purity: > 95 %

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:	none are present at above the cutoff levels for classification of the polymer dispersion as hazardous

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 20 % (w/v). The formulated product will be diluted to less than 1 % prior to end use. The coating resin formulation will be imported in 208 L drums.

The polymer will be used as a pigment dispersant 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 10 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, 50 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 8 plant operators, 4 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 when the containers are opened and stirred, and also 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, 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

Members of the public may be exposed to the imported paste formulation containing the notified polymer following transport accidents. Such accidents are unlikely. The regulated disposal of any waste containing the notified polymer means that environmental contact with the notified polymer is also unlikely. The products containing the notified polymer are not available to the public. The notified polymer is a bound component of the primary coating of vehicle metal body work and is not accessible to public contact. The primary coating is covered by several other coats of paint and contact with the notified polymer is further

prevented. The potential for exposure of the public to the notified polymer is negligible.

8. ENVIRONMENTAL EXPOSURE

8.1. Release

During coatings production, the notifier estimates that up to 105 kg per annum of waste containing the notified polymer will be generated from cleaning up minor spills and quality control testing. The notifier further estimates that up to 100 kg per annum of the notified polymer will be disposed of during coating application and equipment cleaning and up to 200 kg of the notified polymer will be disposed of during drum cleaning.

8.2. Fate

The majority of the notified polymer will be combined with other coating components to form a very high molecular weight and stable coating. Therefore, once incorporated into the coating formulation, the notified polymer is expected to be immobile in the environment. As the coating degrades over time, any fragments, chips and flakes of the coating will be of little concern as they are expected to be inert. The metal panels and car bodies coated with the polymer are likely to be either recycled for steel reclamation or placed into landfill at the end of their useful life. During recycling, the polymer would be destroyed in furnaces and converted to water vapour and oxides of carbon and nitrogen.

A biodegradation study was conducted on a structurally similar polymer according to OECD TG 301B; Determination of Biodegradability by the CO_2 Evolution Modified Sturm Test (Springborn Laboritories 1999a). The inoculum was obtained from the Wareham Wastewater Treatment Plant in Wareham, Massachusetts. A stock solution of the test substance was prepared by adding the polymer (~3 g) to a flask containing medium (1 L) The biodegradation of the test substance was compared against sodium benzoate. The biodegradation of sodium benzoate was 93% after 28 days, indicating the test conditions were valid. After 28 days at 21°C, the mean biodegradation of the test substance, based on titration measurements, was determined to be -17%. This suggests that the test substance exhibits a slight inhibitory effect on the inoculum. Based on this information, the notified polymer is not expected to be readily biodegradable.

The notified polymer in waste from spills, equipment cleaning and drum recycling will be collected by licensed waste disposal contractors and treated by flocculation, filtration and centrifugation. The solid containing the notified polymer will be dried followed by disposal into landfill while the water will be tested prior to release into the sewer. Some of the wastes generated, particularly from drum recycling, may also be incinerated.

The notified polymer is not water soluble and therefore will not be mobile in either the terrestrial or aquatic compartments. As a consequence of its cationic nature and low water solubility, the notified polymer is expected to eventually associate with the soil matrix and sediments. The notified polymer is not expected to cross biological membranes due to its high molecular weight and low water solubility and is therefore not expected to bioaccumulate (Connell 1990).

9. EVALUATION OF TOXICOLOGICAL DATA

Acute oral toxicity data are available for the notified polymer with differences in molecular weight and monomer and prepolymer proportions. No other toxicity data are available.

9.1 Acute Toxicity

9.2.1 Acute Oral Toxicity (WIL, 1999)

TEST SUBSTANCE	Notified polymer (as 37 % aqueous dispersion; doses were not corrected for concentration of polymer).
METHOD	OECD 401 Acute Oral Toxicity – Limit Test.
Species/Strain	Rat/ Crl:CD®(SD)IGS BR
Vehicle	As supplied.
Remarks - Method	No significant protocol deviations.

RESULTS

Group	*Number & Sex of Animals*	*Dose mg/kg bw*	*Mortality*
I	5 per sex	2000	0/10

LD50	> 2000 mg/kg bw
Signs of Toxicity	Mucoid faeces were observed for one animal on the day of dosing. No other clinical signs of toxicity were observed during the study.
Effects in Organs	There were no gross pathological changes observed.
Remarks - Results	No remarkable effects on body weights were observed.
CONCLUSION	The dispersion of the notified polymer is of low toxicity via the oral route.
TEST FACILITY	WIL Research Laboratories, Inc.

9.2 Overall Assessment of Toxicological Data

The acute oral toxicity of the analogue 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 following ecotoxicity data are available for the notified polymer with differences in

molecular weight and monomer and prepolymer proportions.

Test	*Species*	*Results (nominal)*
acute toxicity (static) [OECD TG 203]	rainbow trout (*Oncorhynchus mykiss*)	96 hr LC_{50} = 1.1 mg/L NOEC = 0.75 mg/L
acute immobilisation (static) [OECD TG 202]	*Daphnia magna*	48 hr EC_{50} = 4.6 mg/L NOEC = 3.1 mg/L

LC_{50} : 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.
EC_{50} : 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

The tests on fish (Springborn Laboratories, 1999b) were performed using a static methodology. Observations were performed at 0, 2, 24, 48, 72 and 96 hours. The test was performed using ten specimen fish per loading rate at a temperature of 14ºC. The tests were conducted using test substance made up at nominal concentrations of 0.094, 0.19, 0.38, 0.75, 1.5 and 3 mg/L. While analysis of the test solutions was not conducted, the notifier indicates that all test solutions were clear and colourless. The results of the definitive study showed that after 96 h, mortalities of 10, 80 and 100 % were observed at test concentrations of 0.38, 1.5 and 3 mg/L, respectively and 10 % mortality was observed for the control. The 96-hour LC_{50} to *Oncorhynchus mykiss* is 1.1 mg/L as determined by probit analysis.

The immobilisation tests with *Daphnia magna* (Springborn Laboratories, 1999c) were performed under static conditions with observations performed at 24 and 48 hours. The test was performed in quadruplicate using 5 daphnids per flask at a temperature of 20ºC. The tests were conducted using the test substance made up at nominal concentrations of 3.1, 6.3, 13, 25, 50 and 100 mg/L. While analysis of the test solutions was not conducted, the notifier indicates that all solutions were clear and colourless. After 48 h, no immobilised daphnids were observed in the test vessel containing 3.1 mg/L of the test substance, 95 % immobilisation was observed at a test substance concentration of 6.3 mg/L and 100 % mortality was observed at test substance concentrations above 13 mg/L. The 48-hour EC_{50} to *Daphnia magna* is 4.6 mg/L as estimated by non-linear interpolation.

The ecotoxicity data indicates the polymer is moderately toxic to fish and daphnia based on nominal concentrations. The notified polymer is a close structural analogue of the test substance used in the ecotoxicity tests discussed, as such, the toxicity exhibited by the notified polymer to aquatic organisms is expected to mimic those reported above.

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

The majority of the notified polymer will be combined with other coating components to form a very high molecular weight and stable coating. Therefore, once incorporated into the coating formulation, the notified polymer is expected to be immobile in the environment.

The notified polymer in waste from spills, equipment cleaning and drum recycling will be treated by flocculation, filtration and centrifugation. The resulting solid containing the

notified polymer will be dried followed by disposal into landfill while the water will be tested prior to release into the sewer. Ecotoxicity data for a close analogue suggests that the notified polymer may be moderately toxic to fish and daphnia, however, due to the low release to natural waters, the concentration of the notified polymer in receiving waters is expected to be several orders of magnitude below the LC_{50} of the most sensitive species (fish). Some of the wastes generated, particularly from drum recycling, may also be incinerated.

As a consequence of its cationic nature and low water solubility, the notified polymer is expected to eventually associate with the soil matrix and sediments. The notified polymer is not expected to cross biological membranes due to its high molecular weight and low water solubility and is therefore not expected to bioaccumulate (Connell 1990).

The notified polymer is not likely to present a hazard to the environment when it is stored, transported and used in the proposed manner.

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, 1999). The notified polymer in aqueous dispersion is of 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 Sheet (MSDS) for the imported product E-6274B Electrocoat indicates that this is a possible skin and eye irritant. The MSDS lists a number of potential health effects due to inhalation, namely nausea, headaches, dizziness, mucous membrane and respiratory irritation and central nervous system depression, and that the product is harmful if swallowed and in contact with the skin. The health effects relate mainly to the solvents and other ingredients 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 stirred then 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 polymer 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
Public exposure to the notified polymer will most likely be limited to exposure occurring following transport accidents or to contact with it as an environmental contaminant. Such accidents are not likely and the closely regulated nature of waste disposal from assembly plants will mean that environmental contact is also not very likely. The notified polymer is not volatile. Any exposure that does occur is likely to be dermal and of an infrequent and transient nature. The low likelihood of exposure to the notified polymer and its toxicological profile suggest that it will not pose a significant hazard to public health when used in the proposed manner.

13. RECOMMENDATIONS

Control Measures

Occupational Health and Safety

- Employers should implement the following safe work practices to minimise occupational exposure during handling of the notified polymer in the product E6274B:
  - NOHSC exposure standards for all of the components of the final paint mix should not be exceeded in the workplace

- Employers should ensure that the following personal protective equipment is used by workers to minimise occupational exposure to the notified polymer in the product E6274B:
  - Safety goggles, chemical resistant industrial clothing and footwear and impermeable gloves should be used; where engineering controls and work practices do not reduce vapour and particulate exposure to safe levels, an air fed respirator should also be used

  Guidance in selection of personal protective equipment can be obtained from Australian, Australian/New Zealand or other approved standards.

- A copy of the MSDS should be easily accessible to employees.

- If products and mixtures containing the notified polymer are classified as hazardous to health in accordance with the NOHSC *Approved Criteria for Classifying Hazardous Substances*, workplace practices and control procedures consistent with provisions of State and Territory hazardous substances legislation must be in operation.

13.1 Secondary notification

The Director of Chemicals Notification and Assessment must be notified in writing within 28 days by the notifier, other importer or manufacturer:

(1) Under Section 64(2) of the Act:

- if any of the circumstances listed in the subsection arise.

The Director will then decide whether secondary notification is required.

No additional secondary notification conditions are stipulated.

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 E6274B 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. REFERENCES

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