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February 2001

**NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION  
AND ASSESSMENT SCHEME**

**FULL PUBLIC REPORT**

**Polymer in WE-84-5115**

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**FULL PUBLIC REPORT****Polymer in WE-84-5115****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-84-5115.

**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-84-5115  
E6237, E6176

**3. PHYSICAL AND CHEMICAL PROPERTIES**

The following data relate to the notified polymer at a concentration of 30 % w/w dispersed in water/2-butoxyethanol (97:3), or to a close analogue of the notified polymer differing in counterion and molecular weight. The polymer itself is never isolated from the *in situ* manufactured resin solution.

<b>Appearance at 20°C and 101.3 kPa:</b>	pale brown slightly viscous turbid liquid (dispersion)
<b>Boiling Point:</b>	not determined
<b>Specific Gravity:</b>	1.083 (dispersion)
<b>Vapour Pressure:</b>	the notified polymer is not volatile
<b>Water Solubility:</b>	156 - 186 mg/L (analogue polymer in dispersion, pH 7; see comments below)
<b>Partition Co-efficient (n-octanol/water):</b>	Log P <sub>ow</sub> = 1.33 (analogue polymer)
<b>Hydrolysis as a Function of pH:</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 never isolated from solution
<b>Explosive Properties:</b>	not explosive
<b>Reactivity/Stability:</b>	stable at ambient temperatures

### 3.1. Comments on Physico-Chemical Properties

Water solubility for the notified polymer has not been measured. Data for a polymer differing in counterion and molecular weight, subject of NICNAS notification NA/696, has been provided by the notifier (Lumsden, 1999). Water solubility could not be determined by the standard flask method specified by OECD guidelines because the notified polymer could not be separated from saturated solutions by centrifugation and/or filtration. Hence a visual estimation was carried out using ultraviolet spectroscopy. A mixture of the test material and glass double-distilled water adjusted to pH 7.0 with 0.1M sodium hydroxide, shaken for 1 minute, and the extent of dissolution was assessed visually.

The solubility of the analogue polymer in n-octanol is 3660 mg/L, (Andree, 1996). The n-octanol/water partition co-efficient for the analogue polymer is around 21.4 ( $\log P_{ow} = 1.33$ ).

Adsorption/desorption data were not provided, but it was stated by the notifier that the polymer is expected to bind to the organic component of the soil and sediment thereby becoming immobilised. However, the polymer contains a high proportion functional groups which have affinity for water, consequently there maybe potential for some mobility in the soil compartment. The amine groups in the notified polymer are expected to be protonated (hence positively charged) in moist soil, and interaction between the positive charges on the polymer and (negatively charged) carboxylate groups in natural humic material may reduce mobility.

In the polymer dispersion, the neutralising acid protonates the base polymer sufficiently to stabilise it as a micelle. No  $pK_a$  data was provided but both amine groups could be expected to behave as typical aliphatic amines and be appreciably basic. Consequently both 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:** > 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:**

The toxic or hazardous impurities and adjuvants are present at concentrations below the cutoff for classification of the notified polymer or the products containing the notified polymer as hazardous; the exact concentrations are confidential.

<i>Chemical name:</i>	benzyldimethylamine
<i>CAS No.:</i>	103-83-3
<i>Weight percentage:</i>	< 1 % in polymer solution; exact concentration is exempt information
<i>Toxic properties:</i>	On the NOHSC <i>List of Designated Hazardous Substances</i> (NOHSC, 1999a)  R20/21/22 Harmful by inhalation, in contact with skin and if swallowed R34 Causes burns

**Non-hazardous Impurities  
(> 1% by weight):**

none

**Additives/Adjuvants:**

<i>Chemical name:</i>	2-butoxyethanol
<i>CAS No.:</i>	111-76-2
<i>Weight percentage:</i>	< 5 % in polymer solution; exact concentration is exempt information
<i>Toxic properties:</i>	On the NOHSC <i>List of Designated Hazardous Substances</i> (NOHSC, 1999a)  R20/21/22 Harmful by inhalation, in contact with skin and if swallowed R36 Irritating to eyes R37 Irritating to respiratory system  NOHSC exposure standard 25 ppm TWA with skin notation (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 a concentration of 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 binder 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 45 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 disposed of by licensed waste contractors. The notifier estimates that the maximum amount of spillage would be 1 % per year, which is equivalent to 450 kg of the notified polymer. Licensed waste contractors could take liquid recovered from a spillage to a liquid waste treatment plant where treatment would result in the notified polymer separating to sludge and either being incinerated or disposed of to landfill. Small spills collected onto absorbent material could be disposed of to landfill.

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 135 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 10 kg/year of the polymer (equivalent to 0.02 %). The notifier indicated that all waste is to be disposed of by licensed waste contractors, presumably in a manner similar to accidental spills.

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. Water washing is used to rinse the internal walls of the bath as the contents are transferred. Residual washings and sludge from the bottom of the tank are removed by licensed waste contractors. 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 it would be unlikely to exceed 5 % of total imports. This equates to a maximum annual release of around 2.25 tonnes of the notified polymer.

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.

During metal recovery, the organic paint coatings would be destroyed in the high blast furnace temperatures, and the polymer decomposed to water vapour and oxides of carbon and nitrogen. Any material incinerated as a consequence of trade waste disposal operations would be destroyed in a similar manner.

A study was performed to assess the ready biodegradability of the analogue polymer PMN 2155 (differing from the notified polymer in counterion and molecular weight, and subject of NICNAS notification NA/696) using the Closed Bottle Test (OECD TG 301B) (Sewell, 1997c). Sealed bottles containing the test substance (6.5 mg/L) and inorganic nutrient medium were inoculated with activated sewerage sludge bacteria and incubated for up to 28 days at 20°C. Biodegradation was assessed by the determination of CO<sub>2</sub> produced. The test substance attained 86 % degradation after 28 days. Therefore the polymer may be termed readily biodegradable.

While the notified polymer is readily biodegradable, cured paint films containing the notified polymer released in landfill would be expected to be very slowly degraded by microbiological processes with release of gases such as carbon dioxide, methane, ammonia and



nitrogen.

No release of the uncured polymer to the water compartment is expected, except in the case of a transport accident. However, in the event of such an accident, the polymer would be expected to settle and associate with the sediment. It would not be expected to cross biological membranes due to its high molecular weight and expected limited exposure to water, which should minimise its bioaccumulation potential.

If the uncured polymer were released to the soil as result of accidental spills, it would be expected to associate weakly with the surface of clay minerals. Given the low water solubility, the notified polymer is not expected to be mobile in soil.

## 9. EVALUATION OF TOXICOLOGICAL DATA

There is no toxicity data on the notified polymer. Data are available for the analogue polymer, differing in counterion and molecular weight and the subject of NICNAS notification NA/696, as a 30 % aqueous dispersion also containing a low level of 2-butoxyethanol (referred to as PMN 2155). The dose was corrected for the concentration of active ingredient.

### 9.1 Acute Toxicity

#### 9.1.1 Oral Toxicity (Allen, 1997)

<i>Species/strain:</i>	rat/Crl:CD <sup>®</sup> BR
<i>Number/sex of animals:</i>	5/sex
<i>Observation period:</i>	14 days
<i>Method of administration:</i>	gavage; 30 % 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>	no clinical signs of toxicity were observed during the study
<i>Morphological findings:</i>	there were no gross pathological changes observed
<i>LD<sub>50</sub>:</i>	> 2000 mg/kg
<i>Result:</i>	the analogue polymer was of very low acute oral toxicity in rats

### 9.2 Overall Assessment of Toxicological Data

The acute oral toxicity of the analogue polymer is very low. The toxicity of the notified polymer is not expected to be greatly different from that of the analogue, as the counterion is not expected to have a major effect on the observed toxicity. 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 for the analogue polymer, differing in counterion and molecular weight and the subject of NICNAS notification NA/696, as a 30 % aqueous dispersion also containing a low level of 2-butoxyethanol (referred to as PMN 2155) in support of their application.

<i>Test</i>	<i>Species</i>	<i>Results (nominal)</i>	<i>Reference</i>
acute toxicity [OECD TG 203]	rainbow trout ( <i>Oncorhynchus mykiss</i> )	96 hr LC <sub>50</sub> = 1.3 mg/L NOEC > 1 mg/L	Sewell, 1997a
acute immobilisation [OECD TG 202]	<i>Daphnia magna</i>	48 hr EC <sub>50</sub> = 4.0 mg/L NOEC = 0.56 mg/L	Sewell, 1997b

\* NOEC - no observable effect concentration

### *Fish*

The tests on rainbow trout were performed using semi-static test conditions. Groups of 10 fish were exposed to nominal concentrations of 1.0, 1.8, 3.2, 5.6 and 10 mg/L of the test substance. The cumulative mortality was recorded after 3, 6, 24, 48, 72 and 96 hours. Sub-lethal effects including fish swimming to the surface or bottom of test vessel or mortalities were observed in the groups of fish exposed at test concentrations of 1.8–3.2 mg/L for a period of 3–24 hours.

The Median Lethal Concentration (LC<sub>50</sub>) based on nominal test concentrations was 1.3 mg/L with a 95 % confidence limits of 1.0–1.8 mg/L. The No Observable Effect Concentration (NOEC) was greater than 1.0 mg/L.

### *Aquatic invertebrates*

The tests on *Daphnia magna* were performed over a 48 hour period under static conditions. Two groups of 10 daphnids were exposed to nominal loadings of 0.18, 0.32, 0.56, 1.0, 1.8, 3.2, 5.6, 10 and 18 mg/L. The percent immobilisation was recorded after 24 and 48 hours. The 48-hour median concentration (EC<sub>50</sub>) for the test material to *Daphnia magna* based on nominal test concentrations was 4.0 mg/L with 95 % confidence limits of 3.1–5.2 mg/L. The NOEC was determined to be 0.56 mg/L.

From the ecotoxicity data for the analogue polymer, it is expected that the notified polymer will be moderately toxic to fish and daphnia.

## 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 be decomposed in a similar manner. Some polymer may be placed into landfill, either as a coating on old vehicle parts, in waste from spillage, in sludge from coating baths or other losses (estimated to be < 9 % of total imports, or 4 tonnes).

Movement of the polymer from landfill is not expected when it is cross linked in the cured coating. In this form, it is expected to be very slowly degraded over a prolonged period through the agency of various abiotic and biological processes, again producing water and oxides of carbon and nitrogen.

Ecotoxicity data for a close analogue of the notified polymer suggests that the notified polymer is moderately toxic to fish and daphnia. However, the potential effects of this toxicity are unlikely to be realised given the low amounts, particularly of uncured polymer, likely to be released into the aquatic compartment and the ready biodegradability of the uncured polymer. Consequently, the risk to the aquatic environment from normal use of the polymer is assessed as low.

## 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, based on a study of a close analogue. 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 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 WE-84-5115 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* (National Occupational Health and Safety Commission, 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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Lumsden, A. M. and Bartlett, A. J (1997) PMN 2155: Determination of Water Solubility; Project No. 1014/014, Safepharm Laboratories Ltd, Derby, UK.

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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, Sydney/Wellington.

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