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NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

Polymer in Polyester Resin RCR-29826

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Director
Chemicals Notification and Assessment

FULL PUBLIC REPORT

Polymer in Polyester Resin RCR-29826

1. APPLICANT

Dulux Australia of McNaughton Road CLAYTON VICTORA 3169 has submitted a limited notification statement in support of their application for an assessment certificate for Polymer in Polyester Resin RCR-29826.

2. IDENTITY OF THE CHEMICAL

The notified polymer is not considered to be hazardous based on the nature of the chemical and the data provided. Therefore the chemical name, CAS number, molecular and structural formulae, molecular weight, spectral data, details of the polymer composition have been exempted from publication in the Full Public Report and the Summary Report.

Other name:	polymer in polyester resin RCR-29826
Trade Name:	Dp 687 Waterborne basecoat (product)
Structural Formula:	the structure is a random copolymer.
Number-Average Molecular Weight:	> 2 000
Maximum Percentage of Low Molecular Weight Species	
Molecular Weight < 500:	> 2
Molecular Weight < 1 000:	< 15
Method of Detection and Determination:	infrared (IR) spectroscopy
Spectral Data:	produced by Gel Permeation Chromatography (GPC)

3. PHYSICAL AND CHEMICAL PROPERTIES

The notified polymer is never isolated from the imported polymer solution. The physico-chemical data supplied are for the polymer solution, unless otherwise stated.

Appearance at 20°C and 101.3 kPa:	viscous clear, white liquid with a solvent odour
Boiling Point:	171°C (2-butoxyethanol)
Specific Gravity:	of polymer solution 1.07; of polymer 1.11 (calculated)
Vapour Pressure:	0.1 kPa at 25°C (2-butoxyethanol)
Water Solubility:	claimed as insoluble
Partition Co-efficient (n-octanol/water):	not provided
Hydrolysis as a Function of pH:	not provided
Adsorption/Desorption:	not provided
Dissociation Constant:	not provided
Flash Point:	64°C (2-butoxyethanol)
Flammability Limits:	Upper Explosive Limit =10.6 % (2-butoxyethanol) Lower Explosive Limit = 1.1% (2-butoxyethanol)
Autoignition Temperature:	244°C (2-butoxyethanol)
Explosive Properties:	not available for the polymer; the polymer solution has no explosive properties
Reactivity/Stability:	stable as the notified polymer and as polymer solution; like other organic compounds should be segregated from strong oxidising agents

Comments on Physico-Chemical Properties

The notifier claims that by analogy with similar polymers, the polymer will not be volatile and will be water insoluble. The notifier claims that the polymer is dispersible in water only if neutralised with amine, organic cosolvents and other components of the paint formulation. The dispersion is not stable and separates into water and organic layers after several hours. The polymer is expected to have a very low water

solubility due to its large molecular weight. The low molecular weight fraction (< 1 000) may have moderate to low solubility.

The ability of the polymer to hydrolyse at pH 8.9 (pH of paint product) was investigated by incubating amine neutralised solutions of the polymer at 43°C for 4, 8 and 12 weeks, and observing changes in polymer molecular weight by GPC analysis. The notifier found little molecular weight (MW) change at 4 weeks, a small (< 5%) MW change at 8 weeks, and a more significant (~12%) change at 12 weeks. The notifier concluded that hydrolysis is the most likely means of abiotic degradation (consistent with compounds containing ester groups). However, hydrolysis in the environmental pH range would be precluded by its very low water solubility.

Partition coefficient data was not supplied; this would be difficult to test and the majority of the polymer is not anticipated to cross biological membranes because of its high molecular weight (1,2).

As the solvent evaporates from the polymer solution it will become more viscous. It is expected that the polymer will readily bind to, or be associated with, soil and sediment.

The notifier did not measure dissociation; dissociation is not expected to occur due to the expected excess hydroxyl groups in the reaction formulation.

4. PURITY OF THE CHEMICAL

Degree of Purity: 99%

Toxic or Hazardous Impurities: none

Non-hazardous Impurities (> 1% by weight): none

Maximum Content of Residual Monomers: none

Additives/Adjuvants:

Chemical name:	2-butoxyethanol
CAS No.:	117-76-2
Weight percentage:	10-29%

5. USE, VOLUME AND FORMULATION

The notified polymer is incorporated as a film forming component of an automotive coating, Dp 687 Waterborne basecoat, used to coat the external primed steel of car bodies. The notified polymer will not be manufactured in Australia but will be imported as a solution containing a high percentage (> 60%) of the notified polymer.

The import volume of the polymer in solution is projected to be between 1-20 tonnes in the first year, and up to a maximum of 20 tonnes per year in the subsequent four years.

The coating containing the notified polymer, DP 687 Waterborne basecoat, will be manufactured at the Dulux plant in Clayton, Victoria.

6. OCCUPATIONAL EXPOSURE

As noted above the notified polymer, imported as a solution, is blended with other ingredients to form the paint for coating automobiles. The process is as follows:

Paint Manufacture

polymer solution and other ingredients ------> blending batch in a mixer and testing ---------> filtration and filling ---------> warehouse for distribution

Paint Application

stir ---------> add to circulation tank -------> coat substrate with automatic equipment ----------> product heat cured

There are three main categories of worker who may be exposed to the notified polymer during this process. These will be individuals involved in laboratory development, manufacture and application of paint. Paint manufacture and application to automotive bodies is expected to occur at separate, single sites.

Laboratory development

Laboratory workers may be exposed to the polymer in small scale manufacture of the paint and also when testing the paint. Dermal exposure is the most likely route of exposure. Ocular exposure would only occur in the event of accidental splashing. Laboratory workers may be exposed for a maximum duration of eight hours per day, 20 days per year, in manufacture and testing of the paint.

Paint Manufacture

The polymer solution will be blended with other ingredients using high speed mixers. Paint mixers are fitted with exhaust ventilation to capture volatiles at source. The paint is filled into 1 000 L steel totes, also under exhaust ventilation to capture any vapour generated. During paint make-up, quality control testing and drum filling of

the paint, workers may be exposed for a maximum of eight hours per day for 30 days per year. The most likely route of exposure to the notified polymer is dermal.

Paint Application

The paint (coating) containing the notified polymer, will be applied to automotive bodies by the notifier's customer at a single site. There is the potential for dermal exposure, to the notified polymer, when the paint is added to the circulation tank, during application (hand spray pick-up) and during cleaning of equipment. Ocular exposure would only occur in the event of accidental splashing. Handspray pick-up will be carried out for up to 8 hours per day, 200 days per year. Workers will transfer the paint to a circulation tank for one hour per day, 20 days per year and cleaning will be conducted for one hour per day, 200 days per year. Paint application will be carried out using automatic spray equipment in a well ventilated spray booth with an effective fume extraction system.

There is the potential for exposure to solvents during laboratory development, paint manufacture and application. The solvent in the polymer solution, 2-butoxyethanol is known to cause a range of adverse effects (see paragraph 12). The notifier claims engineering controls e.g. exhaust ventilation and capture of volatiles at source will be in place to minimise exposure to potentially hazardous solvents, thus also reducing potential exposure to the notified polymer.

There is limited scope for accidental spillage to occur during the paint manufacturing process. Should a spill occur it would be contained by bunding.

The polymer solution will be transported from the waterside to the Dulux site in 200 L drums. The paint will be transported by road in 1 000L totes to the customer. Exposure during transport will only occur in the unlikely event of an accident. Exposure is expected to be minimised by the recommended practices for transport given in the MSDS.

7. PUBLIC EXPOSURE

There is negligible potential for public exposure to the notified polymer arising from importation, storage , transportation and formulation into automotive basecoat paint product. The potential for public exposure to the polymer during transport and disposal of process waste and clean-up waste after a spill is very minor. This is minimised by following the recommend practices during storage, transport and waste disposal. Similarly, there is negligible potential public exposure from the end-use application of the chemical, as a spray basecoat applied by spray booth equipment in one manufacturing premise. The notified polymer will finally be immobilised as part of an inert, hardened paint film and while there will be significant public contact with the notified polymer, in this inert form, there seems no likely route of exposure and absorption.

8. ENVIRONMENTAL EXPOSURE

Release

Paint formulation will be carried out under exhaust ventilation with the capture of volatiles. Spills at the formulation site will be contained by onsite bunding. Dulux has developed a solvent recovery procedure (the 'Dusol' process) whereby waste resin and paint are processed to reclaim the solvent. Polymer residues (up to 200 kg per year) will be converted to an inert solid and will be disposed of to landfill.

During application, up to 25% of the polymer may be lost through overspray (up to 5 tonnes per year of the polymer at maximum import volumes). However, release of the paint is contained within spray booths. The resultant overspray will be chemically treated with water scrubbing systems. The notifier claims that the efficiency of these systems is 99.6%. The paint material, which is removed by the scrubbers, is separated using flotation techniques. The sludge is then disposed of by a licensed waste contractor to landfill (as prescribed by the Victorian Environment Protection Authority).

Drums containing the notified polymer will be sent a drum conditioner. This involves incineration of the drum, then washing and recycling for other uses.

Fate

The majority of the notified polymer is not expected to be released to the environment until it has been fully cured into a solid polymer matrix. The coating containing the polymer will share the fate of the substrate to which it is applied. As part of a polymerised coat, no hydrolysis, movement, biodegradation or bioaccumulation of the polymer in soils is expected.

Incineration of the polymer is expected to produce water, and oxides of carbon, nitrogen and sulphur.

Any chips or flakes of the cured paint that occur (due to stone chips, accidents, wear and tear, etc) will be inert, diffuse and form part of the soils or sediments.

9. EVALUATION OF TOXICOLOGICAL DATA

No toxicological data were provided, which is acceptable for polymers of number-average molecular weight (NAMW) greater than 1 000 according to the Act. A high NAMW will restrict transfer across biological membranes. However, there is a significant level of low molecular weight species (less than15% of the polymer species have a molecular weight less than
1 000 and less than 3% with a molecular weight less than 500). These low molecular weight species may be absorbed by dermal contact and have the potential

to cause systemic toxicity. There is a very low percentage of impurities present, that fall below the threshold requiring classification according to the Approved Criteria (3).

On the basis of these data the notified chemical would not be classified as hazardous according to the Approved Criteria (3).

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

No ecotoxicology data were provided, which is acceptable for polymers of NAMW of greater than 1 000 according to the Act.

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

The main environmental exposure of the polymer arises from the landfill disposal of recovered dry waste paint from the formulation and application processes. *Environment Australia* estimates that approximately 5 tonnes per year of the polymer may be consigned to landfill at maximum projected import volumes (due to 200 kg waste created through formulation and 25% overspray in application). However, such material will be cured, or bound to soil, and remain immobile in the environment. The environmental hazard from such disposal is expected to be low. The main environmental hazard would arise through spillage in transport accidents that may release quantities of the uncured polymer to drains and waterways. However, the polymer would quickly become immobile on association with soil/sediment. Adequate control procedures are outlined in the MSDS.

The polymer is unlikely to present a hazard to the environment when formulated as a paint, then bound to solid substrates. Waste generated in this process will be treated and disposed of at an approved landfill site. The cured polymer will not be bioavailable and ultimately will share the fate of the metal panel to which it is bound.

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

The notified polymer will be used in a film forming component of an automotive coating. It is never isolated but will be imported as a solution containing greater than 60% of the notified polymer and will be formulated into the coating (paint).

Due to the large NAMW of the polymer and its physico-chemical properties it will be poorly absorbed across biological membranes and tissues. The notified polymer has a significant level of low molecular weight species that have the potential to cross biological membranes and may lead to systemic toxicity. There is also a very small percentage of impurities. Given that the potentially harmful low molecular weight species and impurities are present at low concentrations in the polymer solution and paint they are unlikely to be of toxicological significance.

Exposure to the notified polymer may occur during manufacture and testing of the paint. During paint manufacture workers may be exposed to the notified polymer

during paint make-up, quality control and drum filling. At the customer site, exposure may occur when adding the paint to the circulation tank, during application of the paint and when cleaning of spray equipment. During all of the processes described above the main route of exposure would be via the skin. Ocular exposure would only occur in the event of splashing. The risks associated with exposure to the notified polymer, in particular to the low molecular weight species, will be minimised by the control and safety measures employed for the solvent components in the polymer solution and paint (see below).

Workers should be aware that the solvent in the polymer solution may cause skin, eye, respiratory irritation and is harmful by inhalation. It may cause adverse effects on the central nervous system and abnormalities in a number of tissues have been shown following prolonged or repeated exposure. The solvents in the polymer solution are present at concentrations which exceed the thresholds that would lead to classification by the Approved Criteria (3). Accordingly, the polymer solution is classified as hazardous. There is the potential for exposure to solvent during the manufacture of the coating and application of the paint. The workers most likely to be exposed will be those conducting sampling, testing and application of the paint. Exposure may occur via dermal and inhalational routes.

Manufacture and testing of the paint in the laboratory will be conducted under well ventilated areas, so the potential for exposure will be low. Solvent exposure during paint manufacture and application will be reduced by capture of volatile components at source. In addition, inhalational exposure will be minimised by operating in accordance with Worksafe Australia's *Exposure Standards for Atmospheric Contaminants in the Occupational Environment: Guidance Note and National Exposure Standards* (5). The paint containing the notified polymer is not classified as hazardous (3) but it does contain solvents to which exposure should be minimised. The paint will be applied in well ventilated spray booths which will reduce potential exposure to solvents. Once the paint has been applied it is cured. The notified polymer becomes an inert component in the hardened paint film and worker contact poses negligible risk.

The engineering control and safety procedures that the notifier states will be employed at both the manufacturing and the application sites, will minimise worker exposure. This will result in low risk to workers exposed to the notified polymer, polymer solution or end-use products.

The public will only come into contact with the notified polymer when it is incorporated into a hardened paint film and has become inert and unavailable. Polymer in Polyester Resin RCR-29826, is unlikely to pose a significant risk to public health under the conditions of manufacture and the end-use products.

13. RECOMMENDATIONS

To minimise occupational exposure to Polymer in Polyester Resin RCR-29826 the following guidelines and precautions should be observed:

- Safe practices for handling any chemical formulation, should be adhered to and include:

  - minimising spills and splashes:
  - practising good personal hygiene; and
  - practising good house keeping and maintenance including bunding of large spills which should be cleaned up promptly with absorbents and put into containers for disposal;

- It is expected that in the industrial environment, protective clothing conforming to and used in accordance with Australian Standard (AS)2919 (6) and protective footwear conforming to Australian/New Zealand Standard (AS/NZS) 2210 (7) should be worn as a matter of course. In addition it is advisable when handling the polymer solution or basecoat containing potentially hazardous solvents to wear chemical-type goggles (selected and fitted) according to AS 1336 (8) and meeting requirements of AS/NZS 1337 (9), impermeable gloves AS 2161-1978 (10) and respiratory protection (selected and fitted) according to AS/NZS 1715 (11) meeting the requirements of AS/NZS 1716 (12), to protect against any unforseen circumstances.

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

In addition, Worksafe Australia's document *Exposure Standards for Atmospheric Contaminants in the Occupational Environment: Guidance Note and National Exposure Standards* (5) should be used as a guide in the control of any volatile components in the polymer solution and paint products containing the notified polymer. Workplace monitoring for these components should be carried out on a regular basis.

14. MATERIAL SAFETY DATA SHEET

The MSDS for the notified chemical was provided in accordance with the *National Code of Practice for the Preparation of Material Safety Data Sheets* (13).

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

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2. Gobas F.A.P.C., Opperhuizen A. & Hutzinger O. 1986, 'Bioconcentration of hydrophobic chemicals in fish: relationship with membrane permeation'. *Environmental Toxicology and Chemistry* Vol 5 pp 637-646.

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

4. National Occupational Health and Safety Commission 1994, *List of Designated Hazardous Substances* [NOHSC:10005(1994)], Australian Government Publishing Service Publ., Canberra.

5. National Occupational Health and Safety Commission 1995, ' Adopted National Exposure Standards for Atmospheric Contaminants in the Occupational Environment', [NOHSC: 1003(1995)], in *Exposure Standards for Atmospheric Contaminants in the Occupational Environment: Guidance Note and National Exposure Standards*, Australian Government Publishing Service Publ., Canberra.

6. Standards Australia, 1987. *Australian Standard 2919 - 1987, Industrial Clothing,* Standards Association of Australia Publ., Sydney.

7. Standards Australia, Standards New Zealand 1994, *Australian/ New Zealand Standard 2210 - 1994 Occupational Protective Footwear, Part 1: Guide to Selection, Care and Use. Part 2: Specifications,* Standards Association of Australia Publ., Sydney, Standards Association of New Zealand Publ. Wellington.

8. Standards Australia, 1994. *Australian Standard 1336-1994*, *Eye protection in the Industrial Environment*, Standards Association of Australia Publ., Sydney.

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

10. Standards Australia, 1994. *Australian Standard 2161-1978, Industrial Safety Gloves and Mittens (excluding Electrical and Medical Gloves)*, Standards Association of Australia Publ., Sydney.

11. Standards Australia/Standards New Zealand 1994, *Australian/New Zealand Standard 1715-1994, Selection, Use and Maintenance of Respiratory Protective Devices,* Standards Association of Australia Publ., Sydney, Standards Association of New Zealand Publ, Wellington

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