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NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION

AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

Polymer in Acrylic Resin R9577/117

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Director
Chemicals Notification and Assessment

FULL PUBLIC REPORT

Polymer in Acrylic Resin R9577/117

1. APPLICANT

Dulux Australia of McNaughton Road CLAYTON VIC 3169 has submitted a limited notification statement in support of their application for an assessment certificate for Polymer in Acrylic Resin R9577/117.

2. IDENTITY OF THE CHEMICAL

The notified polymer is considered not 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 and details of exact import volume and customers have been exempted from publication in the Full Public Report and the Summary Report.

Trade Name:	no specific trade name applies to this polymer; initially it will be imported as a component of the polymer solution R9577/117
Number-Average Molecular Weight:	> 2 000
Maximum Percentage of Low Molecular Weight Species	
Molecular Weight < 500:	< 3%
Molecular Weight < 1 000:	< 10%

3. PURITY OF THE CHEMICAL

Purity:	high
Additives/Adjuvants:	< 35%

4. PHYSICAL AND CHEMICAL PROPERTIES

There are limited data available on the physical and chemical properties of the polymer itself due to the notified polymer not being isolated from the manufactured polymer solution. In most cases data are provided for the polymer solution containing n-butyl acetate/ethyl ethoxy proprionate.

Appearance at 20°C and 101.3 kPa:	colourless, viscous liquid with a solvent odour
Boiling Point:	126°C (n-butyl acetate), by analogy with similar polymers this polymer is not volatile under the conditions of use.
Specific Gravity:	1.053 (polymer solution), 1.132 (calculated for polymer)
Vapour Pressure:	2 kPa at 25°C (n-butyl acetate), by analogy with similar polymers this polymer is not volatile
Water Solubility:	insoluble (by analogy with similar polymers)
Partition Co-efficient (n-octanol/water):	not provided
Hydrolysis as a Function of pH:	not measured, the polymer contains ester groups which may hydrolyse but the notifier considers this unlikely under the conditions of use, containment and disposal
Adsorption/Desorption:	not provided
Dissociation Constant:	not provided
Flash Point:	24°C (n-butyl acetate)
Flammability Limits:	Upper Explosive Limit = 7.6 % (n-butyl acetate) Lower Explosive Limit = 1.7 % (n-butyl acetate)
Autoignition Temperature:	377°C (ethyl ethoxy proprionate)
Explosive Properties:	explosive properties are those of the solvents which will form explosives with air, refer to flammability limits
Reactivity/Stability:	the polymer and its solution are stable but like all 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 has provided a literature reference to substantiate the claim of water insolubility (1), which the EPA accepts as valid. The polymer is likely to have very low water solubility.

No hydrolysis data were presented in spite of the presence of a number of pendant ester groups. The notifier acknowledges that hydrolysis is the most likely means of abiotic degradation. 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 measure and the majority of the polymer is not anticipated to cross biological membranes because of its high molecular weight (2,3). The polymer contains low molecular weight species of a molecular weight less than 500 daltons that may cross biological membranes.

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, thereby becoming immobile.

The notifier did not measure dissociation; the polymer contains a low percentage of free carboxylic acid groups which are expected to have typical acidity.

5. USE, VOLUME AND FORMULATION

The notified polymer will be used as one of the film forming components of an Automotive Repair Primer (ARP) formulation used to coat car panels. Initially, the notified polymer will not be manufactured in Australia but will be imported as an already formulated ARP containing between 30 and 60% of the notified polymer.

The import volume of the polymer in suspension is projected to rise from 5-10 tonnes in the first year, to 10-20 tonnes in the subsequent four years.

If economically feasible, the acrylic polymer solution may in the future be imported into Australia or locally manufactured and used for the local manufacture of the ARP.

Local manufacture of the polymer would be conducted at the Dulux plant in Clayton, Victoria. The commercial production of the coating made with the polymer solution will also be carried out at the Clayton site. The processes are as follows:

<u>Polymer solution manufacture</u>

reactants and solvents charged to reactor	---------->	polymer made in closed reactor	-------> filtration and filling --------> store for reprocessing

<u>Paint manufacture</u>

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

Paint Application

mix, stir and dilute ---------> place in spray gun ------->spray object to be primed ------>apply topcoat ------->panels (car) heat cured

6. OCCUPATIONAL EXPOSURE

Consideration of occupational health exposure has been based on the understanding that the notified polymer will initially be imported as a polymer solution but may at a later stage be manufactured in Australia. There are four main categories of worker who may be exposed to the notified polymer. These will be individuals involved in manufacture, reformulation of the notified polymer and application of end-use products. Manufacture of the polymer solution and the formulation of the spray primer is expected to occur at single sites. Storage of the finished primer will be at single sites in five states before distribution to customers.

The notified polymer has a high molecular weight indicating that it will be poorly absorbed across biological membranes and tissues. The notified polymer has a significant level of monomers with a NAMW of less than 1 000 (approximately 10%) and less than 500 (approximately 3%). Low molecular weight species will have the potential to cross biological membranes and may result in systemic toxicity if exposure occurs. Some of the residual monomers are potentially hazardous on the basis of skin irritation and skin sensitisation effects (4). However, they are present at concentrations below the threshold requiring classification according to Worksafe Australia's *Approved Criteria for Classifying Hazardous Substances* (Approved Criteria) (5)

The likely occupational health effects of the polymer solution are those associated with over exposure to the solvents, ethyl ethoxy proprionate and n-butyl acetate. These solvents have the potential to cause irritation of the skin, eyes and respiratory tract. Adverse effects on the central nervous system (CNS) from exposure to high concentrations are also noted on the Material Safety Data Sheet (MSDS) for the polymer solution. Exposure can be prevented by use of well ventilated areas and operating at atmospheric concentrations below the limits recommended in Worksafe Australia's *Exposure Standards for Atmospheric Contaminants in the Occupational Environment: Guidance Note and National Exposure Standards.* The recommended occupational exposure limit for n-butyl acetate is 150 ppm Time Weighted Average (TWA), 200 ppm Short Term exposure Limit (STEL).

Laboratory development

Laboratory workers may be exposed to the polymer and solvents in the manufacture

of the polymer and paint and also when testing the paint. Dermal exposure is the most likely route of exposure but there may also be inhalational exposure to solvents. However, laboratory development is likely to be small scale manufacture and exposure to the notified polymer and solvents will be minimised by use of equipment fitted with exhaust ventilation and personal protective equipment. Laboratory workers may be exposed for a maximum duration of eight hours per day, 10 days per year, in manufacture of the polymer and eight hours per day for 20 days per year, in manufacture and testing of the paint.

Polymer manufacture

Large scale manufacture of the polymer solution is performed in an enclosed reaction vessel and then drummed off for further processing into paint. Potential exposure will be limited to those workers sampling and testing the reaction mixtures and those filling drums. Maximum duration for these procedures will be eight hours per day for 10 days of the year.

Workers involved in polymer manufacture may also be exposed to potentially hazardous monomer components that have the potential to cause irritation and sensitisation. Again, exposure will be minimised by the closed automated systems in use.

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. Filling of containers with both polymer and paint is conducted 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 is dermal and possibly inhalational exposure to solvents. The polymer will be transported to the paint production plant in sealed 200 L drums and the paint will be transported in 5 L cans to distributers. Exposure, during transport, is only likely to occur in the event of an accident. The polymer solution and paint are classified as Packaging Group III according to the Australian Dangerous Goods Code (6) on the basis of flammable ingredients. Appropriate precautions should be taken in handling and storage.

Paint Application

There is the potential for exposure during activation and thinning of paint, paint application and cleaning of spray equipment. These activities will be performed for up to four hours per day, 220 days per year. Paint application will be carried out in a well ventilated spray booth with an effective fume extraction system thus reducing the potential for exposure to the paint via dermal and inhalation routes.

During all stages of manufacture and application of end-use products, containing the notified polymer, occupational exposure will be kept to a minimum by means of engineering controls and good work practice. MSDS will be available at both the Dulux and customer facilities and training courses will be provided for all employees handling chemicals of this type.

7. PUBLIC EXPOSURE

There is negligible potential for public exposure to the notified polymer arising from importation, storage , transportation and formulation into automotive primer paint products. Similarly, 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. There is possible public exposure from the end-use application of the chemical as a solvent-based spray primer, but this exposure route is minimised by the use of these products being restricted to professional premises with spray booth equipment. 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, as it is present in an inert unavailable form, exposure and absorption are unlikely

8. ENVIRONMENTAL EXPOSURE

Release

As previously noted the polymer manufacture and ARP formulation will be carried out under exhaust ventilation with the capture of volatiles. The polymer will be manufactured in a closed reactor and then drummed off for further processing into the ARP. Spills at the Dulux site will be contained by onsite bunding. Dulux has developed a solvent recovery procedure (the 'Dusol' process) whereby waste resin and paints are processed to reclaim the solvent. Polymer residues (up to 250 kg per year) will be converted to an inert solid and disposed of to landfill.

It is expected that the 200 L steel drums containing the notified polymer will be either re-used on-site or sent to a drum reconditioner. The latter involves incineration and washing of the drums, and then recycling for other uses.

During application, up to 70% of the polymer may be lost through overspray (up to 14 tonnes per year of the polymer at maximum manufacture/import volumes). However, release of the ARP will be contained within spray booths. The resultant overspray will be captured and collected through the spray booths' filtering system. Cleaning of the spray gun and mixing equipment will generate waste and this will be collected. Liquid wastes will be removed by licensed waste disposal contractors. This waste is then treated and sent to trade-waste landfill.

Residues of ARP remaining in paint cans is estimated by the notifier at 3% (up to 600 kg per year of the polymer at maximum manufacture/import volumes). These residues will dry within the can and be disposed of to landfill.

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 is expected.

Incineration of the polymer is expected to produce water and oxides of carbon.
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 sediments.

9. EVALUATION OF TOXICOLOGICAL DATA

No toxicological data were provided, which is acceptable for polymers of NAMW greater than 1 000 according to the Act. A NAMW in excess of 1 000 will restrict transfer across biological membranes. However, there is a significant level of low molecular weight species, approximately 10% with molecular weight less than 1 000 and approximately 3% with a molecular weight less than 500. These low molecular weight species may be absorbed by dermal contact and lead to systemic toxicity. There are also a low level of residual monomers, which are known to cause skin irritation and skin sensitisation. However, the low molecular weight species and residual monomers are present at concentrations below the threshold requiring classification according to Worksafe Australia's Approved Criteria (5). On the basis of these data and physico-chemical properties the notified polymer is considered unlikely to be hazardous.

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 manufacture, formulation and application processes. The EPA estimates that up to 15 tonnes per year of the polymer may be consigned to landfill at maximum projected import volumes (due to 250 kg waste created through manufacture/formulation, 70% overspray in application and 3% residues ARP cans). 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 it is incorporated into the ARP and applied to the panels of cars. The ARP is topcoated.

Such painted panels will be consigned to landfill or recycled at the end of their useful life.

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

The notified polymer will be used as an automotive repair primer. Initially it will be imported as a solution containing greater than 60% of the notified polymer and will be formulated into the automotive repair primer (ARP). In the future, the polymer solution may be manufactured in Australia and this has been considered in the recommendations for use provided in section 12.

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 result in systemic toxicity. There are also a low level of residual monomers, which are known to cause skin irritation and skin sensitisation. However, the low molecular weight species and residual monomers are present at concentrations below the threshold requiring classification according to Worksafe Australia's Approved Criteria (5). These factors and the physico-chemical properties, including negligible volatility under normal ambient conditions support the notifier's claim of expected low toxicity for the notified polymer.

Exposure to the notified polymer may occur during manufacture of the polymer and paint in the laboratory and when testing the paint. Large scale manufacture will be conducted in enclosed reaction vessels and exposure will be limited to those sampling and testing the reaction mixtures and those filling drums. During paint manufacture workers may be exposed to the notified polymer during paint make-up, quality control and drum filling. At the customer site, activation of the paint, thinning and cleaning of spray equipment could result in exposure to the notified polymer. 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 measure employed for the solvent components in the polymer solution and formulated ARP.

Workers should be aware that the solvents in the polymer solution and ARP may cause skin, eye and respiratory irritation and at high concentrations exposure can result in adverse effects on the central nervous system. The solvents are present at concentrations below the thresholds that would lead to classification by the Worksafe criteria (5). Accordingly, the polymer solution and ARP are not classified as hazardous. There is the potential for exposure to solvents during the manufacture of the polymer solution, manufacture of the ARP and during application of the ARP. The workers most likely to be exposed will be those conducting the tasks where exposure to the notified polymer is also likely, eg: sampling and testing of polymer solution, activation, thinning and application of the ARP. Exposure may occur via dermal and inhalational routes. Manufacture of the polymer solution in the laboratory will be conducted under well ventilated areas, so the potential for exposure will be low. Solvent exposure on the plant will be reduced by enclosed reaction vessels and 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* (6). The automotive repair primer, containing the notified polymer will be applied in well ventilated spray booths which will reduce potential exposure. 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 at both the manufacturing site and the application sites will minimise worker exposure and 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 Acrylic Resin R9577/117 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 Acrylic Resin R9577/117, 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 (8) and protective footwear conforming to Australian/New Zealand Standard (AS/NZS) 2210 (9) 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 (10) and meeting requirements of AS/NZS 1337 (11), impermeable gloves AS 2161-1978 (12) and respiratory protection (selected and fitted) according AS/NZS 1715 (13) meeting the requirements of AS/NZS 1716 (14), to protect against any unforseen circumstances.

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

In addition, The Worksafe Australia document *Exposure Standards for Atmospheric Contaminants in the Occupational Environment: Guidance Note and National Exposure Standards* (6) should be used as a guide in the control of any monomer vapours or mists generated during manufacture of the notified polymer, as well as 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* (15).

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

1. Surface Coatings Association Australia 1993, *Surface Coatings: Raw materials and their usage*. Vol 1, pp 385-386. The New South Wales University Press, Kensington, NSW

2. Anliker R. Moser P. & Poppinger D. 1988, 'Bioaccumulation of dyestuffs and organic pigments in fish. Relationships to hydrophobicity and steric factors'. *Chemosphere* Vol 17, No.8, pp 1631-1644.

3. 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.

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

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

6. 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.

7. Federal Office of Road Safety 1992, *Australian Code for The Transport of Dangerous Goods by Road and Rail* 5th Edition (ADG Code). Australian Government Publishing Service Publ., Canberra.

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

9. 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.

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

11. 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.

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

13. 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

14. Standards Australia/Standards New Zealand 1994, *Australian/New Zealand Standard 1716-1994, Respiratory Protective Devices,* Standards Association of Australia Publ., Sydney, Standards Association of New Zealand Publ, Wellington.

15. 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.