File No: PLC/77

July 1998

NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

URALAC P1580

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Director
Chemicals Notification and Assessment

FULL PUBLIC REPORT

Uralac P1580

1. APPLICANT

Robert Decker & Co Pty Ltd of 6 Twin Road NORTH RYDE NSW 2113 and Robert Bryce & Co Ltd of 64 Trenerry Cres ABBOTSFORD VIC 3067 have submitted a notification statement accompanying their application for assessment of a synthetic polymer of low concern, Uralac P1580.

2. IDENTITY OF THE CHEMICAL

Claims were made and accepted for the identity of Uralac P1580 to be exempt from publication in the Full Public Report. The data items were:

chemical name;
CAS number;
structure formula;
polymer constituents; and
residual monomer content.

Trade Name(s):	Uralac P1580
Number-Average Molecular Weight (NAMW):	3 601
Maximum Percentage of Low Molecular Weight Species (Polymers and Oligomers)	
(Molecular Weight < 1 000):	6.8%
(Molecular Weight < 500):	1.8%
Means of Identification (List of Spectral Data Available):	UV/Visible and Infrared (IR) spectroscopy

Uralac P1580 is not considered to be hazardous based on the nature of the polymer and the data provided.

Comments on Chemical Identity

Uralac P1580 meets the definition of a Polymer of Low Concern under the Act except for low molecular weight species < 1 000. The Director of NICNAS exercised discretionary power to allow the polymer to be submitted as a PLC despite the level of low molecular weight species marginally failing the criterion.

A Gel Permeation Chromatography (GPC) trace was supplied for the determination of NAMW and percentage of low molecular species. The polydispersity of the polymer was 9.6, which indicates a wide molecular weight range.

3. PHYSICAL AND CHEMICAL PROPERTIES

Appearance at 20°C and 101.3 kPa:	colourless to light yellow granules
Melting Point:	90-110°C
Density:	1 200 $kg.m^{-3}$
Water Solubility:	insoluble
Hydrolysis as a Function of pH:	not determined (see comment below)
Flammability Limits:	> 100°C
Autoignition Temperature:	> 400°C
Explosive Properties:	not explosive
Stability:	stable
Particle Size Distribution:	3-9 mm
Charge Density:	not polycationic
Cationic/anionic potential in pH range 4 to 9:	not expected
Reactive Functional groups:	will react with isocyanate groups to form high molecular coatings

Comments on Physico-Chemical Properties

The data provided are acceptable for a synthetic polymer of low concern. The monomers used in the polymer are all mentioned in the US EPA list of monomers and reactants giving polyesters exempt from notification.

A test report supporting the water insolubility claim was not provided. However, the notifiers claim that polyesters, under normal conditions, are insoluble in water. The literature supports that polyesters of this kind are highly insoluble and difficult to hydrolyse.

The notifiers claim that the polymer is a stable hydroxyl-terminated polyester. No loss of monomers, additives and/or impurities is known to take place.

4. PURITY OF THE CHEMICAL

Degree of Purity: > 99%

5. USE, VOLUME AND FORMULATION

The notified polymer will not be manufactured in Australia. The polymer will be imported into Australia in 25 kg bags at approximately 30 tonnes per year.

Formulation
The polymer will be formulated into powder coatings containing approximately 40% of the notified polymer. The formulation process consists of 5 steps viz. preparation, mixing, extrusion, micronising and packaging.

In the preparation area, the raw materials are weighed out, including the notified polymer which is in the form of solid flakes. The raw materials are then added to a closed mixer for blending to produce a powdered coating premix, which is then fed to an extruder for melting and extrusion at approximately 120°C. The extrudate is then cut into approximately 20 mm pieces and fed into an air-rinsed microniser and milled to achieve the desired particle size. The finished powder coating product is then separated and packed into 20 kg cardboard boxes. The particle size of finished powder will be in the range of 4 to 140 µm. The average particle size will be in the range from 35 to 50 µm with up to 5% above 100 µm and up to 12% below 10 µm.

End-use
The final product will be used for powder coating at several coating facilities throughout Australia, where the powder will be sprayed through specially designed spray booths and application facilities onto the specific objects. The spray guns charge the powder with a positive or negative charge depending on the spray equipment used. The electrostatically charged powder particles are then sprayed onto earthed metal objects, which are then placed in a stoving oven and heat fixed. The likely coated objects include metal objects designed for outdoor use which can be subjected to vandalism and graffiti. Typical examples are bus shelters (window, door and seat frames), rubbish bins, street furniture, road side signs and posts, and traffic signals.

6. OCCUPATIONAL EXPOSURE

Formulation
During formulation, the number and categories of workers with a potential to be exposed to the notified polymer are as following: formulators (29 personnel), maintenance workers (2 personnel) and technicians (11 personnel). The formulators will work in two 12-hour shifts and the maintenance workers in 8-hour shifts. There are 11 technicians, 4 in research and development and the rest in quality assurance.

The formulation of the notified chemical into a powder coating is mainly a sealed process, with extraction systems to remove airborne particles. In addition, PPE is provided at all

stages of the process. The notifier indicates that workers at the preparation and mixing sites will wear protective overalls, impervious gloves, safety boots, safety glasses and dust masks. PPE includes overalls, safety boots and safety glasses for extrusion site workers, and overalls, safety boots, safety glasses and dust masks for micronising site workers. Standard operation procedures and training will be provided for workers at all stages.

During weighing of the raw materials and their transference to the mixer, workers will handle the notified chemical, however, as the polymer is in the form of large flakes or granules (3-9 mm diameter), inhalational exposure is not possible but skin contamination might occur. Workers will not be exposed to the polymer during mixing as the process is enclosed.

Exposure to the notified chemical may occur when unloading the premix (containing 40% of the polymer) from the mixer and transferring the premix to the extruder. The premix will be in powder form, however, the particle size has not been stated and is unlikely to be accurately known. Skin contamination may occur during these operations, however, as an air extraction system is in place to remove particulates, inhalational exposure to fine particles is likely to be low.

No significant exposure will occur during handling of the extrudate due to the nature of the material. However, after micronisation of the extrudate, some particles of the finished powder are in the respirable range (< 7 μm), so inhalational exposure to the notified chemical may occur. During this phase of the operation, an extraction system is provided to remove fine particulates and the workers are provided with PPE.

Technicians in the research and development section will be involved in the preparation and supervision of the process such as checking the weighing and extruder operations. They will wear protective coats, safety footwear, safety glasses and dust masks. Technicians in quality assurance will test the micronised powder. A laboratory extraction system is in place and these technicians will wear laboratory protective coats, safety glasses and safety footwear. Exposure for technicians is expected to be less than that for formulators.

Exposure to the notified chemical could occur during the packaging process, particularly if spills occur. The size of some of the particles in the finished product are within the respirable range so inhalational exposure is possible.

End-use
During end-use of powder coating, workers are most likely to become contaminated when filling hoppers, spraying, cleaning-up spills and cleaning equipment and spray booths. Both dermal and inhalational exposure is possible during end use. The notifier did not provide OHS data for end users.

Waste collection
The notifier estimates that approximately 50 kg of waste product per 1000 kg of powder coating produced is expected to be collected from the extraction system and water settling tank. Of this 50 kg, approximately 40% by weight will be the resin. All waste is collected: the dust in sealed 200 litre containers and the sludge pumped into a waste collection tanker. It is disposed of as non-hazardous solid material at an approved disposal site. No other material is released directly into the environment. The powder coating will be supplied to various powder coaters who normally achieve a waste factor of approximately 7%. Waste powder is collected through baghouse, cyclone cartridge filters and sweeping from floors and

associated application areas. Waste material is disposed of as non-hazardous solid material at an approved disposal site. The same procedure will be followed with any material spilled in a transport accident.

Transport
As both the notified polymer and finished product are transported and stored as packaged goods, occupational exposure should not occur unless an accident occurs or the packaging is breached.

7. PUBLIC EXPOSURE

There is negligible potential for public exposure arising from industrial use, waste disposal and transport.

Most of the notified polymer will enter the public domain as a finished powder coating on products such as outdoor furniture. Although there will be extensive public contact with powder coated products, the notified polymer will be in the form of a cured, unreactive solid which would not be bioavailable.

8. ENVIRONMENTAL EXPOSURE

. Release

During powder coating formulation, extraction systems are in place to remove airborne particulate matter. The particulate matter is collected through a dust collector system, and disposed of to landfill in 200 L containers. Daily washings from the factory floor are collected in a holding tank where the particulate is allowed to settle. The majority of polymer should settle out and become part of the sludge, which is pumped into a waste collection tanker and disposed of as prescribed waste to an approved landfill site. The liquid, which may still contain a small amount of polymer, is pumped into the on-site waste treatment facility where it is adjusted to a pH of 7 to 10 and sent to sewer.

Application of the powder coating should occur within spray booths where waste powder can be collected through filters and sweepings. The notifiers claim that powder coating applicators normally achieve a waste factor of approximately 7%. Unlike wet spraying, where oversprayed paint is usually wasted, any oversprayed powder can be collected through filters and a cyclone system, and can then be re-used (Price & Turner, 1993). Waste material will be disposed of to landfill.

. Fate

The majority of notified polymer will become immobilised through cross-linking in the insoluble polyester-urethane matrix of the powder coating. Thus, the fate of the majority of the notified chemical will share the fate of the articles to which it is applied. These are expected to be consigned to landfill or recycled by smelting at the end of their useful life.

The powder coated articles will be subject to wear and tear in everyday use. Chips and dust of the coating are expected to be diffusely dispersed in the environment and form part of the

soil or sediments.

Waste polymer sent to landfill is unlikely to leach due to its expected insolubility. Any polymer released to the aquatic compartment should partition to soil/sediment. Combustion of the notified polymer in the presence of excess air will generate oxides of carbon and water vapour.

The large molecular weight of the polymer should ensure that the polymer will not bioaccumulate (Connell, 1989).

9. ASSESSMENT OF TOXICOLOGICAL EFFECTS

No toxicological data was available for the notified polymer. Submission of toxicological data is not required for synthetic polymers of low concern.

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

No ecotoxicological data were provided. This is acceptable for synthetic polymers of low concern with a NAMW greater than 1 000 under the Act.

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

The environmental exposure of the polymer as a result of normal use should be low. Once incorporated into powder coatings, the polymer will be inert and bound to the coated article.

The main environmental exposure arises from landfill disposal of approximately 4 tonnes per annum (worst case) of recovered waste polymer during the formulation and application processes. As the polymer is expected to be very insoluble in water, the polymer waste consigned to landfill is unlikely to degrade or leach and will stay in the landfill.

A small quantity of the polymer could be released from the waste water discharged to the sewer. Here it will be diluted by several orders of magnitude, partition to sludge and be trapped in the solids. The solids from sewage treatment works are disposed of by incineration or landfill.

Instructions in the Material Safety Data Sheet (MSDS) are adequate to limit the environmental exposure from spills.

The overall environmental hazard from the use of the polymer is rated as low.

12. ASSESSMENT OF OCCUPATIONAL AND PUBLIC HEALTH AND SAFETY EFFECTS

The notified polymer is unlikely to pose a toxicological hazard because of its high number-average molecular weight, low percentages of low molecular weight species, water

insolubility and low concentrations of residual hazardous monomers. One of the monomers is on the NOHSC *List of Designated Hazardous Substances* (National Occupational Health and Safety Commission, 1994a), however, the concentration of the residual monomer is below the cut-off level. On the information provided, the notified polymer is not considered hazardous and is unlikely to pose a health risk to workers

Formulation
The main hazard associated with the handling and use of the notified polymer is related to the particle size of the formulated product, where up to 12% of particles have a diameter less than 10 µm. Therefore some particles may be within the respirable range. The mixing process is enclosed, however, inhalational exposure to these particles may occur during handling of the premix prior to extrusion, handling of the finished powder (after micronisation) during the packaging process, or in the event of spills. Air extraction is provided throughout the plant and PPE is provided for workers so the health risk to workers from inhalational exposure is not likely to be significant.

Skin contamination may occur during weighing of the raw materials and handling of the formulated product after mixing and during packaging. The MSDS for the formulated product indicated that skin irritation may occur after repeated or prolonged exposure to the product and although PPE is provided throughout the plant, washing facilities should be provided.

The MSDS for the finished product also indicates that a small amount of isocyanate vapour may be released when the product is heated. Isocyanates are respiratory sensitisers so precautions should be taken to minimise inhalational exposure during handling of the product. Besides isocyanates, other ingredients in the product have NOSHC exposure standards so the health risk can be reduced by adherence to these standards and hazardous substances regulations.

End use
During end use, the most likely activities resulting in worker exposure are filling hoppers, spraying, cleaning-up spills and cleaning equipment and spray booths. PPE is needed for workers performing these activities. Occupational exposure and risk assessment of powder coating practice was detailed in the Full Public Report of Triglycidylisocyanurate (TGIC) (NICNAS, 1994).

As indicated above, small amount of isocyanate vapour may be released (0.3-0.5 mg/kg powder) from the finished product during stoving/curing prior to application and similar measures are required to minimise inhalational exposure.

There may be widespread public contact with the notified polymer on the powder coated surfaces of treated products, but its adhesion to the substrate and physico-chemical properties will be sufficient to preclude absorption across the skin or other biological membranes.

13. MATERIAL SAFETY DATA SHEET

MSDS for both the notified polymer and finished product were provided. Both were prepared in accordance with the *National Code of Practice for the Preparation of Material Safety Data Sheets* (National Occupational Health and Safety Commission, 1994b).

MSDS for the notified polymer was provided by the notifiers 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 notifiers.

14. RECOMMENDATIONS

To minimise occupational exposure to Uralac P1580 the following guidelines and precautions should be observed.

For workers at the formulation site:

- Safety goggles should be selected and fitted in accordance with Australian Standard (AS) 1336 (Standards Australia, 1994) to comply with Australian/New Zealand Standard (AS/NZS) 1337 (Standards Australia/Standards New Zealand, 1992);
- Industrial clothing should conform to the specifications detailed in AS 2919 (Standards Australia, 1987) and AS 3765.1 (Standards Australia, 1990);
- Impermeable gloves or mittens should conform to AS 2161.2 (Standards Australia, 1998);
- All occupational footwear should conform to AS/NZS 2210 (Standards Australia/Standards New Zealand, 1994b);
- Dust mask should confirm to AS/NZS 1715:1994 (Standards Australia/Standards New Zealand, 1994a);
- Spillage of the notified chemical should be avoided. Spillages should be cleaned up promptly with absorbents which should be put into containers for disposal;
- Good personal hygiene should be practised to minimise the potential for ingestion;
- A copy of the MSDS should be easily accessible to employees.

For workers at the spraying sites:

- Overalls, safety glasses, gloves and a full-face air-supplied particulate respirator are to be worn during filling hoppers, manual spraying inside spray booth and clean-up of spray booth;
- Gloves and disposable dust masks are to be worn during clean-up of spills and maintenance work;
- Engineering controls and safe work practices are to be as recommended in the Full Public Report of TGIC (NICNAS, 1994);
- Hazard control measures as recommended for spray painting.

15. REQUIREMENTS FOR SECONDARY NOTIFICATION

Under the Act secondary notification of Uralac P1580 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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National Occupational Health and Safety Commission (1994a) List of Designated Hazardous Substances [NOHSC:10005(1994)]. Canberra, Australian Government Publishing Service.

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