

File No: PLC/283

August 2002

**NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION  
AND ASSESSMENT SCHEME**

**FULL PUBLIC REPORT**

**Polymer in 99R9606**

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**Director  
Chemicals Notification and Assessment**

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**FULL PUBLIC REPORT****Polymer in 99R9606****1. APPLICANT**

The Valspar (Australia) Corporation Pty Ltd of 203 Power Street, Glendenning NSW has submitted a notification statement in support of their application for an assessment certificate for the synthetic polymer of low concern (PLC) 'Polymer in 99R9606'.

**2. IDENTITY OF POLYMER**

**Chemical name:** 1,6-hexanedicarboxylic acid, polymer with ethanol-2, 2'-dioxo, and 1,4 benzene dicarboxylic acid, and 1,2-propanediol, and 2,5-furandione, and 1,2-ethanediol

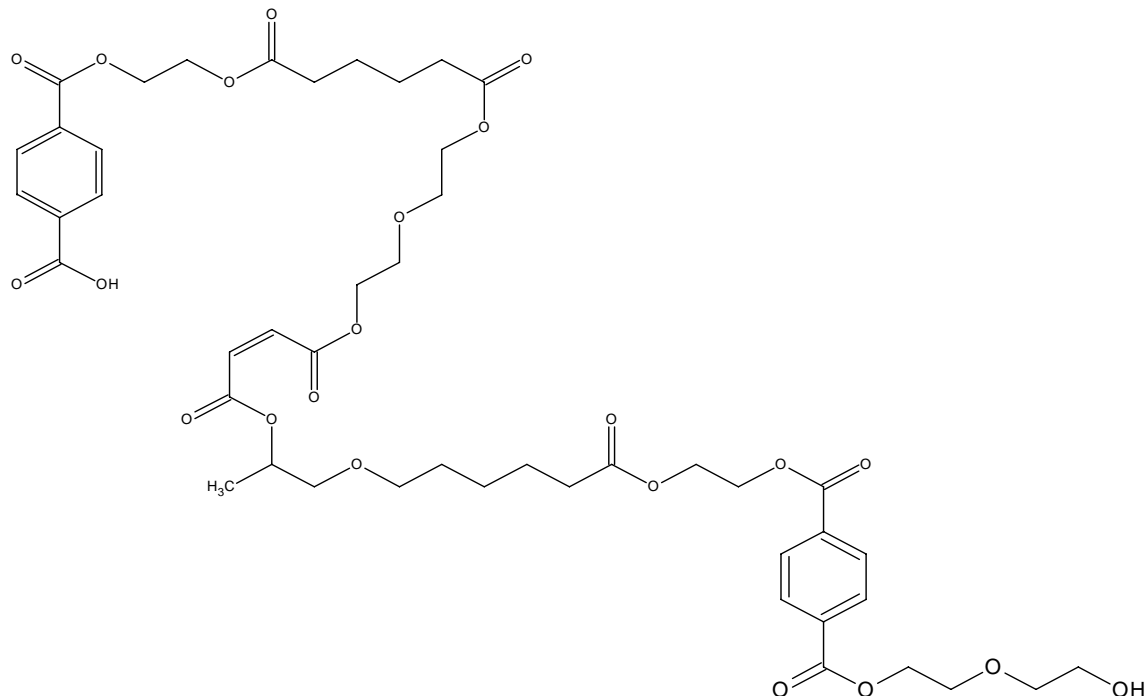
**CAS number:** Not assigned

**Marketing names:**

**Other names:** Polymer in 99R966; unsaturated resin

**Molecular formula:**  $(C_8H_6O_4)_n (C_2H_6O_2)_m (C_4H_6O_2)_p (C_5H_8O_2)_q (C_6H_{10}O_4)_r (C_4H_{10}O_3)_s (C_5H_2O_3)_t$

**Structural formula:**



**Reactive functional groups:**

Only low concern functional groups (carboxylic and alcohol groups)

**Functional group equivalent weight (FGEW):**

Not applicable

**Molecular weight (MW):**

Number-average MW	Weight-average MW	% MW < 1000	% MW < 500	Method
1829	7717	9.5	5.5%	GPC

**Structural identification method:** IR Spectra

**Peaks at** 2953.38, 2875.38, 1542, 1454.24, 1408.87, 1379.69, 1271.71, 1173.13, 1132.42, 1018.40, 979.68, 875.97 and 731.93  $\text{cm}^{-1}$ .

### 3. POLYMER COMPOSITION AND PURITY

**Polymer constituents**

Constituent	Synonym	CAS no.	% weight	% residual
1,4-Benzenedicarboxylic acid	Terephthalic acid, p-benzenedicarboxylic acid	100-21-0	18.115	<0.13
1,2-ethanediol		107-21-1	6.772	<0.1
1,2-propanediol	Propylene glycol	57-55-6	9.386	<0.1
Ethanol, 2,2'-oxybis	ethylene glycol	111-46-6	24.383	<0.1
2,5-Furandione	Maleic anhydride	108-31-6	8.625	<0.1
1,6-Hexanedicarboxylic acid	Adipic acid	124-04-9	32.716	<0.15

**Purity (%):** Not provided

**Hazardous impurities (other than residual monomers and reactants):** None

**Non-hazardous impurities at 1% by weight or more:** None

**Additives/adjuvants:**

99R9606 contains the following:

Chemical name	CAS no.	% (v/v)	Regulatory controls*
Polyester Resin (Notified polymer)	-	30-60%	
Benzene ethenyl (styrene monomer)	100-42-5	30-60%	<i>R10</i> : flammable; <i>R20</i> ; harmful by inhalation; <i>R36/38</i> : irritating to eyes and concentration-cut-off $\geq 2.5\%$ ; Exposure standards for styrene monomer are 50 ppm TWA <sup>1</sup> and 100 ppm STEL <sup>2</sup>

<sup>1</sup> time weighted average

<sup>2</sup> short term exposure limit

Hydroquinone (inhibitor)	123-31-9	0.1%	<i>R20/22-Harmful by inhalation and if swallowed</i> <i>Concentration cut-off level ≥25%</i>
Other Additives	Mixture	<1%	

\* NOHSC, 1999a and 1995

#### 4. PLC JUSTIFICATION

The notified polymer meets the PLC criteria.

#### 5. PHYSICAL AND CHEMICAL PROPERTIES

Property	Result	Comments
<b>Appearance @20°C and 101.3 KPa</b>	Pale yellow solution	
<b>Boiling point</b>	Not determined	145°C (polymer in 99R9606)
<b>Density</b>	1260 kg/m <sup>3</sup>	Density of the polymer in styrene is 1130 kg/cm <sup>3</sup> .
<b>Water solubility</b>	Not determined	The notified polymer is never isolated from its styrene solution but is expected to have low water solubility based on its predominantly hydrophobic character.
<b>Flammability</b>	Not determined	The polymer in 99R9606 is not classified as flammable. With the styrene monomer, the Low Explosive Limit of the solution will be 1.1% and the Upper Explosive Limit 6.1%.
<b>Autoignition temperature</b>	Not determined	145 °C (Styrene monomer)
<b>Explosive properties</b>	Not determined	The Styrene component could form an explosive mixture
<b>Stability/reactivity</b>	Stable under normal conditions.	Cross linking reaction occurs between the resin and styrene component at room temperature over approximately 12 months
<b>Particle size</b>	Not applicable	Polymer is not isolated from styrene monomer
<b>Hydrolysis as function of pH</b>	Not determined	The notified polymer contains ester linkages that could be expected to undergo hydrolysis under extreme pH conditions. However, in the environmental pH range of 4 to 9, significant hydrolysis is unlikely to occur.
<b>Partition coefficient</b>	Not determined	The partition coefficient has not been determined due to its expected low water

		solubility, and its likely hydrophobic nature, indicative of partitioning into the octanol phase.
<b>Adsorption/desorption</b>	Not determined	The notified polymer is expected to be relatively immobile in soil due to its expected low water solubility.
<b>Dissociation constant</b>	Not determined	The notified polymer contains terminal carboxylic acid and alcohol groups which are expected to have typical acidity.

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## 6. USE, VOLUME AND FORMULATION

### Use and volume:

The manufacture of approximately 4.2 tonnes of the notified polymer in 99R9606 took place at Glendenning site of NSW. The notifier indicated that there is no intention of making further quantities of the notified polymer.

The polymer solution will be used in-house as part of the resinous component on industrial products for the composites industry, for example, for casting artificial marble of a special kind. These products will be mixtures containing small percentages of the notified polymer (5% of the solution equivalent to 3.5% of the resin) in various combinations and ratios for in house use or for sale.

Another alternative option is to allow the entire batch of the manufactured resins to solidify until it is cross-linked, and then to be disposed of as solid waste in accordance with regulations of State Land Waste Management Authority.

### Formulation details:

The notified polymer was manufactured in an enclosed heated reaction vessel fitted with stirring and an overhead condenser system. Following batch processing, the notified polymer in 99R9606 resin was drummed off into 200 kg drums and stored at the site.

The notified polymer will be blended in small quantities into other standard unsaturated polyester resin solutions containing other additives such as promoters and inhibitors prior to filtering and packaging into containers (200 L) for distribution to customer sites throughout Australia. The concentration of the notified polymer in styrene solution and in the finished resin solution will be 60 and 5%, respectively.

At the end user site, it is expected that the solution containing the notified polymer (at 5% w/w) along with other resins in styrene will be mixed with catalyst and sprayed, along with glass filament, into moulds. The resin/glass mixture is rolled to remove trapped air and then cured at either ambient or elevated temperatures and be used as a general laminating resin. The notifier indicates that resins into which the notified polymer has been incorporated have a limited shelf life and as such a proportion of the notified polymer may also be disposed of to landfill after full solidification.

## 7. OCCUPATIONAL EXPOSURE

Worker exposure is possible during blending operations, ie when loading 200 L drums containing the polymer solution into the blender, sampling from the mixing vessel and drumming off into 200 kg drums on pallet. The notifier estimated 2 workers are to be involved in chemical plant operation and storage. Workers can also be exposed to the notified polymer during quality control activities (2 workers) and transport (2 workers) of the solidified resin product to the disposal site or, to 200kg steel containers, to customer's premises.

Workers may also be exposed to the products containing the notified polymer during end use as part of the resinous component on industrial products for the composites industry, for example, for casting artificial marble of a special kind. Exposure to the notified polymer will be limited as it will be contained in small percentages in the products.

The main route of exposure is likely to be dermal. Inhalation and ocular exposure (accidental) may also occur. The notifier estimated that each drum will take less than half an hour to empty and to clean. Therefore, there would be a total handling time of approximately 10 hours to dispose of the entire product produced.

Transport workers are unlikely to be exposed to the notified polymer except in the event of accidental spills. The solid waste of the notified polymer can be regarded as inert for handling purposes.

All charging and blending activities are carried out in blending areas (expected to be ventilated), and workers are expected to wear personal protective equipment (safety glasses or chemical goggles, long sleeved shirt and long legged overalls and PVC gloves; forklift drivers will wear safety glasses and chrome leather gloves).

## **8. PUBLIC EXPOSURE**

The general public is unlikely to contact with the liquid polymer, since all the processing from manufacture of 99R9606 to its integration into the final products, or to solid waste of the entire batch, took place in the notifier's Glendenning site. The solid form of the notified chemical, either in the final products or as waste for disposal, can be regarded as inert and not be bioavailable. Hence, the potential of public exposure is minimal.

## **9. ENVIRONMENTAL EXPOSURE**

### **9.1. Release**

It is anticipated that the amount of waste generated from the manufacture of the notified polymer is expected to be very small as a result of the synthesis being carried out in committed equipment. Furthermore, the distillate recovered from the manufacture process along with any reactor washings will be neutralised, and the solids precipitated and treated in an aerobic digester prior to discharge of the treated water to sewer. The resulting solid wastes from this process will be disposed to landfill. The notifier indicates that up to 40 kg of the notified polymer will be disposed of to landfill from the blending and packaging processes. Release during application is expected to also be low because the fibreglass products are moulded, all waste from spraying (assuming overspray of 20%) will be contained within the plant and waste resulting from off cuts is will be minimal. Therefore, the notifier expects that up to 630 kg of notified polymer wastes will be disposed of during manufacture and use and up to 5 kg of the notified polymer will be released during the disposal of end use containers.

The majority of the notified polymer will be incorporated into fibreglass products and at the end of their useful life will be disposed of to landfill.

### **9.2. Fate**

The majority of the notified polymer will be reacted with styrene to form a very high molecular weight and stable polymer matrix. Therefore, once incorporated into fibreglass, the notified polymer is expected to be immobile and pose little risk to the environment.

The notified polymer in the small amount of waste from spills, equipment cleaning and the manufacture of fibreglass products will be collected and disposed of to landfill. Resin that has solidified prior to use will also be disposed to landfill. Liquid wastes resulting from the cleaning of application equipment used in the manufacture of fibreglass products will either be incinerated or evaporated to dryness and the resulting solid residue disposed of in landfill. Incineration of wastes containing the notified polymer will result in the production of water vapour and oxides of carbon.

## **10. EVALUATION OF HEALTH EFFECTS DATA**

No toxicological data for the notified polymer were provided.

## **11. EVALUATION OF ENVIRONMENTAL EFFECTS DATA**

No ecotoxicological data were provided.

## **12. ENVIRONMENTAL RISK ASSESSMENT**

The majority of the notified polymer will be reacted to form a very high molecular weight and stable polymer matrix and, as such, is expected to be immobile and pose little risk to the environment.

Wastes containing the notified polymer from spills, equipment cleaning and the manufacture of fibreglass products will be collected and disposed of in landfill. Resin that has solidified prior to use will also be disposed to landfill. Liquid wastes resulting from the cleaning of application equipment used in the manufacture of fibreglass products will either be incinerated or evaporated to dryness and the resulting solid residue disposed of in landfill. Incineration of wastes containing the notified polymer will result in the production of water vapour and oxides of carbon.

The notified polymer is expected to have low water solubility and, as a result, will be immobile in both terrestrial and aquatic compartments. As a consequence, the notified polymer is expected to associate with the soil matrix and sediments and slowly degrade through abiotic and biotic processes to water vapour and oxides of carbon. The notified polymer is not expected to cross biological membranes due to its high molecular weight and low water solubility and is therefore not expected to bioaccumulate.

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

## **13. HEALTH AND SAFETY RISK ASSESSMENT**

### **13.1. Hazard assessment**

Since the notified polymer meets the criteria of a polymer of low concern, it is not likely to be classified as hazardous according to the *Approved Criteria for Classifying Hazardous Substances* (NOHSC, 1999b).

The Material Safety Data Sheet (MSDS) for 99R9606 Polyester Resin indicated that it is classified as hazardous according to NOHSC's *Approved Criteria for Classifying Hazardous Substances*, (due to aromatic hydrocarbon solvents present, styrene).

Very brief toxicological information for the 99R9606 Polyester Resin is present in the MSDS. The polymer solution has mild to moderate irritation to the eyes and may also be irritant to the skin. Vapour concentrations above the recommended exposure level may irritate the eyes and the respiratory tract, cause headaches, and have an anaesthetic and other CNS effects. Ingestion could cause irritation to mucous membranes, nausea, vomiting, gastro-intestinal disturbances and CNS depression. Upon aspiration into the lungs, chemical pneumonia and damage of the lungs may develop. Similar chronic effects, as well as liver and kidney toxicity may be attributed to the presence of styrene rather than the notified polymer.

### **13.2. Occupational health and safety**

The worst case scenario, is when workers are loading 200 L drums containing notified polymer (60%) into the blender and during testing and sampling. Exposure to the notified polymer may occur due to accidental spills. The risk of adverse effects from exposure to the notified polymer is low given that it is of low hazard. However, there are risks associated with the polymer solution containing styrene. During blending operations, the process is expected to be in ventilated areas. Workers will need skin and eye protection to prevent skin and eye irritation due to styrene presence. Respiratory protection will be required if the ventilation is not adequate. Employers should ensure that the NOHSC exposure standard for styrene monomer is not exceeded.

The risk of exposure to the end use products is low given that the notified polymer is of low hazard and is present at low concentrations.



The risk of workers exposed to the solid waste is low as the notified polymer will solidify before disposing and it will be disposed of in its original container so handling/decanting is limited.

#### *Conclusion*

The notified polymer is of low concern to human health and safety and no specific risk reduction measures are necessary.

### **13.3. Public health**

The general public will not be in contact with the notified polymer in its liquid form of 99R9606 polyester resin, since the resin is manufactured and stored at the notifier's Glendenning site until the forming of solid waste of the entire batch for disposal. The solid waste is inert and not bioavailable, and will be disposed of according to State government regulation. Hence, the notified polymer is likely to pose a minimal risk to public health.

## **14. MSDS AND LABEL ASSESSMENT**

### **14.1. MSDS**

The MSDS of the notified polymer in solution provided by the notifier was in accordance with the NOHSC *National Code of Practice for the Preparation of Material Safety Data Sheets* (NOHSC, 1994a). It is published here as part of the assessment report. The accuracy of the information on the MSDS remains the responsibility of the applicant.

### **14.2. Label**

The label for the notified polymer in solution provided by the notifier was in accordance with the NOHSC *National Code of Practice for the Labelling of Workplace Substances* (NOHSC, 1994b). The accuracy of the information on the label remains the responsibility of the applicant.

## **15. RECOMMENDATIONS**

### *Control Measures*

#### Occupational Health and Safety

- Employers should implement the following engineering controls to minimise occupational exposure to the notified polymer in solution:
  - Exhaust ventilation
- Employers should implement the following safe work practices to minimise occupational exposure during handling of the notified polymer in solution:
  - Avoid spills
- Employers should ensure that the following personal protective equipment is used by workers to minimise occupational exposure to the notified polymer in solution:
  - Impervious gloves, safety glasses or goggles and respirator (if ventilation is not adequate).

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

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

Environment

Emergency procedures

- In the event of a spill, the notified polymer should be contained and absorbed on inert material (soil or earth) and the resulting waste disposed of to landfill.

### **Secondary notification**

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

- (1) Under Subsection 64(1) of the Act; if
  - the notified polymer is introduced in a chemical form that does not meet the PLC criteria.

or

- (2) Under Subsection 64(2) of the Act:
  - if any of the circumstances listed in the subsection arise.

The Director will then decide whether secondary notification is required.

## **16. REFERENCES**

Connell D. W. (1990) General characteristics of organic compounds which exhibit bioaccumulation. In Connell D. W., (Ed) Bioaccumulation of Xenobiotic Compounds. CRC Press, Boca Raton, USA.

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