File No: NA/652

September 1999

NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

Polymer in Polyester Resin CCP E992S

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Director
Chemicals Notification and Assessment

FULL PUBLIC REPORT

Polymer in Polyester Resin CCP E992S

1. APPLICANT

Nuplex Resins (Australia) Pty Ltd of 49 – 51 Stephen Road BOTANY NSW 2019 has submitted a limited notification statement in support of their application for an assessment certificate for Polymer in Polyester Resin CCP E992S.

2. IDENTITY OF THE CHEMICAL

The following requests for exempt information were accepted:

chemical name
other names
CAS number – not assigned
molecular formula
structural formula
number average molecular weight
spectral data
additives/adjuvants
polymer composition
low molecular weight species
residual monomers

Trade Name:	Polyester resin CCP E992S (70% notified polymer)
Number-Average Molecular Weight (NAMW):	>1 000
Maximum Percentage of Low Molecular Weight Species	
Molecular Weight < 500:	<5%
Molecular Weight < 1 000:	<15%

3. PHYSICAL AND CHEMICAL PROPERTIES

The notified polymer is never isolated from the styrene which is added during manufacture and therefore the physical and chemical properties of the pure polymer have not been determined. The properties listed below are for 70% notified polymer in styrene.

Appearance at 20°C and 101.3 kPa:	clear viscous liquid
Boiling Point:	145°C
Specific Gravity:	1.08 1.18 (calculated for the notified polymer)
Vapour Pressure:	0.6kPa at 25°C (similar to styrene)
Water Solubility:	not soluble
Partition Co-efficient (n-octanol/water):	not determined
Hydrolysis:	not expected to hydrolyse
Adsorption/Desorption:	expected to adsorb strongly to soil
Dissociation Constant:	not expected to dissociate as not soluble
Particle Size:	not applicable as only exists in liquid form
Flash Point:	31°C (similar to styrene)
Flammability Limits:	1.1 – 6.1% (similar to styrene)
Autoignition Temperature:	490°C (similar to styrene)
Explosive Properties:	may violently polymerise with heat
Reactivity/Stability:	can polymerise when mixed with organic peroxides

Comments on Physico-Chemical Properties

The polymer is made up of a high level of hydrophobic, aromatic and aliphatic groups, and is expected to be insoluble in water. When cured, the polymer is an inert, high density solid. Hydrolysis is not expected because it is not soluble in water.

Partition and soil absorption behaviour of the notified polymer have not been measured because it is not isolated in pure form, and it is insoluble in water. The notified polymer would be expected to adsorb to soils because it is not soluble in water. On exposure to air, the viscosity of the notified polymer is also expected to increase.

4. PURITY OF THE CHEMICAL

Degree of Purity: >99%

Toxic or Hazardous Impurities: none

5. USE, VOLUME AND FORMULATION

The notified polymer will be manufactured in Australia. Approximately 50 to 100 tonnes of the notified polymer will be manufactured during the first year and is expected to increase to approximately 150 to 200 tonnes per year in the next four years.

The notified polymer will be manufactured at the notifier's resin plant. The polymer will be manufactured in a closed reaction vessel, cooled and mixed with a reactive diluent, styrene, and other additives to form a polymer solution. The notified polymer will always be in styrene (70% notified polymer in styrene) and will never be isolated as a 'pure' substance. The polymer solution is drummed off into 200L steel drums for reprocessing into gelcoats.

The gelcoats containing the notified polymer will also be manufactured at the notifier's plant site. The polymer solution is mixed with other ingredients to form gelcoats. The gelcoats are filled into 20L pails or 200L drums and are stored at the warehouse, ready for distribution to customers for end-use application such as in the fibreglass re-inforced plastic (FRP) industry (e.g. fibre glass boats and swimming pools) and synthetic marble industry (e.g. wash basins, vanity units and shower trays). The gelcoats contain 15 – 25% notified polymer.

6. OCCUPATIONAL EXPOSURE

Polymer manufacture

The commercial production of the notified polymer will be carried out in batches at the notifier's resin plant. The notifier states that liquid reactants are pumped either from bulk storage tanks or from drums into the reaction vessel. Solid reactants are loaded either manually or with a hoist into a hatch at the top of the reactor. The reaction process involves

mixing and heating of the reactants in an enclosed reactor vessel. The heated polymer solution is slowly transferred by pipeline into an adjoining thinning vessel containing styrene. The polymer solution is cooled, filtered and pumped into 200 L steel drums for processing into gelcoats.

There is a potential for dermal, eye and inhalation exposure to monomers for workers when manually loading solid reactants to the reactor vessel. Worker exposure to drips and spills of the notified polymer could occur while filtering and filling steel drums. The notifier states that 3 workers are likely to be exposed to the notified polymer at a maximum duration of 8 hours/day, 20 days/year, during polymer manufacture and drumming activities. Two personnel involved in the quality control testing of the polymer are also expected to have daily exposure to the notified polymer for 1 hour, 20 days/year. The notifier states that workers will wear impervious gloves, coveralls and goggles as a minimum protection when handling the polymer solution. The polymer solution is filled into containers under exhaust ventilation to capture any vapour generated at source.

Gelcoat manufacture

At the notifier's site, the polymer solution is pumped or decanted using a drum cradle, into a mixing tank where other ingredients are added under agitation, to form a gelcoat. The other ingredients are generally pre-weighed and manually added into the mixing tank through a hatch. The mixing process is enclosed and local exhaust ventilation is fitted to capture volatiles generated during this process. The typical batch size is 1 000 to 2 000L. The typical concentration of of the notified polymer in the gelcoat is between 15 – 25 %. The notifier states that 6 workers may be exposed to the notified polymer at a maximum duration of 8 hours/day, 80 days/year.

The properties of the gelcoat are tested by collecting a small sample (up to 500 mL) from the mixing tank. The sample is taken to the laboratory for spraying. The spraying is carried out in a spray booth.

Finally, the gelcoat is filtered and filled into 20L pails or 200L drums. The gelcoat is pumped through a filter into the required container. Filled containers are lidded and warehoused for distribution to customers.

There is a potential for dermal and eye contact, and inhalation of vapour during addition of ingredients for gelcoat manufacture and during quality control testing. Workers exposure to drips and spill could also occur in drumming or filling activities. The number and categories of workers with potential exposure to the gelcoat containing the notified polymer are: manufacture and drum off polymer (6 personnel) and quality control testing of gelcoat (2 personnel). The notifier states that workers involved in the manufacture and drumming of gelcoat are expected to have a maximum exposure of 8 hours /day, 80 day/year. The quality control personnel may have daily exposure of 1 hour, 80 days/year. Also the quality control personnel may be exposed to spray mist generated during spraying when testing the gelcoat. Exposure controls include exhaust ventilation, and use of personal protective equipment such as impervious gloves, coveralls and goggles. A regular maintenance program including

measurement of airflows at determined intervals is also in place. Gel coat testing is carried out in a well-ventilated spray booth with a fume extraction system.

Gelcoat application
The gelcoat will be transported by road to customers throughout Australia. At the customers site, gelcoat is drawn directly from the manufacturer's drum through a spear and hose using a positive displacement double acting pump. The gelcoat moves from the pump through a flow control opening to the spray gun for application. While an operator sprays the gelcoat into the mould, another operator monitors the film thickness and catalyst levels of the sprayed gelcoat. Gelcoats are catalysed with organic peroxides and spray-applied to a wet film with thickness ranging from 0.375 mm to 0.625 mm depending on the end product requirements. There are three types of spray guns that are commonly used in the FRP industry. These include: air atomisation, which is similar to a paint gun; air less - a pressure drop is used to atomise the gelcoat after the gelcoat leaves the nozzle orifice of the gun; and air-assist air less – less pressure drop is used, followed by injection of air to further atomise the gelcoat after it leaves the nozzle orifice of the gun. After application, the gelcoat is allowed to solidify and cure hard before applying the fibreglass laminate to build the final article.

Dermal and eye contact, and inhalation of vapour or spray mist are possible during application of gelcoat. The notifier states that approximately 200 workers with maximum exposure of 8 hours/day, 220 days/year will be exposed to the gelcoat containing the notified polymer. Dermal and eye contact, and inhalation of vapour or spray mist are also likely to occur during monitoring of gel application. The notifier states that approximately 100 workers with maximum exposure of 8 hours/day, 220 days/year will be exposed during monitoring activities. Exposure controls include the use of cartridge type respirators or positive air-displacemenent hoods, and wearing overalls and impervious gloves. Gelcoat application and testing is carried out in a well-ventilated spray booth with a fume extraction system. Skin and to a lesser extent inhalation exposure to the notified polymer and solvents exists during cleaning of spray guns. Materials from spills and equipment cleaning, and residue in drums will be collected and sent to licensed waste contractors for incineration. Empty drums will be sent to a drum reconditioner where they will be cleaned by caustic wash process.

All employees handling chemicals are given internal training courses. The training courses are conducted at commencement of employment then at regular intervals during the year.

7. PUBLIC EXPOSURE

No significant public exposure to the notified polymer is anticipated during manufacture, reformulation, storage, transport or disposal. Public exposure to the notified polymer will occur through dermal contact with surfaces of finished articles such as boat or wash basin coated with gelcoats containing the notified polymer. In this form, the notified polymer is cured and is not expected to leach from the finished articles.

8. ENVIRONMENTAL EXPOSURE

Release

Release to the environment may occur at a number of stages along the production and distribution line. In the manufacturing plant spillages would be contained by bunding, absorbed on to inert materials, collected and incinerated at state-approved facilities. Liquids containing the notified polymer from equipment cleanout would also be collected as above and either recycled or incinerated. The notifier expects 1 000 kg of the notified polymer to be recycled or disposed of each year.

Under normal conditions it is not expected that the chemical would be released during storage and transportation. The MSDS contains adequate instructions for handling a spill should one occur.

Once empty the containers used to hold the notified polymer will be recycled and reconditioned at a drum recycler. The notifier has stated that approximately 500 kg of the notified polymer will be reclaimed from drums per annum and disposed of by incineration at approved facilities.

The gel coats will be marketed Australia wide for use by industry. Overspray (dried and polymerised) of approximately 2 000 kg and trimmings of cured material (2 000 kg) will be consigned to licensed landfill.

Fate

The notified polymer is intended for use as a gel coat in fibreglass reinforced articles. As such, the fate of the majority of the polymer will share the fate of the articles into which it is incorporated. This will generally be ultimate disposal to landfill. Incineration of small articles would destroy the polymer, and produce water and oxides of carbon.

In the customers' manufacturing facilities, waste from the article manufacturing process of approximately 4 000 kg per annum is consigned to landfill. This would be widely dispersed throughout Australia.

Incineration of waste from equipment cleanup and drum washings (1500 kg) in properly operating incinerators would produce water and oxides of carbon.

9. EVALUATION OF TOXICOLOGICAL DATA

No toxicology data were submitted for the notified polymer.

The Material Safety Data Sheet (MSDS) for the polymer solution containing the notified polymer documents anticipated health effects, which are attributed to the solvent. The notified polymer is never isolated from styrene. The health effects resulting from exposure to the polymer solution include nausea, vomiting and central nervous system depression by all routes of exposure, corneal burns, skin irritation or contact dermatitis, irritation of mucous

membranes and genotoxic effects in blood and bone marrow cells. Experimental teratogenic effects have not been reported. The MSDS lists the reference texts on the toxicity and health effects of styrene. The International Agency for Research on Cancer (IARC) has classified styrene as a Group 2B carcinogen – possibly carcinogenic to humans.

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

No ecotoxicological data were provided.

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

The notified polymer is intended for use as a gel coat in fibreglass reinforced articles. The notified polymer is expected to remain within the product matrices. Hence, the majority of the notified polymer will share the fate of the articles into which it is incorporated. It is anticipated that these will ultimately be disposed of to landfill or incinerated. In landfill it is expected that the notified polymer will remain immobile within the matrices.

Waste from empty containers, and from the formulation and use of gel coats will be incinerated in approved facilities.

Hence, the overall environmental hazard of the polymer can be rated as low, given the low environmental exposure.

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

Assessment of Toxicological Hazard
After polymerisation, the notified polymer is unlikely to pose a health risk to workers since the polymer have low levels (< 1%) of residual monomers. Although the notified polymer has reactive functional groups, polymers containing carboxylic groups, aliphatic hydroxyl groups and unconjugated olefinic group lack biological activity (US-EPA Polymer Exemption Guidance Manual, 1997) and are of low health concern. Also, the notified polymer has a high NAMW of greater than 1 000, which should preclude transport across biological membranes.

The toxicity of the notified polymer and the gelcoat containing the notified polymer relates to the presence of styrene. Styrene is harmful by inhalation (R20) and irritating to eyes and skin (36/38), with a cut-off concentration of 2.5 % (National Occupational Health and Safety Commission, 1999b). Since the notified polymer is never isolated from styrene, the polymer solution (30% styrene) and the gelcoat (approximately 11% styrene) containing it are classified as hazardous according to *NOHSC Approved Criteria for Classifying Hazardous Substances* (National Occupational Health and Safety Commission, 1999a) and would require labelling with the above risk phrases. Health hazard information for styrene is summarised in the MSDS.

In accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (Federal Office of Road Safety, 1998), the notified polymer and gelcoat are classified as Dangerous Goods (Class 3) because of the solvent content. The required precautions should be taken during transport, storage and handling.

Occupational Health and Safety

The polymer manufacture is carried out in a closed reaction vessel. There is potential for dermal, eye and inhalation exposure to hazardous monomers when manually loading solid reactants to the reactor. Workers may be exposed to the polymer via dermal and ocular routes during filling of the polymer solution, and blending, filtering and filling of gelcoats containing the notified polymer. Exhaust ventilation and the use of personal protective equipment are the mechanisms usually employed to control exposure. When handling the polymer solution and gelcoat, the minimum protection requires impervious gloves, coveralls and goggles to be worn. The notifier also states that regular air monitoring for styrene is performed during polymer manufacture and gelcoat manufacture. Employers need to ensure that the exposure standard for styrene of 213 mg/m^3 time weighted average (TWA) and 426 mg/m^3 short term exposure limit (STEL) (National Occupational Health and Safety Commission, 1995) is not exceeding during polymer and gelcoat manufacture.

Quality control personnel are also exposed to the notified polymer when collecting test samples and conducting trial spraying in a spray booth. These workers also need to wear impervious gloves, coveralls and goggles.

At the customer site, gelcoat is sprayed into the mould. Sprayers may experience skin, eye and inhalation exposure during this process, therefore it must be carried out in a well ventilated spay booth with fume extraction system. Workers also need to wear the recommended protective clothing consisting of cartridge type respirators or positive air-displacement hoods, overalls and gloves.

The notified polymer and gelcoat are flammable because of the solvent. Precautions must be taken to avoid sources of ignition, e.g. use of earthing leads. Workers handling the notified polymer should wear anti-static overalls and footwear.

Similar considerations apply in the disposal of the notified polymer. Wastes containing the notified polymer in uncured form may be hazardous substances because of the solvent and other resin content, so precautions pertaining to these additional materials should be taken. These would provide adequate protection from the notified polymer.

Public Exposure

The notified polymer will be supplied to industrial customers and not to the general public. Public contact will only occur from touching the surface of coated articles. Similarly, the potential for public exposure to the notified polymer during transport, or disposal of waste after spill is very minor. The notified polymer will finally be cured and become immobilised as part of an inert, hardened coat film. In this form, exposure and absorption of the notified polymer is unlikely to occur.

13. RECOMMENDATIONS

To minimise occupational exposure to the notified polymer and the gelcoat containing the notified polymer the following guidelines and precautions should be observed:

- Respirators should be selected and fitted in accordance with Australian/New Zealand Standard (AS/NZS) 1715 (Standards Australia/Standards New Zealand, 1994a) to comply with AS/NZS 1716 (Standards Australia/Standards New Zealand, 1994b); Safety goggles should be selected and fitted in accordance with Australian Standard (AS) 1336 (Standards Australia, 1994) to comply with 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 should conform to AS/NZS 2161.2 (Standards Australia, 1998); and all occupational footwear should conform to AS/NZS 2210 (Standards Australia/Standards New Zealand, 1994c);

- Spillage of the notified polymer 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;

- Spray painting booths should conform to AS/NZS 4114 (Standards Australia/Standards New Zealand, 1994d); and

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

Employers should ensure that the NOHSC exposure standard for styrene of 213 mg/m^3 time weighted average (TWA) and 426 mg/m^3 short term exposure limit (STEL) is not exceeded during all phases where worker exposure to the notified polymer may occur.

14. MATERIAL SAFETY DATA SHEET

The MSDS for the notified polymer was provided in a format consistent with the *National Code of Practice for the Preparation of Material Safety Data Sheets* (National Occupational Health and Safety Commission, 1994).

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 polymer 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

Federal Office of Road Safety (1998) Australian Code for the Transport of Dangerous Goods by Road and Rail. Canberra, Australian Government Publishing Service.

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

National Occupational Health and Safety Commission (1995) 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. Canberra, Australian Government Publishing Service.

National Occupational Health and Safety Commission (1999a) Approved Criteria for Classifying Hazardous Substances [NOHSC:1008(1999)]. Canberra, Australian Government Publishing Service.

National Occupational Health and Safety Commission (1999b) List of Designated Hazardous Substances [NOHSC:10005(1999)]. Canberra, Australian Government Publishing Service.

Standards Australia (1987) Australian Standard 2919-1987, Industrial Clothing. Sydney, Standards Association of Australia.

Standards Australia (1990) Australian Standard 3765.1-1990, Clothing for Protection against Hazardous Chemicals Part 1 Protection against General or Specific Chemicals. Sydney, Standards Association of Australia.

Standards Australia (1994) Australian Standard 1336-1994, Eye protection in the Industrial Environment. Sydney, Standards Association of Australia.

Standards Australia (1998) Australian Standard 2161.2:1998, Occupational Protective Gloves, Part 2: General Requirements. Sydney, Standards Association of Australia.

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

Standards Australia/Standards New Zealand (1994a) Australian/New Zealand Standard 1715-1994, Selection, Use and Maintenance of Respiratory Protective Devices. Sydney/Wellington, Standards Association of Australia/Standards Association of New Zealand.

Standards Australia/Standards New Zealand (1994b) Australian/New Zealand Standard 1716-1994, Respiratory Protective Devices. Sydney/Wellington, Standards Association of Australia/Standards Association of New Zealand.

Standards Australia/Standards New Zealand (1994c) Australian/New Zealand Standard 2210-1994, Occupational Protective Footwear. Sydney/Wellington, Standards Association of Australia/Standards Association of New Zealand.

Standards Australia/Standards New Zealand (1994d) Australian/New Zealand Standard 4114-1994, Spray Painting Booths. Sydney/Wellington, Standards Association of Australia/Standards Association of New Zealand.

United States Environmental Protection Agency (US EPA) (1997) Polymer Exemption Guidance Manual. Environmental Protection Agency, Office of Pollution Prevention and Toxics, Washington, DC.