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NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

Polyurethane Polymer in Spensol F96

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Director
Chemicals Notification and Assessment

FULL PUBLIC REPORT

Polyurethane Polymer in Spensol F96

1. APPLICANT

A.C. Hatrick Chemicals Pty Ltd of 49-61 Stephen Road BOTANY NSW 2019 has submitted a limited notification statement in support of their application for an assessment certificate for Polyurethane Polymer in Spensol F96.

2. IDENTITY OF THE CHEMICAL

Polyurethane Polymer in Spensol F96 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, spectral data and composition have been exempted from publication in the Full Public Report and the Summary Report

The notified polymer contains no hazardous impurities at levels necessary to classify it as a hazardous substance (1). Therefore, information on the purity of the chemical has been exempted from publication in the Full Public Report and the Summary Report.

Other name:	polyurethane dispersion (formulation)
Trade name:	Spensol F96 and coded for sale as 04442 (formulation)
Number-average molecular weight (NAMW):	>1000
Method of detection and determination:	infrared spectroscopy

3. PHYSICAL AND CHEMICAL PROPERTIES

The following physico-chemical properties relate to the polymer and not the polymer dispersion (Spensol F96, containing the notified polymer at 30%) unless indicated otherwise.

Appearance at 20°C and 101.3 kPa:	pale yellow viscous liquid (for Spensol F96)
Odour:	sweet amine odour (for Spensol F96)

Boiling Point:	not applicable for polymer, for aqueous medium 100ºC
Specific Density:	1.084 kg/m^3
Vapour Pressure:	not applicable for polymer. Spensol F96 will have a vapour pressure similar to water
Water Solubility:	not available, but is unlikely to be soluble
Partition Co-efficient (n-octanol/water) log P_{ow}:	not applicable due to probable low water solubility
Hydrolysis as a function of pH:	not available, it is unlikely hydrolysis will occur at neutral pH due to low water solubility, however hydrolysis would occur in alkaline pH
Adsorption/Desorption:	the chemical is non-volatile and viscous thus would have low mobility and limited effects to soil, water and air
Dissociation Constant pK_a**:**	not applicable
Flash Point:	dried polymer will burn in a general fire
Flammability Limits:	not applicable
Combustion Products:	carbon monoxide, carbon dioxide and nitrogen oxide
Decomposition Temperature:	none given
Decomposition Products:	none given
Autoignition Temperature:	not known
Explosive Properties:	not explosive
Reactivity/Stability:	contact with oxidising agents will degrade the polymer
Particle size distribution:	not applicable

Comments on Physico-Chemical Properties

No data were provided for melting point and boiling point of the polymer. As Spensol F96 contains substantially water, the boiling point and freezing point would be similar to those of water.

No data were provided for vapour pressure of the polymer. By analogy with similar polymers, this polymer is not expected to be volatile. However, for Spensol F96 the vapour pressure would be similar to that of water.

No data were provided for water solubility. By analogy with similar polymers of high molecular weight and complex structure, the notified polymer is not expected to be significantly soluble in water.

No data were not provided for partition coefficient and hydrolysis due to the polymer's low solubility in water. The polymer is not expected to hydrolyse under neutral pH conditions or in the environmental pH range. However, due to the presence of ester linkages, it may undergo hydrolysis under alkaline conditions.

No data were provided for adsorption/desorption on the grounds that the polymer, being non-volatile and a viscous semi-solid, would have a very low migratory tendency into air, water, and soil.

No data were provided for dissociation constant. The polymer is expected to contain a low amount of free carboxylic acid functionalities due to the presence of combined dimethylol propionic acid. These are expected to have typical acidity.

The polymer is expected to have reasonable chemical stability under normal conditions. However, it has the potential to react with oxidising agents and bases. The dry polymer will also burn in a fire forming low molecular weight organic compounds, carbon monoxide, carbon dioxide, and oxides of nitrogen.

4. PURITY OF THE CHEMICAL

Degree of purity: > 85%

5. INDUSTRIAL USE

The notified polymer will be manufactured in Australia within the formulation Spensol F96 to be used a in clear varnishes for timber. It is anticipated that 50 tonnes will be produced in the first year rising to 200 tonnes per year after 5 years.

6. OCCUPATIONAL EXPOSURE

The notified polymer will be manufactured in a total batch size of 10 tonnes. This will involve the pumping of liquid monomer and manual transfer of solid monomers into a closed reactor system under a forced ventilation system. The reaction produces the notified polymer as a 30% aqueous solution (Spensol F96), which is then automatically pumped into a holding tank and tested for quality control. From here the formulation containing the notified polymer will be filtered and filled into 200 L steel drums. The manufacture, quality control and filling will be performed by up to twenty employees who will be potentially exposed to the formulation containing the notified polymer at 30% for two hours/day, every two months initially, rising to twice a month.

Polyurethane Polymer in Spensol F96 will be transported to customer sites by road and stored in an approved facility prior to manufacture into varnish. There is not expected to be any exposure to the notified polymer except in the event of a spill. Three workers will be involved in the transportation of the notified polymer in formulation and the loading/unloading of the steel drums by forklift. The drums may be stored at the manufacturing site and at interstate sites prior to delivery, being the responsibility of a store worker and a forklift driver.

The final varnish formulation will involve the formulation containing the notified polymer, to be pumped into a mixing vessel and mixed with other ingredients and blended. This process would be handled by two workers, each being potentially exposed for three hours per day. Three workers may be involved in quality control, performing batch adjustment. This would entail potential exposure for six hours per day. The final varnish formulation, containing around 10% of the notified polymer, would then be filtered and filled into 2 L metal containers for commercial application. This would involve the potential exposure of another three workers for six hours per day. Exhaust ventilation would be utilised over the mixing vessel and other sites of vapour release to minimise exposure to fumes from potentially hazardous ingredients formulated with the Spensol F96.

The varnish, containing the notified polymer in Spensol F 96, will be applied by professional painters by brush or roller. It is difficult to predict the number of workers exposed or the extent of exposure. It is expected that professional painters would have had suitable training in using the product safely, such as using the varnish only in well ventilated areas so as to reduce any possible exposure to volatile fumes that may be released.

7. PUBLIC EXPOSURE

There is potential for public exposure to the polyurethane polymer arising from the transport of the Spensol F96 formulation in 200L drums, and from transport of the reformulated varnishes in a variety of metal containers. In the event of a transport accident the spill is to be contained according to the recommendations contained in the Material Safety Data Sheet (MSDS).

Most of the notified polymer will enter the public domain as a dried clear varnish. The potential for public contact is large. However the polymer is non-volatile and after application cures to form a protective coating of a very high molecular weight which will preclude dermal absorption. Whilst the public exposure during application of varnish will require the use of personal protective equipment, the dried varnish should present no possibility of exposure.

8. ENVIRONMENTAL EXPOSURE

. Release

There is a potential for release of the notified polymer to the environment during the manufacture, transport, secondary processing, and final use stages.

At the manufacturing plant, any excess material left after filling the drums will be blended into the next batch. All filter residues are intended to be deposited in secure landfill in accordance with Local, State and Federal regulations. In the case of a spillage, it would be collected and disposed of similarly. Packaging of the aqueous dispersion of the polymer in sealed steel drums minimises the potential for release during transport.

Waste from the varnish formulation process would consist of polymer residue remaining in used drums. These are consigned to landfill in accordance with Local, State and Federal regulations. Other possible release will be when painting equipment i.e. brushes, rollers etc. is cleaned and when paint cans containing excess paint are disposed of. The washings are likely to enter the drain with copious quantities of water, followed by treatment at a sewage treatment plant. Empty cans and excess paint in cans are likely to be disposed of with the normal household garbage by landfill.

. Fate

Most of the notified polymer will be used to coat timber and should have limited environmental exposure once cured. Waste generated during paint manufacture will be consigned to landfill, as well as any unused paint residues in cans. Most of the polymer washed down drains when brushes and rollers etc. are cleaned will be contained in the sewage sludge which will be landfilled or incinerated.

The notified chemical is a polymer with low water solubility, degradation or leaching from landfill sites is not expected. Incineration of the notified substance is expected to produce water, and oxides of carbon and nitrogen.

9. EVALUATION OF TOXICOLOGICAL DATA

Toxicological data are not required for polymers of NAMW > 1000 according to the Act.

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

No ecotoxicological data were provided, which is acceptable for polymers of NAMW > 1000 according to the Act.

Due to its high NAMW the polymer is not expected to cross biological membranes.

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

The polymer is unlikely to present a significant hazard to the environment when it is manufactured, formulated, and used in the proposed manner.

The notifier has estimated that at maximum manufacture ca. 500 kg per annum of polymer will be disposed of when brushes and rollers etc. are washed and empty cans are disposed of by domestic consumers. The uncured polymer that is disposed of via the drains due to such activities will be treated in the sewage treatment plant, where most, if not all, of the polymer will be removed with the sludge and disposed of by incineration or landfill. Empty cans of paint are normally disposed of by landfill with the household garbage.

Any spills or accidents involving the polymer dispersion when cleaned up according to the recommendations in the Material Safety Data Sheet (MSDS) would not be an environmental hazard.

The low level environmental exposure of the polymer as a result of normal use indicates that the overall environmental hazard should be negligible.

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

The notified polymer is manufactured as a 30% emulsion in water. In this form the polymer does not present any major physico-chemical concerns to workers.

The polymer has a NAMW > 1000 with a low percentage of low molecular weight species (<1.0%). Therefore it is not expected to cross biological membranes and cause systemic effects. The polymer contains a number of hazardous impurities, however, according to the *List of Designated Hazardous Substances* (1), these levels are not high enough to classify the polymer as hazardous. However, the final formulation, Spensol F96, has been classified as hazardous according to Worksafe Australia's *Approved Criteria for Classifying Hazardous Substances* (2).

There is not expected to be any significant exposure during the initial manufacture of the notified polymer as it will occur within a closed reaction system. However, there may be however, the potential for dermal exposure during sampling for quality control and the filling of the 200 L drums of the polymer in formulation. There should not be any exposure to the notified polymer during the cleaning of the reactor, as water is added and the washings are used in the next reaction batch. Workers that are potentially exposed will be wearing chemical goggles, overalls, solvent resistant gloves. While these are primarily employed to protect against the potentially hazardous monomer species used in manufacture, they will serve to minimise exposure to the notified polymer.

There is not expected to be significant exposure to the notified polymer during transport and storage, except in the event of a spill. Should this occur, the steps described in the recommendations section of the MSDS should be followed to minimise exposure to the notified polymer.

There is the potential for dermal exposure to the notified polymer through possible leakage or spillage when connecting/disconnecting the pumping equipment during the pumping of the notified polymer into mixing vessel. There may be the risk of dermal contact through spills or splashing during the mixing/formulation of the varnish, containing 10% of the notified polymer. Exposure may also occur during the sampling for quality control, and the final filtration and dispensing into tins for retail sale. To minimise dermal exposure, workers should wear as a minimum impervious gloves, coveralls and protective goggles. The varnish manufacturer employs exhaust ventilation over the mixing and filling units to minimise exposure to any volatile vapour released from the varnish during formulation and packaging.

There is likely to be significant dermal exposure to the notified polymer during application with brush or roller by professional painters. To reduce the level of exposure, coveralls, protective goggles and solvent resistant gloves should be used. If the varnish is not utilised in a well ventilated area, a respirator suitable for organic vapours should be utilised. Good personal hygiene, ie washing hands, should be practiced to prevent the long term dermal exposure from the notified polymer from varnish sticking or drying on skin.

There is considerable potential for public contact with the polyurethane polymer arising from its use in the Spensol F96 formulation. This contact arises from the application in the home of the varnishes. However the number-average molecular weight of the polymer and the other physico-chemical properties dictate against significant toxic effects through dermal adsorption. There may also be widespread public contact with the notified polymer in its cured form as a surface varnish. However, once the polymer is cured, its adhesion to the substrate and physico-chemical properties of the dry film will preclude absorption across the skin and other biological membranes.

13. RECOMMENDATIONS

To minimise occupational exposureto Polyurethane Polymer in Spensol F96 the following guidelines and precautions should be observed:

- if engineering controls and work practices are insufficient to reduce exposure to Polyurethane Polymer in Spensol F96 to a safe level, then:

  - eye protection should be selected and fitted in accordance with Australian Standard (AS) 1336 (3) and comply with Australian Standard/New Zealand Standard AS/NZS 1337 (4)

  - industrial clothing should conform to the specifications detailed in AS 2919 (5)

  - industrial gloves should conform to the standards detailed in AS 2161 (6)

- particular care should be taken to avoid spillage or splashing of the notified chemical; should a spill occur, cover spill with sodium chloride to allow coagulation; dispose of solid waste in a sealed container which should be incinerated or disposed to landfill; wear the above recommended personal protective equipment during cleanup

- store the notified polymer away from oxidising agents and prevent from freezing; Polyurethane Polymer in Spensol F 96 is not flammable, however the dried polymer is combustible; hazardous polymerisation may occur

- good personal hygiene should be practised to minimise the potential for ingestion

- a copy of the MSDS should be easily accessible to employees

14. MATERIAL SAFETY DATA SHEET

The MSDS for Spensol F96 was provided in an acceptable format according to the *National Code of Practice for the Preparation of Material Safety Data Sheets* (7).

This MSDS was provided by A.C. Hatrick Chemicals Pty Ltd as part of their notification statement. The accuracy of this information remains the responsibility of A.C. Hatrick Chemicals Pty Ltd.

15. REQUIREMENTS FOR SECONDARY NOTIFICATION

Under the Act, secondary notification of Polyurethane Polymer in Spensol F96 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. Worksafe Australia, 1994, *List of Designated Hazardous Substances [NOHSC:10005(1994)],* AGPS, Canberra.

2. Worksafe Australia, 1994, *Approved Criteria for Classifying Hazardous Substances [NOHSC:1008(1994)],* AGPS, Canberra.

3. Standards Australia, 1994, *Australian Standard 1336-1994, Recommended Practices for Eye Protection in the Industrial Environment.*, Standards Association of Australia Publ. Sydney, Australia.

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

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

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

7. Worksafe Australia, 1994, *National Code of Practice for the Preparation of Material Safety Data Sheets [NOHSC:2011(1994)]*, AGPS, Canberra.