

File No: PLC/115

August 1999

**NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION
AND ASSESSMENT SCHEME**

FULL PUBLIC REPORT

Polymer in EXP-3641

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Director
Chemicals Notification and Assessment

FULL PUBLIC REPORT**Polymer in EXP-3641****1. APPLICANT**

Rohm and Haas Australia Pty Ltd of 4th Flr, 969 Burke Rd, CAMBERWELL, VIC 3124 has submitted a Polymer of Low Concern notification statement in support of their application for an assessment certificate for Polymer in EXP-3641.

2. IDENTITY OF THE CHEMICAL

The chemical name, CAS number, molecular and structural formulae, molecular weight, spectral data, details of the polymer composition and exact production volume have been exempted from publication in the Full Public Report.

Characterisation as a Synthetic Polymer of Low Concern

**Number-Average
Molecular Weight (NAMW):** 4660

**Maximum Percentage of Low
Molecular Weight Species**

Molecular Weight < 500: 4 %

Molecular Weight < 1 000: 7 %

Polymer Stability The polymer is expected to be stable

Reactivity The polymer does not contain any highly reactive functional groups

Particle Size The polymer will be manufactured and used in aqueous emulsion only

Charge Density The polymer is not expected to be charged in the environmental pH range of $4 < \text{pH} < 9$

Water Solubility	The polymer is stated to be insoluble in water
Method of Detection and Determination:	The polymer is characterised by GPC and identified by IR spectroscopy. A reference spectrum has been provided.

The polymer meets the criteria for assessment as a synthetic polymer of low concern under Regulation 4A of the *Industrial Chemicals (Notification and Assessment) Act (1989)* (the Act).

3. PHYSICAL AND CHEMICAL PROPERTIES

The physical and chemical properties which were provided as part of the notification are for a 30 % aqueous emulsion of the notified polymer.

Appearance at 20°C and 101.3 kPa:	milky white liquid with ammonia odour
Boiling Point:	100°C (for the emulsion)
Specific Gravity:	1.02 (for the emulsion)
Vapour Pressure:	the polymer is not expected to be volatile
Water Solubility:	stated to be insoluble (see comments below)
Partition Co-efficient (n-octanol/water):	not determined (see comments below)
Hydrolysis as a Function of pH:	not determined (see comments below)
Adsorption/Desorption:	not determined (see comments below)
Dissociation Constant:	not determined (see comments below)
Flammability Limits:	not flammable
Explosive Properties:	not expected to be explosive
Reactivity/Stability:	expected to be stable under normal environmental conditions

Comments on Physico-Chemical Properties

The notifier claims that by analogy with similar polymers, the polymer is not expected to be volatile under the conditions of use. The polymer solution is also expected to boil at the temperature of water, while the vapour pressure of the polymer is also predicted to be very low.

The water solubility was not determined, but the notifier states that the polymer is expected to be of low solubility (less than 1 mg/L), by comparison with similar polymers, since it is non-ionic, of high molecular weight and composed almost entirely of hydrophobic groups.

The polymer contains ester linkages that could be expected to undergo hydrolysis under extreme pH. However, due to the low water solubility, this is unlikely in the environmental pH range of between 4 and 9.

The determination of partition coefficient and adsorption/desorption was not undertaken as the notified polymer is expected to be insoluble in water and will largely partition into n-octanol rather than water. Due to its low water solubility, the polymer is expected to become associated with the organic component of soils and sediments.

No dissociation constant data was provided, although the polymer has a small percentage of carboxylic acid groups likely to have typical acidity.

4. PURITY OF THE CHEMICAL

Degree of Purity: 30 %

Hazardous Impurities: none

**Non-hazardous Impurities
(> 1% by weight):** none

**Maximum Content
of Residual Monomers:** All residual monomers are present at 0.005 % (or less) and at below the concentration cutoff for classification of the notified polymer as hazardous.

Additives/Adjuvants:

<i>Chemical name:</i>	water
<i>CAS No.:</i>	7732-18-5
<i>Weight percentage:</i>	69 – 71 %

<i>Chemical name:</i>	aqueous ammonia
<i>CAS No.:</i>	1336-21-6
<i>Weight percentage:</i>	< 0.1 %
<i>Hazardous properties:</i>	Aqueous ammonia is corrosive at high concentrations, and is a skin, eye and respiratory system irritant. There is a NOHSC exposure standard for gaseous ammonia of 25 ppm TWA, 35 ppm STEL.

The notified polymer will be reformulated to produce house paints, containing up to 4 % (w/w) notified polymer. A number of further additives would be expected in the finished house paints, but these have not been specified in the notification.

5. USE, VOLUME AND FORMULATION

The notified polymer will be used as a component of interior and exterior water based house paints, and will be sold to both contractors and the general public. Application will generally be by brush or roller, although spray application may also be used.

The notified polymer will be manufactured in Australia in the form of a 30 % aqueous emulsion. The emulsion will be transported in bulk or in 200 L steel drums to a number of paint manufacture sites, where it will be reformulated to produce paint containing 2 – 4 % (w/w) notified polymer. The paint will be packed into 1 L, 4 L, 10 L and 20 L epoxy lined steel cans for distribution to retail and wholesale paint sellers.

The notified polymer will be manufactured at volume in the range of 100 – 1000 tonnes per annum when in full production.

6. OCCUPATIONAL EXPOSURE

Polymer Manufacture

The polymer manufacture will involve 15 - 20 plant operators for up to 2 hours per day, up to 60 days per year in polymer production, and for an additional half hour per day, up to 100 days per year in filtering the emulsion and loading road tankers. The reactants will be charged to an enclosed 500 to 10000 L pressure rated reactor via a hard piped system. No exposure of the workers to the monomers is expected as the charging system is enclosed. The emulsion will then be transferred through a hard piped system to a holding tank of 500 to 10000 L, where other ingredients, particularly water, are added. The finished polymer emulsion will be filtered and stored in bulk tanks or 200 L drums. The bulk emulsion will be transferred to road tankers for transport. During the filling process, and during maintenance of the reaction vessels and filters, there is potential for dermal exposure to the polymer solution in the form of drips and spills. As the polymer emulsion will be viscous, the formation of aerosols is

unlikely.

Laboratory technicians and transport and storage workers will also be exposed to the notified polymer in the manufacture stage. Up to 5 scientific staff may be exposed to the notified polymer in small quantities during quality control procedures. Transport and storage workers may have some dermal exposure to drips and spills while loading and unloading road tankers.

Workers in the polymer manufacture area are stated to have to wear impervious gloves, safety glasses, safety boots and coveralls.

Paint Manufacture

The emulsion of the notified polymer will be transferred to paint mixing vessels for reformulation into paints. Where the emulsion is transported in drums, it will be transferred by placing a spear into the drum and using a drum pump. Dermal exposure to drips and spills of the solution of the notified polymer is possible at this stage. Emulsion transported in bulk will be transferred through a hard piped system. Local exhaust ventilation is supplied at the paint mixing vessel. The notifier has estimated that 60 to 80 paint makers at approximately 6 sites will be exposed to the emulsion of the notified polymer for up to 4 hours per day, 60 days per year. Laboratory technicians will also be involved in laboratory testing of paint formulations, and in quality control on the finished paints. Dermal exposure to drips and spills is possible during the laboratory testing. The laboratory testing will involve 5 laboratory staff for 8 hours per day, 25 days per year. The quality control testing will only involve contact with the 2 – 4 % notified polymer in the formulated paint, and will involve 40 workers, for 1 hour per day, 60 days per year.

The formulated product (2 - 4 % notified polymer) is filled into 1 L, 4 L , 10 L or 20 L epoxy lined steel cans under exhaust ventilation. Dermal exposure to the 2 - 4 % solution of notified polymer is possible during filling.

Warehouse workers will handle the drums of polymer solution and also the filled cans of finished paint, but no exposure is expected unless the packaging is ruptured.

Workers in the paint formulation area are stated to have to wear neoprene gloves, safety glasses and coveralls.

Paint Sales and Application

The paints containing the notified polymer will be available to both professional painting contractors and do-it-yourself home painters. Paint application will generally be done by brushes or rollers, although spray painting may also occur. Occupational contact with the notified polymer can occur during the tinting of paints at point of sale by the store staff, and during the application of the paints by professional painting contractors. The exposure for these workers will be to the finished paint containing 2 – 4 % notified polymer, and would normally be dermal. No details of the types of personal protective equipment used to prevent exposure for these workers was provided by the notifier.

After application of the paint, it will cure and crosslink, and the notified polymer will no longer be separately available for exposure.

Worker Education and Training

The notifier states that all operators involved in the handling of the notified polymer and in formulation, manufacture and testing of paints containing the notified polymer will have received training in and are familiar with the correct handling of similar coating materials. Material Safety Data Sheets (MSDS) will be available to all workers.

Handling and application instructions will be provided on the cans and in brochures for use by contract and domestic do-it-yourself painters.

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 the surfaces of houses or buildings coated with paints containing the notified polymer. Contact of the notified polymer in uncured form with skin and eyes is also possible for members of the public who paint their own houses.

8. ENVIRONMENTAL EXPOSURE

Release

There is potential for release during the polymer manufacture, the paint formulation and the paint application. The manufacturing process will take place at the notifier's plant and any spills that occur will be contained by the plant bunding. The formulation process will take place at approximately 6 paint-manufacturing companies and any spills that occur will also be contained by plant bunding.

During the manufacturing process, the notifier estimates that up to 9 tonnes per year of waste polymer would be generated at the plant. The notifier estimates that, during formulation, 200 kg per annum of waste polymer per customer will be generated. Six customers are expected, equating to 1.2 tonnes of polymer waste per annum. During painting application the notifier expects that 500 kg of polymer waste will be produced from the washing of equipment.

Most of the polymer emulsion is transported to paint manufacturers in bulk storage tanks; some is shipped in 200 L steel drums. After the transport drums have been emptied at the formulation site the notifier estimates that they will retain no more than 2 % of the original contents, which corresponds to 1.2 kg of the notified polymer per drum. Drum reconditioners will scrape out the residue and send it to licensed waste sites. Drums at the manufacturing plant will not be reconditioned. The drums will be spiked and the residue drained into the plant waste water treatment system. The drums will be sent as prescribed waste to an approved solid waste site.

Some residue will also remain in the 'empty' paint containers after use. It is estimated that 2 % of the container contents will remain as residue in the containers.

Fate

Once applied to the surfaces of houses as paint the notified polymer will be incorporated in a hard, durable, inert film and would not present a significant hazard. Any fragments, chips and flakes of the paint will be of little concern as they are expected to be inert.

The solid waste generated in the manufacturing, formulation and application of the coating will be disposed of to landfill, although incineration is an option. At the manufacturing site, the polymer in cleaning wastewater is recovered as an insoluble solid by precipitation in concrete lined flocculation pits. Clear wastewater is pumped to a lagoon for evaporation and on site irrigation. The final concentration of notified polymer in the irrigation water is expected to be less than 1 ppm. The containers and residue will also be disposed of to landfill. Leaching of the polymer from landfill is unlikely, given the low solubility of the substance.

The polymer is not expected to cross biological membranes, due to the low solubility and high molecular weight, and as such should not bioaccumulate (Connell, 1989).

9. EVALUATION OF TOXICOLOGICAL DATA

No toxicology data were submitted, which is acceptable for a synthetic polymer of low concern with a NAMW greater than 1000 according to the Act. Polymers of high molecular weight do not readily cross biological membranes. The polymer is stable with low volatility.

The MSDS cites toxicity information for acrylic emulsions similar in composition to the notified polymer. Acute oral and dermal toxicity is low, and skin and eye irritation are stated to be effectively of no consequence. The notifier states that no injuries or diseases related to occupational exposure to the notified polymer have been reported from overseas experience.

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

No ecotoxicological data were submitted, which is acceptable for a synthetic polymer of low concern with a NAMW greater than 1000 according to the Act.

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

In the event of accidental spillage of the polymer emulsion into waterways, the polymer is not expected to disperse into the water, but settle out onto sediments. If the polymer is spilt on land, either during usage or transport, it is expected to become immobilised in the soil layer. Contaminated soil can then be collected and disposed to landfill.

The majority of notified polymer associated with waste from the application of the coating to house surfaces should not enter the environment until it is disposed of to landfill. Movement of the polymer itself by leaching from landfill sites is not expected because of its low water solubility and high binding affinity to soil. Once incorporated into finished paints, the notified polymer is locked within the paint coating.

The cleaning of paint application equipment will result in approximately 500 kg of notified polymer being washed to the sewer. The average nationwide Predicted Environmental Concentration (PEC) in sewage treatment plant effluent is 0.00039 mg/L. This assumes 100 % discharge of the notified chemical to domestic sewers (ie. 500 kg/annum or 1.37 kg/day), and an average of 190 L of water released to sewer per person per day and a national population of 18.5 million.

Given the above, environmental exposure and the overall environmental hazard is expected to be low.

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

No toxicological information has been provided for the notified polymer and therefore the substance cannot be assessed against the NOHSC *Approved Criteria for Classifying Hazardous Substances* (National Occupational Health and Safety Commission, 1999). The overall toxicity of the notified polymer is expected to be low as it is not highly reactive and, having a high molecular weight would not readily cross biological membranes.

Occupational Health and Safety (OHS)

There is little potential for significant occupational exposure to the notified polymer in the transport and storage of the polymer solution or the paint component containing this polymer. There will be exposure during the manufacture and reformulation of the polymer and during production of the paint component, and in the use and disposal of the paints.

The monomers used in the production of the polymer are hazardous substances, and workplace controls are required to control exposure and ensure that the relevant exposure standards and workplace hazardous substances regulations are met. The monomers will be introduced into the reaction vessel via an enclosed system, which will prevent worker exposure. The residual monomer concentrations in the finished polymer are below the cutoff levels for classification as hazardous.

During the manufacture and reformulation processes, the main exposure route for the notified polymer will be dermal. The paints and polymer emulsions will be viscous, and ready formation of aerosols is not expected. The polymer is not expected to be hazardous by dermal exposure as the high molecular weight will preclude absorption through the skin. The engineering controls and personal protective equipment specified in the notification (impervious gloves, safety glasses, safety boots and coveralls) will provide a high level of protection against the notified polymer. In these processes, the polymer solutions and paints will be handled by workers with knowledge of the processes and trained in procedures to control exposure to hazardous substances. No significant OHS risks are expected when control and protective measures are implemented.

Occupational exposure during the sale and professional use of the paints is likely to be widespread and often under poorly controlled conditions. Dermal contact during handling and application of the paints is likely. The risk associated with dermal contact with the notified polymer in the form of uncured paints will be low, though, due to the low toxicological hazard of the polymer and the low concentration (2 – 4 %) in the finished paints.

Public Health

Dermal and possibly eye contact with the notified polymer may occur during application of the paints containing the polymer by the general public, and dermal contact with surfaces coated with the notified polymer is likely. If contact occurs, exposure would be low, because of the low concentration (2 – 4 %) of notified polymer in the paints, the cured state of the polymer on the coated surface, and the high molecular weight of the notified polymer, which will preclude absorption across the skin or other biological membranes.

13. RECOMMENDATIONS

To minimise occupational exposure to Polymer in EXP-3641 the following guidelines and precautions should be observed:

- Employers should ensure that exposure to the monomers in the polymer production process is kept below the relevant exposure standards;
- 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 3765.2 (Standards Australia, 1990);
- Impermeable gloves or mittens should conform to AS 2161 (Standards Australia/Standards New Zealand, 1998);
- All occupational footwear should conform to AS/NZS 2210 (Standards Australia/Standards New Zealand, 1994b);

- Spillage of the notified chemical should be avoided. Spillages should be cleaned up promptly with absorbents which should then 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.

If the conditions of use are varied from the notified use (as an ingredient in paint products), greater exposure of the public may occur. In such circumstances, further information may be required to assess the hazards to public health.

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* (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 subsection 64(1) of the Act, secondary notification will be required if the polymer characteristics cease to satisfy the criteria under which it has been accepted as a Synthetic Polymer of Low Concern. 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

Connell D. W. (1989) General characteristics of organic compounds which exhibit bioaccumulation. In Connell D. W., (Ed) Bioaccumulation of Xenobiotic Compounds. CRC Press, Boca Raton, USA.

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.

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

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Standards Australia (1990) Australian Standard 3765.2-1990, Clothing for Protection against Hazardous Chemicals Part 2 Limited protection against specific chemicals. Standards Association of Australia, Sydney.

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

Standards Australia/Standards New Zealand (1994a) Australian/New Zealand Standard 1715-1994, Selection, use and maintenance of respiratory protective devices. Standards Association of Australia/Standards Association of New Zealand, Sydney/Wellington.

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