File No: LTD/2002

July 2002

NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME (NICNAS)

FULL PUBLIC REPORT

Polymer in Emulsion Exp-3668

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Director
Chemicals Notification and Assessment

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1. APPLICANT AND NOTIFICATION DETAILS

APPLICANT
Rohm and Haas Australia Pty Ltd, 4th Floor, 969 Bourke Road, CAMBERWELL VIC 3124

NOTIFICATION CATEGORY
Limited: Polymer with NAMW ≥ 1000 (greater than 1 tonne per year).

EXEMPT INFORMATION (SECTION 75 OF THE ACT)
Data items and details claimed exempt from publication:
All compositional information, identity of residual monomers, molecular weight and customer sites and identity.

VARIATION OF DATA REQUIREMENTS (SECTION 24 OF THE ACT)
No variation to the schedule of data requirements is claimed.

PREVIOUS NOTIFICATION IN AUSTRALIA BY APPLICANT(S)
None

NOTIFICATION IN OTHER COUNTRIES
The polymer has been notified in the USA, and a notification is pending in Canada.

4. INTRODUCTION AND USE INFORMATION

MODE OF INTRODUCTION OF NOTIFIED CHEMICAL (100%) OVER NEXT 5 YEARS
The notified polymer will initially be imported as a component in emulsion EXP-3668. After 2-3 years it is expected that the polymer will be manufactured in Australia.

MAXIMUM INTRODUCTION VOLUME OF NOTIFIED CHEMICAL (100%) OVER NEXT 5 YEARS

Year	*1*	*2*	*3*	*4*	*5*
Tonnes	37	<148	<148	<148	148

USE
Polymer in emulsion EXP-3668 will be used in a clear coating for timber floors and interior domestic timber trim.

5. PROCESS AND RELEASE INFORMATION

5.1. Distribution, Transport and Storage

PORT OF ENTRY
Geelong

TRANSPORTATION AND PACKAGING
In years 1 to 3, the polymer Emulsion EXP-3668 will be imported into Victoria in 200 litre steel drums and transported by road to the notifier where it will be stored. In years 4 and 5 the polymer emulsion will be manufactured at the notifiers plant. It will be packaged in 200 litre drums and stored in a bunded area. The emulsion will be transported by road.

5.2. Operation Description

Polymer Manufacture

EXP-3668 polymer emulsion will be produced via an exothermic polymerisation reaction. The monomers are charged via a hard piped system from bulk storage to a pressure rated reaction vessel, vented to remove any vapours. Minor components are added manually to the reaction vessel. The vessel is sealed during the polymerisation process. Following polymerisation, the polymer is transferred via a hard piped system to a holding tank where other ingredients, including water, are added. After quality control checks the emulsion will be transferred, again via a hard piped system, to a semi-automated filling line where it will be loaded into drums and sealed.

Coating Formulation

At the coating manufacturing site, the polymer emulsion will be loaded into stainless steel mixing vessels by placing a spear into the 200 litre drums and pumping the emulsion out. Other ingredients are added to the vessel and mixed to produce the finished coating. A batch sample of the finished paint is taken and sent for QC testing. The finished paint will be transferred via hard piped system to a semi-automated filling line where the paint will be filled into epoxy lined paint cans ranging from 0.5 to 20 litres.

Coating Application

The coating products will be marketed to both painting contractors and do-it-yourself painters. They will be applied using a range of equipment including brushes, rollers and spray equipment. However, the use of spray application is expected to be limited.

5.3. Release

RELEASE OF CHEMICAL AT SITE

Polymer Manufacture

Washings from reaction vessels and piping will be transferred via piping to the plants concrete lined flocculation pits where the polymer emulsion is flocculated with the addition of ferrous sulphate and sodium hydroxide. The majority of the polymer will precipitate as a result of this process. The supernatant is neutralised and pumped to a lagoon for evaporation. Some of the water from the lagoon is used for irrigation of the on-site vegetation. The notifier indicates that the concentration of the polymer in the irrigation water is expected to be below 1 ppm. The flocculated polymer will be transferred to settling pits until dry and the disposed of to a licensed waste landfill site. Approximately 6000 kg of the polymer emulsion (~2,220 kg of polymer) will be lost in washings each year. Almost all of this will end up in landfill.

Minor spills (~30 kg per annum of polymer) will be taken up by absorbent material and transferred to the on-site settling pits. After drying this material will be taken to landfill as described above.

Paint Manufacture

Wash waters from paint manufacture are expected to be recycled for use in the formulation of subsequent batches of paint. There is potential for spillage of the polymer emulsion to occur during reformulation into coatings products. Should spills occur the notifier anticipates that the spills will be contained within the plants through bunding. Any residues or spills that can be taken up in liquid form will either be treated in the on-site effluent treatment plants or taken off-site by a licensed waste contractor for treatment and disposal. It is anticipated that in both cases the waste polymer (~75 kg per annum per customer) will end up in licensed landfill.

Around ~150 kg the polymer will remain in the drums containing the emulsion after emptying. The empty drums will either be disposed of to a licensed drum reconditioner or disposed of to licensed landfill.

RELEASE OF CHEMICAL FROM USE

The greatest potential for environmental release of the polymer is through its application in paint products by painting contractors or do-it-yourself painters cleaning paint application equipment (brushes, rollers and spray equipment). It is likely that the washings from the equipment will be washed down the drain with copious quantities of water as is currently practised in domestic situations. Up to 2,000 kg per annum of the notified polymer could enter the sewer through this

route. If spray equipment were used, a small amount of overspray would be expected. However, it not anticipated that the coatings will be applied using spray equipment often, so only minor amounts of the polymer will be released in this manner.

It is estimated that an additional ~1,300 kg per annum of the polymer will be retained in the empty paint cans and disposed of in domestic waste.

5.4. Disposal

The majority of the waste polymer will be disposed of to landfill either as flocculated waste from manufacture of the polymer or coatings products or as part of cured coatings remaining in the drums or paint tins.

6. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE AT 20°C AND 101.3 kPa	The Emulsion EXP-3668, of which the polymer is a component, is a milky white liquid
BOILING POINT	100°C at 101.3 kPa

METHOD Not provided.
Remarks Boiling point of water, applicable to Emulsion EXP-3668.

DENSITY	≈1200 kg/m^3 at

METHOD Not provided
Remarks Applicable to Emulsion EXP-3668.

VAPOUR PRESSURE	Not determined

Remarks The polymer in Emulsion EXP-3668 is not volatile.

WATER SOLUBILITY	1x10^{-3} g/L at 20°C

METHOD Turbidity Method
Remarks Samples were prepared containing the product at levels ranging from 4 ppm to 800 ppm in Milli-Q water. The turbidity of each solution was measured with a Turbidimeter model DRT 100B, HF Instruments. Three reading were taken for each sample. Solubility was determined by extrapolating to zero from the linear portion of the turbidity measurements.
TEST FACILITY Analytical and Computational Technology Centre (2001)

HYDROLYSIS AS A FUNCTION OF pH

Remarks The polymer in Emulsion EXP-3668 contains functional groups that may undergo hydrolysis under extremes of temperature and pH, but this is not expected at ambient temperature and in the environmental pH range of 4-9. The polymer also contains functional groups that readily undergo hydrolysis and rapidly cross-link upon drying of the emulsion.

PARTITION COEFFICIENT (n-octanol/water)	Not determined

Remarks A partition coefficient was not determined for this notification due to the notified polymer's low water solubility. The polymer is expected to strongly partition to the organic phase. The notifier did, however, submit a QSAR a estimation of the partition coefficient of the intermediate subunit. The value obtained for the moiety was 1.82.

Adsorption/Desorption	Not determined.

Remarks The polymer is predominately composed of structural features that are known to strongly adsorb. This, together with the high molecular weight and low water solubility, would

indicate that the polymer would strongly adsorb in soils and sediment.

DISSOCIATION CONSTANT Not determined.

Remarks The polymer has very low water solubility and is not expected to dissociate in water.

PARTICLE SIZE Not applicable.

Remarks The polymer is an emulsion in water.

EXPLOSIVE PROPERTIES The polymer is not explosive.

REACTIVITY

The polymer in Emulsion EXP-3668 is designed to self cross-link upon drying of the emulsion.

7. TOXICOLOGICAL INVESTIGATIONS

7.1. Acute toxicity – oral

TEST SUBSTANCE: Substance A (Polymer intermediate as emulsion)

METHOD: OECD TG 401 Acute Oral Toxicity..
Species/Strain: Rat/ CD®BR
Vehicle:
Remarks - Method: Male and females rats were gavaged with the test substance, as received, at 5.0 g/kg body weight. Dose was calculated on an "as is" basis; no adjustment was made for percent active ingredient (46%).

RESULTS

Group	*Number and Sex of Animals*	*Dose mg/kg bw*	*Mortality*
1	6 males	5000	0
2	6 females	5000	0

LD50: >5000… mg/kg bw
Signs of Toxicity: None
Effects in Organs: None
Remarks - Results: No mortalities or clinical signs related to the test substance were observed over the 14-day observation period. There were no apparent dose-related body weight effects and necropsy revealed no gross changes.

CONCLUSION: The notified chemical is of low toxicity via the oral route.

TEST FACILITY: Rohm and Haas Company Toxicology Department (1991a)

7.2. Acute toxicity - dermal

TEST SUBSTANCE: Substance A (Polymer intermediate as emulsion)

METHOD: OECD TG 402 Acute Dermal Toxicity..
Species/Strain: Rat/CD®BR
Vehicle:
Type of dressing: Occlusive
Remarks - Method: Dose was calculated on an ''as is" basis; no adjustment was made for percent active ingredient (46%). Observations were made for 14 days.

RESULTS

Group	*Number and Sex of Animals*	*Dose mg/kg bw*	*Mortality*
1	6 males	2000	0
2	6 females	2000	0

LD50: >2000… mg/kg bw
Signs of Toxicity - Local: None
Signs of Toxicity - Systemic: None
Effects in Organs: None
Remarks - Results: Desiccation and/or alopecia on the application site were observed beginning on day 6 of the study. There were no mortalities and no clinical signs related to the test substance. Necropsy revealed no gross

changes.

CONCLUSION The notified chemical is of low toxicity via the dermal route.

TEST FACILITY Rohm and Haas Company Toxicology Department (1991b)

7.4. Irritation – skin

TEST SUBSTANCE Substance A (Polymer intermediate as emulsion)

METHOD OECD TG 404 Acute Dermal Irritation/Corrosion.
Species/Strain Rabbit/New Zealand White
Number of Animals Six
Vehicle
Observation Period 7 Days
Type of Dressing Occlusive
Remarks - Method 0.5 ml of the test Substance was used with no adjustment for the percent active ingredient (46%).

RESULTS

Lesion	*Mean Score**	*Maximum Value*	*Maximum Duration of Any Effect*	*Maximum Value at End of Observation Period*
Erythema/Eschar	0	0	0	0
Oedema	0	0	0	0

*Calculated on the basis of the scores at 24, 48, and 72 hours for ALL animals.

Remarks - Results No mortality, clinical signs or skin irritation was observed during the study.

CONCLUSION The notified chemical is non-irritating to skin.

TEST FACILITY Rohm and Haas Company Toxicology Department (1991c)

7.5. Irritation - eye

TEST SUBSTANCE Substance A (Polymer intermediate as emulsion)

METHOD OECD TG 405 Acute Eye Irritation/Corrosion.
Species/Strain Rabbit/New Zealand White
Number of Animals 6 (unwashed)
3 (washed)
Observation Period 7 days
Remarks - Method 0.1 mL of the polymer emulsion was used with no adjustment for percent active ingredient (46%)

RESULTS

Lesion	*Mean Score**	*Maximum Value*	*Maximum Duration of Any Effect*	*Maximum Value at End of Observation Period*
Conjunctiva: redness	0	0	0	0
Conjunctiva: chemosis	0	0	0	0
Conjunctiva: discharge	0	0	0	0
Corneal opacity	0	0	0	0
Iridial inflammation	0	0	0	0

*Calculated on the basis of the scores at 24, 48, and 72 hours for ALL animals.

Remarks - Results After conjunctival application, approximately 75% of the test substance

	remained in contact with the eyes. In the washed and unwashed eyes, no corneal, iridal or conjunctival effects were observed during the study. No mortality or clinical signs were observed.
CONCLUSION	The notified chemical is non-irritating to the eye.
TEST FACILITY	Rohm and Haas Company Toxicology Department (1991d).

8. ENVIRONMENT

8.1. Environmental fate

No environmental fate data were submitted.

8.2. Ecotoxicological investigations

The notifier has supplied the following studies on an analogous product, Substance B, which contains the same polymer but at a higher concentration.

8.2.1. Acute toxicity to fish

TEST SUBSTANCE	Experimental emulsion Substance B.
METHOD	OECD TG 203 Fish, Acute Toxicity Test – Static conditions. EC Directive 92/69/EEC C.1 Acute Toxicity for Fish – Static Conditions.
Species	Rainbow Trout (*Onchorhynchus mykiss*)
Exposure Period	96 h
Water Hardness	36 mg $CaCO_3$/L
Analytical Monitoring	Nominal concentrations were used throughout the study for the concentrations of the test substance.
Remarks – Method	A total of 10 fish were exposed to each of 5 treatment levels (130, 220, 360, 600 and 1000 mg/L). Cloudiness was observed at all test concentrations, which increased as the concentration of the test substance increased.
RESULTS	No mortalities or sublethal effects were observed throughout the study. Hence the 96 h LC50 for the test substance was determined to be 1,000 mg/L and the No-observed Effect Concentration (NOEC) was 1,000 mg/L.
CONCLUSION	The test substance is practically non-toxic to rainbow trout.
TEST FACILITY	Springborn Laboratories (1995a)

8.2.2. Acute/chronic toxicity to aquatic invertebrates

TEST SUBSTANCE	Experimental emulsion Substance B.
METHOD	OECD TG 202 Daphnia sp. Acute Immobilisation Test and Reproduction Test – Static conditions. EC Directive 92/69/EEC C.2 Acute Toxicity for Daphnia – Static conditions.
Species	*Daphnia magna*
Exposure Period	48 hours
Water Hardness	160 mg $CaCO_3$/L
Analytical Monitoring	Nominal concentrations were used throughout the study for the concentrations of the test substance.
Remarks - Method	A total of 10 daphnia were exposed to each of 5 treatment levels (130, 220, 360, 600 and 1000 mg/L). Cloudiness was observed at all test concentrations, which increased as the concentration of the test substance increased
RESULTS	No immobilisations or sublethal effects were observed throughout the study. Hence the 48 h EC50 for the test substance was determined to be

	1,000 mg/L and the No-observed Effect Concentration (NOEC) was 1,000 mg/L.
CONCLUSION	The test substance is practically non-toxic to *Daphnia magna*.
TEST FACILITY	Springborn Laboratories (1995b)

9. RISK ASSESSMENT

9.1. Environment

9.1.1. Environment – exposure assessment

Waste from polymer manufacture and reformulation will end up being disposed of to landfill as an inert solid. A small amount of the polymer may be incinerated as part of the reconditioning of the drums containing the polymer emulsion. Incineration of the polymer would destroy the material with the production of water vapour, and oxides of carbon and silicon.

Washings from the cleaning of application equipment is expected to be released to the sewer where it is anticipated that it will be removed through the sewage treatment process. Waste remaining in the empty paint cans will be disposed of in domestic garbage ultimately finding its way into landfill.

The majority of the notified polymer will end up being applied to timber either as a floor coating or coating to internal timber trims. The polymer coating will dry to form an inert coating on the surface of the timber. It will remain on the timber until it is gradually worn down by human traffic, being slowly dispersed on shoes etc. At the end of its useful life it will either be removed by sanding (and presumably replaced by another coat of a similar product) or disposed of to landfill bound to the timber to which it has been applied. If removed by sanding, the coating containing the notified polymer will be broken up into solid particulate matter and most likely disposed to landfill.

9.1.2. Environment – effects assessment

Ecotoxicity studies for fish and daphnia on a related product (containing the same polymer) show very little toxicity.

9.1.3. Environment – risk characterisation

Waste polymer from manufacture, reformulation into coatings or residues in containers (either polymer transport drums or paint tins) will be disposed of to landfill as an inert solid. A small amount of polymer may be incinerated as part of the drum reconditioning process. Incineration of the polymer would destroy the material with the production of water vapour, and oxides of carbon and silicon.

The majority of waste polymer generated during manufacture (through spills and washing) will be disposed of in landfill, with a small amount remaining in solution being transferred to onsite lagoons for evaporation. Waste form the washing of application equipment will be washed down the drain where it will be removed as part of the sewage treatment process and buried in landfill.

The combination of the low toxicity of the notified polymer and the limited exposure of the polymer to the aquatic compartment indicate that the polymer is unlikely to have an adverse effect on aquatic organisms.

The majority of the notified polymer will be applied to timber surfaces and either share the fate of the timber at the end of its useful life (most likely to landfill) or be removed by sanding. If removed by sanding the coating containing the notified polymer will be broken up into solid particulate matter and most likely disposed to landfill.

9.2. Human health

9.2.1. Occupational health and safety

9.2.1.1 OCCUPATIONAL EXPOSURE ASSESSMENT

Manufacture of the Polymer:

One plant operator (1 hour/day, 20 days/year) will be involved in the preparation for, and overseeing of, the polymerisation process described in section 5.2, and in the taking of samples for quality control testing. Two plant operators (8 hours/day, 20 days/year) will transfer the polymer emulsion from the holding tank to a semi automated filling line where the polymer

emulsion will be filled into drums and sealed. Laboratory Technicians (1 hour/day, 20 days/year) will test the emulsion for various physical properties. The polymer in Emulsion EXP-3668 is not volatile and any exposure to it is likely to be by skin and eye contact during the handling of the emulsion. At the manufacturing site all plant operators who may come into contact with the polymer emulsion must wear safety helmets, safety glasses, impervious gloves, coveralls and safety boots as a minimum. Safety showers are accessible to all plant workers.

Manufacture of the Coating.
Coating makers (10-15, 2 hours/day, 60-100 days/year) and coating packers (4-6, 8 hours/day, 100 days/year) will be involved in the manufacturing and packaging process described in section 5.2. Paint Technicians (3-4, 0.5 hours/day, 60-100days/year) will test the paint for various physical properties. Mixing vessels are fitted with exhaust ventilation to capture any volatile materials at source, and automated filling lines also have exhaust ventilation. Coating makers and packers must wear safety glasses, impervious gloves, coveralls and safety boots. Paint Technicians must wear safety glasses, impervious gloves and coveralls.

Material Safety Data Sheets are available to all workers at both polymer and coating manufacturing sites. Internal safety training courses are run for all employees who handle chemicals.

Coating Application
The number of professional contractors and do-it-yourself painters who will use the coating products is expected to be large. The coating will be applied mostly using brushes and rollers, and there is potential for skin contact to occur.

9.2.2. Public health

There is potential for public exposure to the polymer emulsion in the event of an accident spillage during transportation and application.

The end-use products containing ~20% of the notified polymer will be used by painting contractors or the do-it-yourself consumers for applying to domestic and commercial premises. The public will handle the coatings and apply them by brush or roller. Exposure would be through skin or accidentally eye contact during the application. The coating is designed to self cross-link upon drying after application, and hence the public exposure to the notified polymer in the dry membrane of coatings will be minimal.

9.2.3. Human health - effects assessment

Toxicological data was provided on the intermediate polymer in the emulsion Substance A for the notified polymer that is similar material in composition. The test material is of low oral and dermal toxicity, with LD50 greater than 5000 and 2000 mg/kg bw respectively in rats. It is practically non-irritating in the skin and eyes of rabbit. The high molecular weight and low water solubility of the notified polymer are likely to limit its absorption across biological membranes (Connell:1990). In addition, emulsion EXP-3668 product has been used commercially in the USA for a few years, and no adverse effects have been reported following human exposure.

9.2.3.1 SUMMARY OF TOXICOLOGICAL INVESTIGATIONS

Endpoint and Result	*Assessment Conclusion*
Rat, acute oral LD50 >5000… mg/kg bw	low toxicity
Rat, acute dermal LD50 >2000… mg/kg bw	low toxicity
Rabbit, skin irritation	non-irritating
Rabbit, eye irritation	non-irritating

9.2.4. Human health – risk characterisation

9.2.4.1 OCCUPATIONAL HEALTH AND SAFETY

On the basis of the limited toxicological data provided, and the known or estimated physical-chemical properties, the notified polymer is not expected to represent an occupational hazard.

Engineering controls in the manufacturing process, and safe work practices should ensure that exposure to the chemical will be limited. The notified polymer is considered to be of low risk to workers.

9.2.4.2 PUBLIC HEALTH

The public will use clear coatings containing the notified polymer and dermal exposure will be expected during application. However, in view of its physical and chemical properties (high molecular weight, low water solubility, non-volatile) and its expected low acute toxicity, the notified polymer is unlikely to pose a significant health risk to the public.

10. CONCLUSIONS

10.1. Environment

The chemical is not considered to pose a risk to the environment based on its low toxicity and reported use pattern, which will result in limited environmental exposure.

10.2. Health hazard

Based on the available data the notified chemical is not classified as hazardous under the NOHSC *Approved Criteria for Classifying Hazardous Substances* (NOHSC:1999).

10.3. Human health

10.3.1. Human health – Occupational health and safety

There is Low Concern to occupational health and safety under the conditions of the occupational settings described.

10.3.2. Human health – public

Based on the submitted information, it is considered that the notified polymer will not pose a significant hazard to public health when used in the proposed manner.

11. RECOMMENDATIONS

CONTROL MEASURES

Occupational Health and Safety

- Employers should ensure that the following personal protective equipment is used by workers to minimise occupational exposure to the notified chemical during manufacture and reformulation:
  - Coverall, gloves, glasses

  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 Polymer in Emulsion EXP-3668 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.

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

The Director will then decide whether secondary notification is required.

No additional secondary notification conditions are stipulated.

12. MATERIAL SAFETY DATA SHEET

The MSDS for the Emulsion EXP-3668 was provided in a format consistent with the *National Code of Practice for the Preparation of Material Safety Data Sheets* (NOHSC: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.

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9. Springborn Laboratories (1995a) SLI Report # 95-2-5694, SLI Study # 86.1294.6181.103: Experimental Emulsion 'Substance B' – Acute toxicity to rainbow trout (*Oncorhynchus mykiss*), Wareham, Massachusetts, USA, Springborn Laboratories Inc. Environmental Sciences Division. (unpublished report submitted by Rohm and Haas Australia Pty Ltd).

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