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NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

Acrylic Polymer in Emulsion EXP-3361

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Director
Chemicals Notification and Assessment

FULL PUBLIC REPORT

Acrylic Polymer in Emulsion EXP-3361

1. APPLICANT

Rohm and Haas Australia Pty Ltd of 969 Burke Road CAMBERWELL VIC 3124 has submitted a limited notification statement in support of their application for an assessment certificate for Acrylic Polymer in Emulsion EXP-3361.

2. IDENTITY OF THE CHEMICAL

Acrylic Polymer in Emulsion EXP-3361 is not considered to be hazardous based on the nature of the polymer and the data provided. Therefore the chemical name, CAS number, molecular and structural formulae, molecular weight, spectral data, details of the purity, polymer composition and exact import volume have been exempted from publication in the Full Public Report and the Summary Report.

Trade Name:	no specific trade name applies to this polymer; it will be imported as a component of the polymer emulsion EXP-3361
Number-Average Molecular Weight:	> 2 000
Weight-Average Molecular Weight:	> 40 000
Maximum Percentage of Low Molecular Weight Species	
Molecular Weight < 500:	< 10%
Molecular Weight < 1 000:	< 15%
Method of Detection and Determination:	infrared spectroscopy

3. PHYSICAL AND CHEMICAL PROPERTIES

Appearance at 20°C and 101.3 kPa:	the polymer emulsion containing the notified polymer is a milky white liquid
Boiling Point:	100°C (at 760 mm Hg) (emulsion)
Specific Gravity:	1.06 (emulsion)
Vapour Pressure:	not provided
Water Solubility:	not provided
Partition Co-efficient (n-octanol/water):	not provided
Hydrolysis as a Function of pH:	not provided
Adsorption/Desorption:	not provided
Dissociation Constant:	not provided
Flash Point:	not provided
Flammability Limits:	not provided
Autoignition Temperature:	not provided
Explosive Properties:	not provided
Reactivity/Stability:	polymer is stable; temperatures above 177°C should be avoided to prevent the onset of polymer decomposition

Comments on Physico-Chemical Properties

The level of information provided by the notifier for physico-chemical data is minimal. While individual monomers of the notified polymer have an environmentally significant level of water solubility, when combined in polymer form, solubility is unlikely to be significant.

There are some ester groups on the polymer but these would not be expected to hydrolyse under normal environmental conditions.

The octanol-water partition coefficient would be expected to be high, and the polymer is likely to readily adsorb to soil and sediments. Due to the lack of solubility, these attributes would be difficult to measure.

4. PURITY OF THE CHEMICAL

Degree of Purity:	> 99%
Toxic or Hazardous Impurities:	the notified polymer contains less than 1% acrylic monomers, which can cause skin, eye and respiratory irritation; one monomer can cause burns, others may cause skin sensitisation (1).
Maximum Content of Residual Monomers:	< 1%

5. USE, VOLUME AND FORMULATION

The notified polymer will be initially imported at a concentration of less than 50% in the formulation Emulsion EXP-3361. After the first year, it is anticipated that manufacture of the polymer will occur within Australia at the notifier's plant. The estimated import volume for the first year is up to 100 tonnes. The estimated quantity to be manufactured in Australia is expected to be up to 700 tonnes per year by the fifth year.

The notified polymer will be used by the notifier's customers as a component of paints. These paints will be available to both industry and the general public.

6. OCCUPATIONAL EXPOSURE

Three categories of people may be exposed to the notified polymer in the course of their work. These include people involved in the manufacture, reformulation and application of the notified polymer and associated end use products.

Manufacture

Manufacture of liquid emulsion containing up to 50% of the notified polymer will involve monomers and other reaction components being piped via a hard piped transfer system to a closed reaction vessel. Following synthesis, the emulsion will be unloaded from the vessel, filtered, and transferred to 200 L drums or bulk storage facilities. Reactor operators load and unload the reactor vessel by manipulating valves in the piping system. These workers are expected to be involved with the manufacture of the notified polymer for approximately 4 hours per day, 12 days per year. Minimal exposure is expected, as the process is enclosed and largely automated. Filtration operators may be dermally exposed to the emulsion containing the notified polymer while changing used filters. Eye contact is expected to be limited to drips and splashes. Filter changes will be needed approximately 12 times per year, and will take about 1 hour each time.

Workers involved in polymer manufacture may also be exposed to potentially hazardous monomer components, which may cause irritation and sensitisation (1). The notifier states that exposure to these components will be minimised by the presence of a caustic scrubber to remove monomer odours and a pressure rated bursting disk, which is installed as part of the reactor system.

Laboratory workers may be exposed for up to 1 hour per day, 30 days per year to relatively small amounts of the notified polymer during testing and development. Dermal contact is expected to be the main route of exposure for these workers.

Transport workers may be dermally exposed to the notified polymer for approximately 1 hour per day, 30 days per year, while filling and unloading tankers during bulk transport of the polymer emulsion. Accidental eye contact may also occur while hoses are being connected or disconnected.

Reformulation

Emulsion EXP-3361 will be reformulated by the notifier's customers into paint products. The final concentration of the polymer in these products will be relatively low. Dermal exposure may occur if drums of the emulsion are tapped for transfer to a closed mixing vessel. Some reformulation sites may have bulk storage facilities, from which temporary or permanent piping systems would be run to transfer the polymer to the mixing vessel. Inhalational exposure to the notified polymer is expected to be minimal, as the polymer is not expected to be volatile, based on its physico-chemical properties. The notifier states that mixers will be fitted with exhaust ventilation to capture other volatile paint components at source. Worker exposure to the notified polymer is expected to be minimal during the rest of the reformulation and packaging processes, as the equipment is automated and enclosed. Paints will be filled into epoxy lined tin plate cans under exhaust ventilation. Some dermal contact may occur during equipment cleaning and repair. Eye contact is not expected.

Laboratory workers and quality control personnel may be exposed to the notified polymer as a component of both the emulsion and paints during paint development and testing. Dermal contact will be the main route of exposure, although inhalational exposure may occur during test spraying of paint products. The notifier states that all quality control testing of paint is carried out in spray booths, which would minimise worker exposure.

Transport workers will handle paint products containing the notified polymer, although these products will be packaged in 1 L, 4 L, and 10 L containers, and exposure is only likely to occur in the event of an accident or leaking packaging.

Application

Professional painters will come into contact with the notified polymer while applying paint products containing Emulsion EXP-3361. Once again, dermal contact is likely to be the main route of exposure, and any contact with the paint is likely to be prolonged. Inhalational exposure may take place if the paint products are sprayed onto surfaces. The notifier estimates that a professional painter may use products

containing the notified polymer approximately 50 days per year.

There may be significant worker contact with dried paints containing the notified polymer, however, the notified polymer will be bound to the paint and will therefore not be bioavailable.

7. PUBLIC EXPOSURE

Manufacturing, transport and reformulation of the notified polymer or paint products containing the notified polymer are unlikely to result in significant public exposure.

The notified polymer will be used at relatively low concentrations in paint intended for application on interior surfaces. These paints will be available to the general public and the potential route of exposure would be by dermal contact. The notified polymer is not volatile and inhalational exposure should be minimal. Once dried, the notified polymer is bound to the paint.

8. ENVIRONMENTAL EXPOSURE

Release

Releases through manufacture of the polymer emulsion, reformulation into end use paints and application of end use paints can be expected.

Manufacture will be carried out at the notifier's plant in Victoria, where a maximum of 700 tonnes in the fifth year is expected to be produced. Raw materials are charged to the reactor through a hard piped system from bulk storage. Release through this mechanism will therefore be negligible. The polymer emulsion is filtered to remove coagulant solid polymer and is transferred through the hard pipe system into bulk storage tanks.

During manufacture, release can be expected through washing of equipment, minor spills, and disposal of residues from filters. The notifier has estimated around 500 kg per annum at maximum expected production will be lost through washing of equipment and minor spills. Disposal of residues from the manufacture, other than on filters, will be via the plant latex disposal system. The polymer will be flocculated using ferrous sulphate and disposed of as a prescribed waste.

Releases during reformulation can be expected from spillage and waste paint resulting from mixer washings. The notifier has estimated 100 kg per year of the polymer will be released by these mechanisms. Spills will be contained by bunding, and these and other releases will be taken off-site by a licensed waste contractor for burial after treatment at a trade waste landfill.

The main source of release can be expected through end use. Washings from paint application equipment are expected to be to the sewer, while empty paint cans and their residues would generally be disposed of via normal household garbage. The notifier estimates 500 kg of polymer will be disposed of by tradespeople and

domestic users per year. However, for a worst case scenario, it will be assumed that all the end use paints will be used by domestic users, and as such, will generate far greater rates of release. The following release figures are based on emission estimates in the USES model (2). This provides an estimated release fraction for paints, lacquers and varnishes at private use. In the absence of data from the notifier, it will be assumed that the vapour pressure of the polymer is less than 1 Pa.

Release estimates for paints at private use, based on maximum annual production of 700 tonnes:

Compartment	*Release fraction*	*Volume (per annum)*
Air	0.002	1 400 kg
Soil	0.002	1 400 kg
Waste water	0.01	7 000 kg

Fate

If the polymer is disposed of prior to dilution in paints, it will be in trade waste landfill sites after treatment by trade waste contractors. Disposal at the manufacturing site will occur after passing through the notifier's plant latex disposal system where the polymer is flocculated and disposed of as prescribed waste. It is likely that little polymer will enter the aquatic system through disposal in this manner.

Excess paints, residues from containers, cleaning of application equipment and empty containers will be disposed of by landfill where the polymer would be immobilised through incorporation in the dried paint.

After application the paint dries to form a protective coating. Any waste product of the dry paint through chipping or flaking will be inert and form part of the sediments, or will be consigned to household garbage if used for inside purposes, and landfilled.

Due to the relatively insoluble nature of the polymer, any waste disposed of to sewer through cleaning of application equipment would be expected to associate with sludge in the sewage treatment plant. Sludge containing the notified substance will be incinerated or landfilled. Incineration would destroy the polymer, and create typical decomposition products of oxides of carbon.

Bioaccumulation of the polymer is not expected because of its high molecular weight which is likely to inhibit membrane permeability and prevent uptake during exposure. The company has submitted a label and a Material Safety Data Sheet (MSDS) for the notified polymer which has adequate recommendations for disposal and handling accidental spillage.

9. EVALUATION OF TOXICOLOGICAL DATA

No toxicological data were provided for the notified polymer, which is acceptable for polymers of number-average molecular weight (NAMW) greater than 1 000 according to the Act.

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

No ecotoxicological data were provided for the notified polymer, which is acceptable for polymers of NAMW greater than 1 000 according to the Act.

Acrylic polymers are moderately toxic to green algae, inhibiting growth through overchelation of nutrients. Polyacrylic acid appears to be the most potent form of polycarboxylic acid in its ability to chelate nutrient elements and may exhibit toxic effects at concentrations greater than 1 ppm (3). The acrylic acid component of this polymer is less than 2% by weight, and toxicity is known to be mitigated by salt formation and humic acid. Therefore, the potential of this polymer to be toxic to aquatic species is low.

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

A predicted environmental concentration (PEC) through end use and disposal on an Australia-wide scale has been derived using the following assumptions:

1. The maximum anticipated annual volume of 700 tonnes is produced.
2. All end product is used in domestic applications, with releases based on those estimated in the USES model (2).
3. Sewer output is based on an Australian population of 18 million people, using 150 L of water per day.
4. Application is spread over 300 days of the year.

The estimated yearly release to waste water is 7 000 kg. This equates to 23.3 kg per day around the country. Sewer output is 2 700 ML per day, which gives a PEC in the sewage treatment plant of 8.6 µg/L (ppb). This is prior to dilution in receiving waters, and any removal from the STP through adsorption to sludge. This supports the conclusion that the polymer will pose a low environmental hazard.

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

With a NAMW greater than 1 000, the notified polymer is unlikely to cross biological membranes and cause systemic toxicity. The proportion of low molecular weight species in the notified polymer is quite high (less than 15% of the polymer species have a molecular weight less than 1 000 and less than 10% have a molecular weight less than 500) and may be absorbed by dermal contact. However, levels of the low molecular weight species in the emulsion containing the notified polymer will be around 7.5%, and the level in paint products is low (less than 0.75%). Therefore the low molecular weight species should not be of toxicological significance.

Manufacture

The occupational health risk posed by the notified polymer to workers involved in the manufacture of the Emulsion EXP-336 is low, due to the expected low toxicity of the notified polymer and the anticipated low exposures. Dermal contact is expected to be the main route of exposure for all workers involved in the manufacture of the emulsion. Health hazard information on the MSDS for Emulsion EXP-336 indicates that slight skin irritation may occur, based on toxicity profiles for a number of other similar acrylic emulsions. Accidental eye contact may also lead to slight irritation. The level of residual monomers (less than 0.5%) and low molecular weight species (less than 7.5%) in the emulsion are not expected to cause adverse health effects. Inhalation is not expected to be a significant route of exposure.

There is a moderate occupational health risk associated with working with the monomer components during manufacture, as acrylic monomers can cause irritation, burns and skin sensitisation. The exposure to these constituents is expected to be minimal, however the Worksafe Australia document *Exposure Standards for Atmospheric Contaminants in the Occupational Environment: Guidance Note and National Exposure Standards* (4) should be used as a guide in the control of workplace levels of these potentially hazardous substances.

Reformulation

The occupational health risk for workers involved in reformulation of the notified polymer is also low. Dermal contact is also likely to be the main route of exposure for workers in this field and as discussed above, the health risk is expected to be minimal. Inhalation may be a route of exposure for laboratory and quality control staff, who will carry out spray painting during testing. The MSDS for Emulsion EXP-3361 indicates that inhalation of the vapour or mist may cause headache, nausea and irritation. This is likely to be due to the low concentration of aqua ammonia present. The notified polymer will be at a relatively low concentration in the paints and is not expected to be volatile, however measures should be taken to minimise exposure to any volatile components of the emulsion or paint.

Application

Inhalational exposure to the notified polymer may occur if tradespeople use spray painting equipment to apply paints containing the notified polymer. As discussed above, workers should minimise their exposure to any potentially hazardous paint components when using spray equipment. Dermal exposure to the notified polymer presents a low occupational health risk, for the reasons outlined above.

Worker contact with dried paint containing the notified chemical presents negligible health risk, as the paint will be in cured form and the polymer will not be bioavailable.

Public

Manufacturing, transport and reformulation of the notified polymer or paint products containing the notified polymer are unlikely to result in significant public exposure.

The majority of public exposure will be by dermal contact with paint products,

containing a relatively low concentration of the notified polymer. The high NAMW indicates that the notified polymer is unlikely to cross biological membranes and cause systemic toxicity. As discussed previously, the levels of low molecular weight species in the final paint products are unlikely to present a health hazard. Therefore, use of the notified polymer in paints should present a minimal health hazard to the public.

13. RECOMMENDATIONS

To minimise occupational exposure to Acrylic Polymer in Emulsion EXP-3361 the following guidelines and precautions should be observed:

- It is good work practice to wear industrial clothing which conforms to the specifications detailed in Australian Standard (AS) 2919 (5) and occupational footwear which conforms to Australian and New Zealand Standard (AS/NZS) 2210 (6) to minimise exposure when handling any industrial chemical;

- Spillage of the emulsion and paints containing the notified polymer 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.

In addition, The Worksafe Australia document *Exposure Standards for Atmospheric Contaminants in the Occupational Environment: Guidance Note and National Exposure Standards* (4) should be used as a guide in the control of any monomer vapours or mists generated during manufacture of the notified polymer, as well as any volatile components of paint products containing the notified polymer. Workplace monitoring for these components should be carried out on a regular basis.

14. MATERIAL SAFETY DATA SHEET

The MSDS for the notified polymer was provided in accordance with the *National Code of Practice for the Preparation of Material Safety Data Sheets* (7).

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

1. National Occupational Health and Safety Commission 1994, *List of Designated Hazardous Substances* [NOHSC:10005(1994)], Australian Government Publishing Service Publ., Canberra.

2. USES 1994, *Uniform System for the Evaluation of Substances, version 1.0*. National Institute of Public Health and Environmental Protection, Ministry of Housing and Spatial Planning and the Environment, Ministry of Welfare, Health and Cultural Affairs. Distribution no. 11144/150, The Hague, The Netherlands.

3. Nabholz JV., Miller P., Zeeman M. 1993, 'Environmental Risk Assessment of New Chemicals Under the Toxic Substances Control Act (TSCA) Section Five', in *Environmental Toxicology and Risk Assessment*, ASTM STP 1179. G. Landis, J.S. Hughes, M.A. Lewis (eds). American Society for Testing and Materials, Philadelphia. pp 40-45.

4. National Occupational Health and Safety Commission 1995, 'Adopted 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*, Australian Government Publishing Service Publ., Canberra.

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

6. Standards Australia/Standards New Zealand 1994, *Australian/New Zealand Standard 2210-1994, Occupational Protective Footwear,* Standards Association of Australia Publ., Sydney, Standards Association of New Zealand Publ, Wellington.

7. 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.