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NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

Polyurethane Polymer in Acrysol RM-12W

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Director
Chemicals Notification and Assessment

FULL PUBLIC REPORT

Polyurethane Polymer in Acrysol RM-12W

1. APPLICANT

Rohm and Haas Australia Pty Ltd of 969 Burke Road CAMBERWELL VICTORIA 3124 has submitted a limited notification statement in support their application for an assessment certificate for Polyurethane Polymer in Acrysol RM-12W.

2. IDENTITY OF THE CHEMICAL

Polyurethane Polymer in Acrysol RM-12W 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, molecular weight, spectral data and details of the polymer composition have been exempted from publication in the Full Public Report and the Summary Report.

Trade name:	polymer is imported within imported colloidal solution Acrysol RM-12W
Number-average molecular weight (NAMW):	> 1000
Method of detection and determination:	infrared spectroscopy and gel permeation chromatography

3. PHYSICAL AND CHEMICAL PROPERTIES

Appearance at 20°C and 101.3 kPa:	clear to milky white liquid with a solvent odour
Boiling point:	58.8°C (at 760 mm Hg)
Specific gravity:	1.04
Vapour pressure:	not determined, expected to be negligible due to high molecular weight

Water solubility:	as physico-chemical properties are expected to be similar to a high molecular weight polyethylene glycol, notified polymer is expected to have moderate water solubility
Partition co-efficient (n-octanol/water):	not determined
Hydrolysis as a function of pH:	not determined
Adsorption/Desorption:	not determined
Dissociation constant:	the notified chemical does not contain any groups which would be expected to dissociate in water
Flash point:	not flammable
Flammability limits:	not flammable
Autoignition temperature:	polymer is unlikely to ignite
Explosive properties:	polymer is not explosive
Reactivity/Stability:	polymer is non reactive

Comments on Physico-Chemical Properties

The notified polymer consists mainly of polyethylene glycol. Therefore, its physico chemical properties would be expected to be similar to high molecular weight polyethylene glycol. Polyethylene glycol with a molecular weight of 20,000 has an appreciable solubility in water of > 10% (1) and similar solubility for the notified polymer may be expected.

The hydrolysis as a function of pH was not determined and the notifier claims the compound is relatively stable under environmental conditions. The notifier states that the small proportion of carbamate groups within the polymer may undergo hydrolysis under extreme acid/base conditions.

The partition coefficient was not determined. However given the expected solubility in water it is anticipated that the partition coefficient would be low.

No information was provided on the adsorption/desorption properties of the polymer. Given the polymer's expected moderate water solubility it is anticipated that it will not strongly adsorb.

The dissociation constant was not determined. This is acceptable as the polymer contains no acidic or basic functional groups that dissociate in water.

4. PURITY OF THE CHEMICAL

Degree of purity: > 80%

5. USE, VOLUME AND FORMULATION

The notified substance will be imported as a component (< 20% w/w) of an aqueous colloidal solution. The estimated quantity of the notified chemical to be imported over the next five years is greater than one tonne per annum.

The main use for the product is reformulation into paints. These paint products would be expected to be used in wide variety of applications.

6. OCCUPATIONAL EXPOSURE

The colloidal solution (containing the notified polymer at < 20%) will be contained within 205 L sealed drums for storage and transport. The solution will not be repackaged before delivery.

The solution will be reformulated at 5-10 sites in metropolitan areas, into paint products as a component at concentrations of 0.2%. This will be performed by up to five blending workers per site, who will be involved in pumping the colloidal solution into formulated paint and dispersing at high speeds in closed blending pots and the cleaning of the blending pots. This will entail potential exposure to the notified chemical in the polymer dispersion and paint for 6-8 hours per day for 12-15 days per year.

The paint will be checked by up to three quality control staff, who will potentially become exposed to the notified chemical in paint for 1-3 hours a day, 8-12 days per year.

The paint will be contained in cans of 205 L, 20 L and 1 L and will be used for both domestic and industrial applications. There will be up to four can fill operators per site who may be potentially exposed to the notified chemical during the automatic filling operations for 6-8 hours per day, 12-15 hours per day. There may also be some exposure to maintenance personnel who maintain the mixing and filling equipment for between 2-4 hours per day, 4 days per year.

Local exhaust ventilation will be utilised at the sites of reformulation over the areas for sampling, dispersion into paint and container filling.

Domestic and industrial applicators of the paint containing the notified chemical will number possibly less than three thousand, depending on the customer base of the notifier. Exposure would occur through application of the paint containing the notified chemical at < 0.2% by brush or spray application for 6-8 hours per day, 50-90 days per year. Supervisory personnel in industrial application will probably be

exposed during primer and curing processes for 1 hour per day, 8 days per year.

Drum recycling will entail the possible exposure of workers involved in drum cleaning/reconditioning to the colloidal solution or paint containing notified chemical. This will probably occur for 3 hours per day, 10 days per year.

7. PUBLIC EXPOSURE

There is little potential for public exposure to the notified polymer during storage, transport and formulation into paint products. Minor public exposure to the uncured form of the notified chemical may result from accidental spillage during formulation, transport and storage. Disposal of the chemical after accidental spillage is expected to be carried by incineration or landfill in accordance with Local, State and Federal regulations which will minimise public exposure.

The notified chemical will initially be supplied to 5-10 customers who will blend the colloidal solution with other compounds into paint and other surface coatings at a final concentration of 0.2% w/w Acrysol RM-12W which leads to < 0.2% final concentration of the notified chemical. The finished paint is packaged into 250 L, 20 L and 1 L containers which will be marketed for industrial and domestic use as a paper, metal and wood coating. There is some potential for public exposure arising from the use of the domestic paint products.

Production losses of the finished coatings at each formulation plant are expected to be about 10%, and a similar level of loss is calculated to occur during application of the finished coatings arising from application inefficiencies, cleaning of equipment and residues in containers. Some of these residues/washings will enter the sewers and drains, while most will be disposed of to liquid or solid waste disposal facilities in accordance with local regulations.

The chemical will finally be immobilised as part of a cross-linked hardened paint film and there will be significant public contact with the notified chemical in this inert form.

8. ENVIRONMENTAL EXPOSURE

Release

Paint manufacture and packaging will take place in a closed system (or system that does not create aerosols) reducing the likelihood of the chemical being released into the environment during routine mixing of formulations and packing of final products. The polymer wastage factor at each site of paint manufacture is estimated to be 10%. It is expected that these losses would include drum/storage container residues, transfer piping and blending tank residues, samples and filter residues. Disposal of these residues will be either as trade waste, incineration or landfill. The notifier has estimated that < 10% of the polymer will be lost to the sewer as a result of the paint manufacturing process.

The diverse applications of the end products will mean that their use is widespread.

The main loss to the environment occurs with the end use. Quantities of the product may be lost in spray application of paint. These losses have been estimated to be up to 10%. In addition release to the environment will occur through the washing of painting equipment such as brushes. The painting equipment will be washed using large amounts of water releasing the chemical into the sewerage system. Residue from the paint cans will be disposed of in landfill. Assuming a similar rate of loss for brush and spray application an overall loss of 10% of the polymer to the sewerage system can be estimated. The consultant for the notifier has estimated approximately 70% of the paint product will be applied using spray application and 30% using brush application.

Spills are to be contained using an inert material such as sand and transferred to separate suitable containers for recovery and disposal. The liquid and solids will then be disposed of by incineration or in landfill according to government regulations.

Fate

The precise fate of the chemical in the environment is not known. The chemical is relatively soluble and would therefore be expected to disperse. It appears unlikely that the polymer will degrade under environmental conditions and is not expected to undergo biodegradation.

For those quantities of waste from paint manufacture which are incinerated the likely combustion products are oxides or carbon and hydrogen.

The polymer is expected to cross-link slowly under the action of oxygen or sunlight at ambient temperatures. Hence, it is unlikely that the polymer will breakdown after application within paint products.

The chemical is likely to be released in small quantities over a widespread area and bioaccumulation of the polymer is unlikely due to the high molecular weight (> 1000 daltons).

9. EVALUATION OF TOXICOLOGICAL DATA

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

The high molecular weight indicates that the notified chemical will be poorly absorbed across biological membranes into tissues. The physico-chemical properties include negligible volatility under normal ambient conditions and a boiling point expected (for the polymer) of approximately 58°C. These factors support the notifier's claim of expected low toxicity for the chemical.

The notified chemical cannot be classified according to Worksafe Australia's *Approved Criteria for Classifying Hazardous Substances* (2).

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

Ecotoxicological data were not provided, which is acceptable for polymers with number average molecular weight of greater than 1000, according to the Act.

The notified substance is not expected to exhibit toxic characteristics, as large polymers are not readily absorbed by biota, and being non-ionic it would not over-chelate minerals. Due its high NAMW (> 1000) the polymer is not expected to cross biological membranes (3, 4).

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

The risk posed by the use of the end product appears to be small in that it will be incorporated at a small percentage (0.2%) in a range of paint products the use of which might be expected to be widespread across Australia. The total quantity to be released through the sewer system annually Australia wide has not been estimated by the notifier. They have estimated that 10% would be lost to the environment as a result of paint manufacture.

Assuming that 10% of the notified substance imported remains dissolved and thus is released into the sewerage system as a result of use of the end product, a predicted environmental concentration (PEC) of 8.6 ppb for the substance in sewage water across Australia can be estimated. This value is based on the following assumptions: 8 tonne (20% of the 40 tonne of colloidal solution imported in the fifth year) maximum annual use an Australian population of 17 million and a daily per capita waste water discharge (a conservative estimate) of 150 L. Thus, normal use of the end products appears to be unlikely to cause undue load on water and sewage treatment plants to treat and biodegrade effluent.

The notified polymer is unlikely to present a hazard to aquatic organisms due to its low concentration in waters and its expected low potential to cross biological membranes. Polymers exceeding 1000 in molecular weight and which are non-ionic are of low concern.

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

The number-average molecular weight of the notified chemical is greater than 1000, indicating that the risk of adverse health effects should be minimal as the notified polymer is unlikely to cross biological membranes.

There is unlikely to be any significant exposure to the notified chemical imported in the colloidal solution during importation and transport to the reformulation sites. Significant exposure may occur however in the event of a spill, which should be contained according to the practices described in the recommendations.

There may be dermal exposure to the notified chemical during reformulation into the paint due to splashing or spillage during the transfer of the colloidal solution into the mixing pot. This will be minimised by eye goggles, protective clothing and neoprene

gloves. Respiratory devices will be utilised should exhaust ventilation be inadequate to control vapours from the colloidal solution or paint. However, the notified chemical is unlikely to pose an inhalational hazard due to the expected low vapour pressure. As most of the process is conducted by automated machinery in a closed system, the potential for worker exposure is minimised.

There may be the potential for dermal exposure to the notified chemical in paint products during quality control, container filling and paint application (both industrial and domestic), through splashing and spillage. As the notified chemical is contained within the paint at < 0.2%, it is unlikely that any significant levels of exposure will occur. Any precautions to minimise exposure to the paint formulation such as respiratory protection, eye goggles, protective gloves and protective clothing will serve to minimise exposure to the notified chemical.

There may be dermal exposure to the notified chemical in the colloidal solution or paint formulation to cleaners and drums reconditioners through splashing and spillage. As the drums are likely to only contain residues, the level of exposure to the notified chemical is not expected to be significant. Any exposure should be minimised through the use of eye goggles, chemical resistant gloves and protective clothing.

There is negligible potential for public exposure to the polyurethane polymer arising from importation, storage, transportation and formulation into paint products. Similarly, the potential for public exposure to the chemical during transport and disposal of process waste and clean-up waste after a spill is very minor. There is likely public exposure from the end-use application of the chemical as a water-based surface coating, but the polyurethane polymer is at a very low concentration (< 0.2%) in these coatings. The chemical will finally be immobilised as part of a cross-linked hardened paint film and while there will be significant public contact with the notified chemical in this inert form, there seems no likely route of exposure and absorption.

13. RECOMMENDATIONS

To minimise exposure to Polyurethane Polymer in Acrysol RM-12W the following guidelines and precautions should be observed:

- Safety goggles should be selected and fitted in accordance with Australian Standard (AS) 1336 (5) to comply with Australian/New Zealand Standard AS/NZS 1337 (6),

- Industrial clothing should conform with the specifications detailed in AS 2919 (7),

- Impermeable gloves or mittens conforming with AS 2161 (8),

- 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 by incineration or landfill according to local, state or federal government regulations;

- Formulations containing the notified chemical should be kept in a cool dry place as they may splatter above 100°C;

- Heating Polyurethane Polymer in Acrysol RM-12W above 177°C may generate monomer vapours;

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

- A copy of the Material Safety Data Sheet (MSDS) should be easily accessible to employees.

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* (9).

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 chemical 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. Data from MSDS for Polyethylene glycol 20,000, obtained from Oxford University MSDS DataBase. http://physchem.ox.ac.uk/MSDS/P/POLYETHYLENE%20GLYCOL%2020,000

2. National Occupational Health and Safety Commission 1994, Approved Criteria for Classifying Hazardous Substances [NOHSC:1008(1994)], Australian Government Publishing Service, Canberra.

3. Anliker R, Moser P & Poppinger D, 1988, *Bioaccumulation of dyestuffs and organic pigments in fish. Relationships to hydrophobicity and steric factors*. Chemosphere 77(8): 1631-1644

4. Gobas FAPC, Opperhuizen A and Hutzinger O, 1986, *Bioconcentration of hydrophobic chemicals in fish: relationship with membrane permeation*. Environmental toxicology and Chemistry 5: 637-646

5. Standards Australia 1994, Australian Standard 1336-1994, *Eye protection in the Industrial Environment*, Standards Association of Australia Publ., Sydney.

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

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

8. Standards Australia 1978, Australian Standard 2161-1978, *Industrial Safety Gloves and Mittens (excluding electrical and medical gloves),* Standards Association of Australia Publ., Sydney.

9. 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.