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NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

EFKA Polymer 401

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Director
Chemicals Notification and Assessment

FULL PUBLIC REPORT

EFKA Polymer 401

1. APPLICANT

Multichem Pty Ltd of Suite 6 400 High St KEW VIC 3101 has submitted a notification statement accompanying their application for assessment of a synthetic polymer of low concern, EFKA Polymer 401.

2. IDENTITY OF THE CHEMICAL

Trade Name:	EFKA Polymer 401
Number-Average Molecular Weight (NAMW):	8 610
Weight-Average Molecular Weight:	26 428
Maximum Percentage of Low Molecular Weight Species (Polymers and Oligomers)	
(Molecular Weight < 1 000):	1.1%
(Molecular Weight < 500):	0.1%
Means of Identification (List of Spectral Data Available):	gel permeation chromatography, infrared spectroscopy

3. PHYSICAL AND CHEMICAL PROPERTIES

The notified polymer is imported as a solvent solution in n-butyl acetate (30-40%) and secondary butanol (less than 10%) and is never isolated. It is a clear yellow solution with physico-chemical properties characteristic of the solvents (see Material Safety Data Sheet - MSDS).

Appearance at 20°C and 101.3 kPa:	powder
Melting Point:	~95°C

Density: 1 030 kg/m^3

Water Solubility: 0 mg/L

Reactivity: stable

Comments on Physico-Chemical Properties

Water solubility, claimed by the notifier to be 0 mg/L, was determined by a simple bench test. One milligram of the notified polymer was added to 1 litre of water in a flask. The notifier observed no dissolving of the polymer after 1 hour at 20°C. The water was decanted, and the flask dried at 120°C and weighed. There was no difference in weight after and before the addition of water. However, the result of this test only shows that the notified polymer's solubility in water is less than 1 mg/L. Also, the presence of a polyethylene glycol component and the weakly basic imidazole functionality would indicate that some solubility of the polymer could reasonably be expected.

The polymer contains a number of ester functionalities, but hydrolysis in the environmental pH range would be precluded by the low water solubility. The imidazole group contains an alkyl group on the nitrogen. The notifier claims that the lone pair is not susceptible to protonation as this would disrupt the aromatic Hückel system of the imidazole ring. Furthermore, the imidazole group is sterically shielded from the environment due to the long polar side chains attached adjacently to the acrylic backbone. Therefore, it is claimed that protonation is unlikely.

4. PURITY OF THE CHEMICAL

The maximum weight percentage of residual monomers is less than 0.05% for each monomer.

5. USE, VOLUME AND FORMULATION

The notified polymer is a dispersing agent used in all kinds of high quality, solvent-based industrial coatings including automotive topcoats, as well as in pigment concentrates. It will be imported as a component of a solvent solution containing n-butyl acetate at 30 to 40% and sec. butanol at less than 10% (see attached MSDS). The polymer will be imported at a rate of 950 kg for the first year rising to 1 500 kg per year by the fifth year.

6. OCCUPATIONAL EXPOSURE

The notified polymer is to be imported in 28 kg pails or 208 kg drums and exposure during transport and handling would only be likely in the event of an accident.

During paint production the solvent solution is pumped into the mill base following

opening of the container. Exposure at this point is possible while connecting and disconnecting lines. Paints are typically mixed in a sealed system with solvent fumes removed via local exhaust ventilation. Following mixing, steel containers of various sizes are typically filled and sealed automatically again with fume extraction systems in place.

The paints containing the notified polymer will primarily be used in spray painting applications. Most spray painting is conducted in ventilated spray booths to prevent solvent exposure so that exposure to the polymer is expected to be correspondingly low. Some exposure may be expected during maintenance and cleaning operations.

7. PUBLIC EXPOSURE

There is negligible potential for public exposure to the polymer arising from importation, storage, transportation and formulation into paint products. Similarly, the potential for public exposure to the polymer during transport and disposal of process waste and clean-up of waste after a spill is very minor. There is potential for public exposure from the end-use application of the chemical within an automotive 'touch-up' paint kit, but these kits contain only small quantities of paint and the concentration of the notified polymer within the paint will be low. The chemical will finally be immobilised as part of an inert, hardened paint film, and while there may be significant public contact with the notified chemical in this inert form, there seems no likely route of exposure and absorption.

8. ENVIRONMENTAL EXPOSURE

. Release

Release will occur during reformulation and end use operations. Reformulation will be carried out at various paint company locations, where the notified polymer will be present at a level of no greater than 3% in the final paint.

The formulation process for industrial coatings consists of dispersion, let down, and filling. Customers of the notifier estimate total losses of product through this process to be less than 2%, or 30 kg per annum based on maximum expected import volumes. This will be spread over many sites, and many days of the year. Emissions during the formulation process are typically combined with cleaning solvents, processed through waste paint plants where solvents are recovered and polymers are polymerised with other solids due to the heat generated, and granulated for disposal to landfill.

Residues of the polymer remaining in drums are estimated to be less than 1% (15 kg based on maximum import volumes). Empty drums are typically sent to drum reconditioners/recyclers where any notified polymer present would be blended with cleaning solvents and other solid residues, which are often used to produce general purpose drum or industrial enamels.

The major release could be expected through end use application. The notifier

states that, when reformulated, the product will be used in all kinds of high quality, water-based industrial coatings. The notifier is advised from end users that spray paint application can lead to losses of up to 50% due to overspray. Depending on the type of method employed, transfer efficiencies can range from 35% for some spray painting methods to over 90% for more efficient methods (1,2). Using losses of 65% as a worst case scenario, this equates to around 975 kg per year, or around 3.25 kg per day if spraying operations are carried out on 300 days of the year. Generally, overspray is collected in scrubber and filter systems, and disposed of to landfill.

. Fate

The low water solubility of the notified polymer indicates leaching from landfill sites is not expected. Any incineration of the notified polymer is expected to produce water, and oxides of carbon and nitrogen.

After application, the notified polymer is not expected to be released to the environment until it has been cured into a solid polymer matrix. The resultant matrix structure should limit the hydrolysis or biodegradation potential of the polymer. Any chips and flakes of the cured paint that occur (due to stone chips, accidents, wear and tear, etc) will be inert, diffuse and form part of the soil or sediments.

Bioaccumulation of the polymer is unlikely due to the high molecular weight of the polymer even before curing. Biological membranes are not permeable to polymers of very large molecular size (3,4).

9. EVALUATION OF TOXICOLOGICAL DATA

Toxicological data are not required for synthetic polymers of low concern according to the Act. However, the following acute oral toxicity study was submitted.

9.1 Acute oral toxicity of EFKA Polymer 401 (5)

Species/strain:	rat/Wistar
Number/sex of animals:	5/sex
Observation period:	14 days
Method of administration:	gavage
Clinical observations:	none
Mortality:	none
Morphological findings:	none
Test method:	according to OECD Guidelines (6)

LD_{50}:	> 2 090 mg/kg
Result:	the notified polymer exhibited low acute oral toxicity in rats

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

No ecotoxicological data were provided which is acceptable for polymers of low concern with a NAMW greater than 1 000 according to the Act.

10. ASSESSMENT OF ENVIRONMENTAL HAZARD

Disposal of the notified polymer to landfill is unlikely to present a hazard to the environment. Up to 68% of the polymer may be sent to landfill as waste resulting from formulation losses, overspray through application and residues in containers. Any disposal of material collected in filter and scrubber systems, and any surface on which the notified polymer has cured will be in a solid matrix and is not expected to biodegrade or leach.

With the exception of accidental spillage, losses to the aquatic system are expected to be minimal. In the event of release to sewer, the polymer is likely to become immobile through association with sludge in the sewage treatment plant.

The low environmental exposure of the polymer as a result of the proposed use, together with its expected low environmental toxicity, indicates that the overall environmental hazard should be negligible.

11. ASSESSMENT OF OCCUPATIONAL AND PUBLIC HEALTH AND SAFETY EFFECTS

EFKA Polymer 401 has been notified as a synthetic polymer of low concern under section 23 for the purposes of section 24A of the Act. The polymer meets the criteria for a synthetic polymer of low concern specified in regulation 4A of the Act and can, therefore, be considered to be of low hazard to human health. This conclusion is supported by the finding that the notified polymer exhibited low acute oral toxicity in rats.

Exposure during transport and handling is only expected to occur in the rare event of an accident.

During paint production the solvent solution containing the notified polymer is pumped into the mill base following opening of the container. Dermal exposure at this point is possible while connecting and disconnecting lines. Ocular exposure is possible but less likely. Paints are typically mixed in a sealed system with

solvent fumes removed via local exhaust ventilation. Following mixing, steel containers of various sizes are typically filled and sealed automatically again with fume extraction systems in place. Exposure during these operations is unlikely.

The polymer solution used in paint manufacture contains n-butyl acetate at up to 40%. This is a flammable liquid which is mildly toxic by inhalation and ingestion, an experimental teratogen and a skin and severe eye irritant. High concentrations are irritating to eyes and respiratory tract and cause narcosis (7). The Worksafe exposure standard is 150 ppm (TWA) or 200 ppm (STEL) (8). The polymer solution also contains less than 10% secondary butanol, a flammable solvent. Secondary butanol is harmful by inhalation at concentrations above 25% (9) in a formulation and is an eye irritant (7). The Worksafe exposure standard is 100 ppm (TWA) (8). There may be a risk of adverse health effects from fume inhalation or splashing into the eye during pumping of the polymer solution into the mill base. Thus eye protection as described below and good general and local exhaust ventilation should be employed during these operations. According the the MSDS the polymer solution may also cause skin irritation and gloves as described below should be worn.

The paints produced using the notified polymer will primarily be used in spray painting applications. Most spray painting is conducted in ventilated spray booths to prevent solvent exposure so that exposure to the polymer is expected to be correspondingly low. Some exposure may be expected during maintenance and cleaning operations. The nature of the solvents in the paints are unknown and the MSDS for the paint(s) should be consulted prior to use.

Although exposure to the notified polymer is likely to be intermittent, prolonged contact could occur if protective clothing, gloves and eye protection are not worn due to the adherent viscous nature of the formulations. Nevertheless, the risk of adverse health effects, even in the worst case is likely to be minimal.

The risk of adverse public health effects is expected to be negligible given the low intrinsic hazard of the polymer and limited opportunity for exposure.

12. RECOMMENDATIONS

To minimise occupational exposure to notified polymer the following guidelines and precautions should be observed:

- Spillage of the notified chemical should be avoided, spillages should be cleaned up promptly which should then be put into containers for disposal or recycling;
- Good personal hygiene should be practised to minimise the potential for ingestion;
- A copy of the relevant MSDS should be easily accessible to employees.

During paint manufacture, users of the imported polymer solution should be aware of the presence of the flammable solvents, secondary butanol and n-butyl acetate,

and take appropriate precautions. Additionally, good general and local exhaust ventilation should be used to maintain levels of secondary butanol in the atmosphere below the Worksafe exposure standard of 100 ppm (8) and levels of n-butyl acetate below the Worksafe exposure standard of 150 ppm (8); eye protection should be selected and fitted in accordance with Australian Standard 1336 (10) and meet the requirements of Australian/ New Zealand Standard 1337 (11); gloves conforming to Australian Standard 2161 (12) should also be worn.

13. MATERIAL SAFETY DATA SHEET

The MSDS for the polymer solution to be imported was provided in accordance with the *National Code of Practice for the Preparation of Material Safety Data Sheets* (13).

This MSDS was provided by the notifier 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 notifer.

14. 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.

15. REFERENCES

1. Randall, P.M. 1992, 'Pollution Prevention Methods in the Surface Coating Industry', *Journal of Hazardous Materials*, vol. 29, 275-292.

2. Oil and Colour Chemists' Association, Australia 1974, *Surface Coatings, Volume 2 - Paints and Their Applications*, TAFE Educational Books, Kensington, NSW.

3. Anliker, R., Moser, P. & Poppinger, D. 1988, 'Bioaccumulation of dyestuffs and organic pigments in fish. Relationships to hydrophobicity and steric factors', *Chemosphere*, vol. 17, no. 8, pp. 1631-1644.

4. Gobas, F.A.P.C., Opperhuizen, A. & Hutzinger, O. 1986, 'Bioconcentration of hydrophobic chemicals in fish: relationship with membrane permeation', *Environmental Toxicology and Chemistry*, vol. 5, pp. 637-646.

5. Sterner, W. & Chibanguza, G. 1989, data on file, EFKA Chemicals b.v., Hillegom, The Netherlands.

6. Organisation for Economic Co-operation and Development 1995-1996, *OECD Guidelines for the Testing of Chemicals on CD-Rom*, OECD, Paris.

7. *Dangerous Properties of Industrial Materials*, 9th Ed., Sax N. I. and Lewis R. J. Sr Eds, Van Nostrand Reinhold, 1996.

8. National Occupational Health and Safety Commission, 1995, *Exposure Standards for Atmospheric Contaminants in the Occupational Environment*, Australian Government Publishing Service Publ., Canberra.

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

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

11. 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, New Zealand.

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

13. National Occupational Health and Safety Commission 1994, *National Code of Practice for the Preparation of Material Safety Data Sheets [NOHSC:2011(1994)]*, AGPS, Canberra.