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**NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION
AND ASSESSMENT SCHEME**

FULL PUBLIC REPORT

POLYMER IN RELUGAN AME

This Assessment has been compiled in accordance with the provisions of *the Industrial Chemicals (Notification and Assessment) Act 1989*, and Regulations. This legislation is an Act of the Commonwealth of Australia. The National Industrial Chemicals Notification and Assessment Scheme (NICNAS) is administered by Worksafe Australia which also conducts the occupational health & safety assessment. The assessment of environmental hazard is conducted by the Department of the Environment, Sport, and Territories and the assessment of public health is conducted by the Department of Health and Family Services.

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Director
Chemicals Notification and Assessment

FULL PUBLIC REPORT
POLYMER IN RELUGAN AME

1. APPLICANT

BASF Australia Ltd of 500 Princes Hwy, Noble Park, Victoria 3174 has submitted a limited notification statement in support of their application for an assessment certificate for Polymer in Relugan AME.

2. IDENTITY OF THE CHEMICAL

Polymer in Relugan AME 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, spectral data, identity of impurities and exact import volume have been exempted from publication in the Full Public Report and the Summary Report

Trade names: Relugan AME (this is a 31% aqueous dispersion of the notified polymer)

Number-average molecular weight: 14000

Weight-average molecular weight: 110000

Maximum percentage of low molecular weight species (molecular weight < 1000): 2.6%

Method of detection and determination:

Infrared spectroscopy

3. PHYSICAL AND CHEMICAL PROPERTIES

The notified polymer will be imported as a component of an aqueous dispersion and is never isolated. The properties listed below are those of either the dispersion or the notified polymer as indicated.

Appearance at 20°C and 101.3 kPa: light brown liquid (dispersion)

Melting Point/Boiling Point: > 200°C (polymer); approx. 100°C (b.p. of dispersion)

Density: 1120 kg/m³ at 20°C (dispersion)

Vapour Pressure: 2.3 kPa at 20°C (dispersion)

Water Solubility: miscible in all proportions at 20°C (polymer)

Partition Co-efficient (n-octanol/water) log P_{ow}: < -2 at 25°C (polymer)

Adsorption/Desorption:	DOC adsorption 24% after 6 days (polymer)
Autoignition Temperature:	> 200°C (polymer)
Decomposition Products:	toxic fumes containing products of combustion such as carbon monoxide and carbon dioxide together with traces of oxides of nitrogen

Comments on physico-chemical properties:

Solubility of the polymer has been determined by adding it freeze dried in small portions (ca 50 mg) at a time, to small quantities of distilled, deionised water and mixing. A clear solution was always obtained. When 100 mg portions of the notified polymer were added, clumping occurred at first but when mass of water is about half the mass of the polymer, treatment in the ultrasonic bath for about 3 h gave a clear solution. Based on these observations it has been concluded that the polymer is miscible with water at all proportions.

On the basis of the hydrolysis behaviour of similar acrylic amides the notified polymer is unlikely to undergo hydrolytic decomposition in the environmental pH range. Adsorption potential of the polymer was measured by incubating the polymer solution with activated sludge from a biological waste water treatment plant. There was 40% adsorption 3 hours after mixing with the sludge but this decreased to 24% after 6 days of incubation, with an average adsorption of about 35% between 1-3 days. The high miscibility of the polymer with water, the low log P_{ow} , and low adsorptivity to soil/sediment indicate that the polymer will bind poorly to soil and organic matter and be mobile in the soil.

As a sodium salt of a carboxylic acid, the polymer is expected to have a typical dissociation constant.

4. PURITY OF THE CHEMICAL

Degree of purity: 99.8%

Toxic or hazardous impurities: None

Non-hazardous impurities (> 1% by weight): None

Maximum content of residual monomers: 0.1%

Additives/Adjuvants: None

5. INDUSTRIAL USE, FORMULATION AND IMPORT VOLUME

The notified polymer is intended to be used as a retanning agent for leather and as a dyeing auxilliary.

The notified polymer will be imported into Australia as a 31% aqueous dispersion in 120 L plastic drums at a rate of less than 10 tonnes per year for the first five years.

6. OCCUPATIONAL EXPOSURE

The notified polymer will be transported by road to the notifier's warehouse in a container. As required the individual drums will be transported to a single customer. Exposure is unlikely except in the event of an accident.

When the drums are received at the tanners the polymer dispersion will be transferred to a weighing vessel by pump or gravity feed. Water is added to dilute the formulation 1:5 after which the dilute solution is pumped via a closed system into a rotating drum containing the leather. The weighing vessel is rinsed with water and the liquor is also pumped into the leather-containing drum. The rotating mill remains closed during the treatment process.

After mixing is complete a wringer operator transfers the wet skins from the rotating drum to the wringer. A dryer operator then transfers the wrung skins to a conveyor for drying which is conducted at 50-60°C.

Three operators are expected to be involved in retanning or dyeing and would handle the chemical for a maximum of 12 times per 24 hours for 2-3 minutes each time. Exposure is possible through splashing during weighing out, during transfer of the wet skins from the rotating drum to the wringer and during transfer of the wrung skins to the dryer.

7. PUBLIC EXPOSURE

The notified polymer will be supplied only to industrial leather processors and public exposure during processing is expected to be negligible. Minor public exposure to the notified polymer may result from accidental spillage during transport and storage. Disposal of processing wastes and the polymer after accidental spillage is expected to be carried out in accordance with existing regulations which will minimise public exposure. The polymer will be immobilised to the treated leather and hence this will be an insignificant exposure pathway.

8. ENVIRONMENTAL EXPOSURE

. Release

There will be no release to the environment during transport and storage except in a major accident.

At the leather tanners mixing of skins with the polymer solution will occur. The notifier claims (with no supporting data) that 95% of the polymer is taken up by the leather during the mixing. After the mixing process the skins are transferred from the rotating drum to the wringer. The wrung skins are then transferred to a conveyor that passes through an oven for drying. Minor spills and drips during these processes are contained and diverted to the waste water treatment plant.

. Fate

The fate of the bulk of the polymer (95%) will be tied to the fate of the finished leather. Leather that has been treated with the polymer is expected to be used in making leather products. Most of the treated leather will be landfilled, either as trimmings during the making of leather articles or when the goods are disposed of.

The waste solution from the mixing vessels, containing 5% of the polymer, is

diverted to the company's waste water treatment plant. Based on the adsorption data provided, only about 25-35% of the polymer arriving in the waste water treatment plant is likely to be adsorbed by the sludge after 1-6 days. The remaining 65-75%, equivalent to about 3-4% of the total import, is released to the aquatic environment through the sewer.

Waste containing the polymer, generated during trimming and buffing of leather, and as sludge from waste water treatment is expected to be disposed of through landfill or incineration. Some of the polymer disposed to landfill in an uncured form may dissolve in the soil solution and show some mobility in the environment. The polymer will eventually undergo slow microbial degradation in the soil.

9. EVALUATION OF TOXICOLOGICAL DATA

Toxicological data are not required for polymers of number-average molecular weight (NAMW) > 1000 according to the *Industrial Chemicals (Notification and Assessment) Act, 1989* and no data were submitted for the notified polymer.

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

According to the Act, environmental effects testing is not required for polymers with NAMW>1000 as such polymers are too large to cross biological membranes.

Water soluble polymers, even with NAMW > 1000, may cause some toxicity by affecting the outer membrane of aquatic organisms or their near environment, for example by over chelation of nutrient elements needed by algae for growth (1). Polycarboxylic, water soluble acrylics such as the present one in particular have the potential to produce the latter effect. However when such polymers are released to the environment as Na or K salts as in the present case, the hardness of the receiving waters is thought to mitigate the toxicity considerably (1). In addition the highest toxicity occurs when carboxylate functions are adjacent, which is not the case with the present polymer.

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

Most of the polymer will be disposed of to landfill with the leather to which it is cured. There will be no environmental hazard from such cured polymer. Some polymer will however arrive in landfill in an uncured form. This results from waste during the tanning/dyeing process and that adsorbed to sludge in the waste water treatment plant. This uncured polymer disposed to landfill may tend to be mobile due to the high miscibility of the polymer with water. However this will not present a major hazard as the amount of polymer disposed in this way will be small. Incineration of the polymer will produce water and oxides of carbon and nitrogen.

Assuming the notifier's estimate of only 5% of the polymer to be left in the retanning/dyeing solution, without being adsorbed to the leather, the total discharge to the waste water treatment from the annual import would be < 500 kg. The company data indicate that, on average, only about 25-35% of this would be adsorbed by sewage sludge. The remaining 65-75 would be released to the environment via the effluent treatment.

The total volume of liquid waste discharge by the company is estimated at 62.05

million litres per year. This gives a concentration of < 5 mg/L of the polymer in the waste water leaving the company's treatment plant to the sewer, assuming an even use throughout the year. Further dilution to the ppb range would occur once discharged to the sewer.

Overall, there is potential for the polymer to enter the aquatic habitat due to its high water solubility and poor elimination at the waste water treatment plant. The large molecular weight of the polymer however will prevent it being absorbed through biological membranes. Therefore the environmental hazard of the polymer can be rated as low.

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

The notified polymer has a NAMW greater than 1000 and should not be able to be absorbed across biological membranes to cause systemic effects. The levels of low molecular weight species (2.6%) and residual monomers (maximum of 0.1%) would not render the polymer hazardous according to the criteria of Worksafe Australia (2).

There is potential for occupational exposure during retanning or dyeing operations. This could occur during addition of the imported polymer dispersion to a weighing vessel or during transfer of treated leather from the treatment vessel to the wringer and from there to the drying oven. Exposure during weighing out can occur through splashes and drips but is not likely to be frequent. Exposure during transfer operations is possible but should be low given the short duration of the tasks (2-3 minutes) and the low concentration (maximum 6%) of polymer in the liquor.

The risk of adverse occupational health effects from exposure to the notified polymer is expected to be low given the low hazard and likely low exposure during normal conditions of transport, storage, use, maintenance of equipment and disposal. Similarly, the risk of adverse public health effects is expected to be minimal under the same circumstances. In the infrequent event of a large accidental spill there should be minimal risk to the health and safety of those exposed to the notified polymer as a result or those involved in the clean up.

13. RECOMMENDATIONS

To minimise occupational exposure to Polymer in Relugan AME the following guidelines and precautions should be observed:

- . safe work practices, as should be followed when handling any chemical formulation, should be adhered to - these include:
 - minimising spills and splashes;
 - practising good personal hygiene; and
 - practising good housekeeping and maintenance including bunding of large spills which should be cleaned up promptly with absorbents and put into containers for disposal.
- . it is expected that, in the industrial environment, protective clothing and protective footwear may be worn as a matter of course. If so, clothing should conform to Australian Standard (AS) 2919 (3) and footwear to Australian/New Zealand Standard (AS/NZS) 2210 (4); in addition, it may be advisable when handling chemical formulations containing the notified polymer to wear

chemical-type goggles (selected and fitted according to AS 1336 (5) and meeting the requirements of AS/NZS 1337 (6)) and impermeable gloves conforming to AS 2161 (7) to protect against unforeseen circumstances;

a copy of the relevant Material Safety Data Sheets (MSDS) should be easily accessible to employees.

14. MATERIAL SAFETY DATA SHEET

The MSDS for Relugan AME containing the notified polymer was provided accordance with Worksafe Australia's *National Code of Practice for the Preparation of Material Safety Data Sheets* (8).

This MSDS was provided by BASF Australia Ltd as part of their notification statement. The accuracy of this information remains the responsibility of BASF Australia Ltd.

15. REQUIREMENTS FOR SECONDARY NOTIFICATION

Under the *Industrial Chemicals (Notification and Assessment) Act 1989*, secondary notification of Polymer in Relugan AME 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. Nabholz J V, Miller P and Zeeman M 1993, 'Environmental Risk Assessment of New Substances under the Toxic Substances Control Act Section Five. In W G Landis, J S Hughes and M A Lewis (Eds), *Environmental Toxicology and Risk Assessment*, American Society for Testing and Materials, ASTM STP 1179, Philadelphia, pp 40-55.
2. National Occupational Health and Safety Commission 1994, *Approved Criteria for Classifying Hazardous Substances [NOHSC:1008(1994)]*, Australia Government Publishing Service, Canberra, Australia.
3. Standards Australia, 1987, *Australian Standard 2919 - 1987 Industrial Clothing*, Standards Association of Australia Publ., Sydney, Australia.
4. Standards Australia, Standards New Zealand 1994, *Australian/ New Zealand Standard 2210 - 1994 Occupational Protective Footwear, Part 1: Guide to Selection, Care and Use. Part 2: Specifications*, Standards Association of Australia Publ., Sydney, Australia, Standards Association of New Zealand Publ. Wellington, New Zealand.
5. Standards Australia, 1994, *Australian Standard 1336-1994, Recommended Practices for Eye Protection in the Industrial Environment*, Standards Association of Australia Publ., Sydney, Australia.
6. Standards Australia, Standards New Zealand 1992, *Australian/ New Zealand Standard 1337-1992, Eye Protectors for Industrial Applications*, Standards Association of Australia Publ., Sydney, Australia, Standards Association of New Zealand Publ. Wellington, New Zealand.

7. Standards Australia 1978, *Australian Standard 2161-1978, Industrial Safety Gloves and Mittens (excluding Electrical and Medical Gloves)*, Standards Association of Australia Publ., Sydney, Australia.
8. National Occupational Health and Safety Commission 1994, *National Code of Practice for the Preparation of Material Safety Data Sheets [NOHSC:2011(1994)]*, AGPS, Canberra, Australia.