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NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

POLYACRYLATE 2294

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, Housing, Local Government and Community Services.

For the purposes of subsection 78(1) of the Act, copies of this full public report may be inspected by the public at the Library, Worksafe Australia, 92-94 Parramatta Road, Camperdown NSW 2050, between the hours of 10.00 a.m. and 12.00 noon and 2.00 p.m. and 4.00 p.m. each week day except on public holidays.

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Director
Chemicals Notification and Assessment

FULL PUBLIC REPORT

POLYACRYLATE 2294

1. APPLICANT

BASF Australia Ltd, 500 Princes Highway, Noble Park, Victoria 3174

2. IDENTITY OF THE CHEMICAL

Based on the nature of the chemical and the data provided, Polyacrylate 2294 is considered non-hazardous. Therefore, identity of the chemical, its components, impurities, spectral data and additives have been exempted from poblication in the Full Public Report and the Summary Report.

Trade name: ACRONAL DS 2294 X(Notified polymer as a 50% dispersion in water)

Method of detection and determination:

The polymer can be separated by gel permeation chromatography and identified by infrared spectroscopy.

3. PHYSICAL AND CHEMICAL PROPERTIES

The physical and chemical properties listed below are that of ACRONAL DS 2294 X containing approximately 50% notified polymer in water unless otherwise stated, as the polymer is imported or manufactured in this form and is never isolated.

Appearance at 20°C and 101.3 kPa:	Milky white to off-white liquid
Odour:	Slight aromatic odour
Density:	1070 kg/m^3
Vapour Pressure:	2.3 kPa @ 20°C
Water Solubility:	By analogy with similar polymers, it is not soluble in water. Water insolubility is a functional requirement of the polymer
Partition Co-efficient (n-octanol/water) log P_{OW}:	Not applicable

Hydrolysis as a function of pH:	Not data. As Polyacrylate 2294 is an acrylic polymer, it will not hydrolyse. The ester and nitrile functionalities in the polymer are unlikely to undergo hydrolysis under environmental conditions due to insolubility of the polymer.
Adsorption/Desorption:	Not determined (the polymer would be expected to be immobile in soils, particularly after drying)
Dissociation Constant pKa**:**	Not applicable
Flash Point:	Not applicable
Flammability Limits:	Not applicable
Combustion Products:	Dried polymer will burn with a smoky flame producing carbon monoxide, carbon dioxide, water vapour,trace amounts of oxides of nitrogen and sulphur
Pyrolysis Products:	Not determined
Decomposition Temperature:	Not determined
Decomposition Products:	Not determined
Autoignition Temperature:	Not applicable
Explosive Properties:	Non-explosive
Reactivity:	Non-reactive
Particle size distribution:	Not applicable

· **Comment on Physical/Chemical Properties**

Data for hydrolysis, dissociation constant and adsorption/desorption of the notified polymer were not provided due to the low water solubility and lack of a suitably sensitive analytical procedure. Significant hydrolysis or dissociation is not expected under environmentally relevant conditions.

4. PURITY OF THE CHEMICAL

Degree of purity : > 99%

Residual monomers and other reactants:

. **Chemical name:** 2-Propenoic acid, ethyl ester
Weight percentage: 0.1%

. **Chemical name:** 2-Propenoic acid, methyl ester
Weight percentage: 0.1%

. **Chemical name:** 2-Propenenitrile
Weight percentage: <0.001%

5. INDUSTRIAL USE

The notified polymer as a dispersion is used for: coating and impregnating of fabrics and knits; binding non-woven fabrics; textile lamination; and foam applications. After application to the fabric, the polymer self crosslinks to form a stable and inert coating or a bonding medium. The notified polymer will comprise up to 50% of the dispersion to be imported or manufactured.

6. OCCUPATIONAL EXPOSURE

. Importation

The projected import volume or the manufacture of the notified polymer will be 10 to 100 tonnes per annum in the first two years and 100 to 1000 tonnes per annum in the following three years

Initially the notified polymer as an aqueous dispersion will be shipped in lots of seventy 200 litre (14-15 tonnes) high density polyethylene lined drums or in Intermediate Bulk Containers (IBC) of 1000 kg lots.

In Australia the polymer dispersion will be stored and supplied to numerous customers. Up to 6 workers will be involved in transport, storage and distribution of the polymer dispersion.

. Manufacture

The notified polymer will also be manufactured in Australia as a dispersion in water. The process is an exothermic thermal polymerisation of acrylate monomers. The reaction is carried out in a closed reactor vessel with a condenser fitted to its vent. The non-condensable components consisting mainly of air is vented to atmosphere. After stabilisation the polymer dispersion is transferred through a pipe system to a two stage filtration process involving coarse and fine filtration. The latter stage is carried out under local exhaust ventilation. The filtered dispersion containing the notified polymer is pumped into a bulk storage tank. The dispersion is then pumped (computer control) into:

. 200 litre open head polyethylene lined drums or;

. 1000 litre polyethylene bags fitted to IBC containers,

under local exhaust ventilation and transported by road to processing sites.

Exposure to the notified polymer during manufacture:

- one operator, 8 hours per day during preparation of batches of additives;
- sixteen operators over 4 shift groups, with four operators rostered for 3 x 8 hour shifts per day with one operator rostered off per day over a period of one year at the polymerization reactor;
- two operators, each rostered for 6 x 12 hour shifts on alternate weeks during filtration, especially during:
    - the 30 minute period involving removal and installation of the filter system after 3 reactor batches during `coarse filtration' and;
    - the 40 to 45 minutes period involving the washing of the filter screen during `fine filtration'

per 100 tonne.

- eight operators, in groups of 4 per week alternatively, 12 hours per day over a period of one year during packaging, estimated as:
    - 1.25 to 1.5 hour per operator per 100 tonne during drum filling; and
    - 1.25 to 2.25 hours per operator per 100 tonne during containerising.

. Processing

The polymer dispersion is pumped from a drum or bulk container into a 200 litre mixing vessel where it is compounded with other ingredients. The product containing the notified polymer is pumped into a bath where the non-woven fabric is coated by means of adjustable rollers or skimming blade as the fabric passes through the coating system. The excess compound is removed from the fabric by an exhaust extraction system beneath the fabric belt. The fabric is then dried and cured by passing through curing ovens operated at 120-130°C.

6 to 9 operators, 3 (one feeder, one drier and one finishing operator) per 8 hour shift, in 2 to 3 shifts per day, will be exposed to the notified polymer containing the product during processing. The estimated duration of exposure for the:

- feeder operator is 480 hours;
- drier operator is 980 hours; and
- finishing operator is negligible

per year.

7. PUBLIC EXPOSURE

The polymer coated fabrics will be available on the commercial and domestic markets for use principally as window furnishing materials, as `block out' linings on window curtains. However, due to the negligible volatility and cross linking processes that occur during the drying and curing of treated fabrics, public exposure to the polymer is expected to be minimal.

8. ENVIRONMENTAL EXPOSURE

. Release

It has been indicated by the notifier that a maximum of 120 kg of gelatinous waste per 100 tonnes of the polymer dispersion is generated during manufacture and will be disposed of by landfill. This gelatinous waste comprises solids from the filtration of the polymer dispersion, residue trapped in the manufacturing plant's waste water treatment system and from a monthly clean out of the reactor. The gelatinous waste is air dried before disposal by landfill. The reactor is washed out with water and the wash water treated in the plant's waste water treatment system, together with waste water from other operations. It is estimated by the notifier that 2-3 kg of polymer is trapped by the plant's waste water treatment system from these washings, with the waste water discharged as trade waste to the sewer. There was no indication given of the amount of polymer discharged to the sewer, however, it is likely that most of the polymer will be trapped in the solids by the manufacture's waste water treatment plant and disposed of by landfill.

The notifier states that there is minimal waste from application, estimated at 0.5% of that used. The high efficiency is obtained by applying the polymer to the fabric using rollers. It is expected that there will be two customers for the polymer who dispose of uncured polymer as trade waste to the sewer and cured polymer, e.g. coated fabric trim, by landfill. The notified polymer is only intended for use on fabrics. Release of the notified polymer to the environment, resulting from this application, is only expected in its cured form and will ultimately be consigned to landfill bound to the disposed of window furnishing fabrics.

. Fate

The polymer will be used to coat fabrics and should have limited environmental exposure. Most of the notified polymer is not expected to be released to the environment until it has been fully cured onto the fabric as a solid polymer matrix. The resultant matrix structure should limit the hydrolysis and biodegradation of the polymer. The ultimate fate of the polymer coated fabric is likely to be landfill. Waste generated during manufacture will also be consigned to landfill.

As Polyacrylate 2294 is a polymer with low water solubility, leaching from landfill sites is not expected. Bioaccumulation of the polymer is unlikely due to the high molecular weight of the polymer even before curing. Incineration of the notified substance is expected to produce water, oxides of carbon, and trace amounts of oxides of nitrogen and sulphur.

9. EVALUATION OF TOXICOLOGICAL DATA

No toxicology data have been provided for the notified polymer which is acceptable under the Act for a polymer with number average molecular weight >1000.

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

No aquatic toxicity data were provided, but none are required according to the Act, since the notified polymer has a number average molecular weight (NAMW) > 1000.

Due to its high NAMW the polymer is not expected to cross biological membranes.

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

The polymer is unlikely to present a hazard to the environment at any stage of its manufacture or use. Of the original quantity of polymer emulsion imported/manufactured it is expected that >99% will not be released from the processing/application sites until it has been cured. The ultimate fate of all cured polymer is not known but most likely the majority will be disposed of by landfill or incineration. Leaching of the cured polymer from landfill is not expected due to the chemical and physical bonding which occurs during the surface coating process. Incineration will only produce water, and oxides of carbon and trace amounts of oxides of nitrogen and sulphur.

Uncured polymer wastes are expected to be a maximum of 120 kg of gelatinous solids per 100 tonnes of polymer dispersion produced. The water used in cleaning the reactor is treated in the plant's waste water treatment system which the notifier states would trap most of the polymer. The gelatinous solids generated during manufacture will be collected and treated by air drying before being disposal of by landfill. Uncured polymer that is disposed of by landfill should not degrade or leach due to its insolubility in water.

Assuming that each customer uses half of the polymer, the amount of polymer disposed of as waste is between 0.7 and 7 kg per day, as cured polymer disposed of at landfill and as uncured polymer disposed of as trade waste to the sewer. One customer discharges trade waste to a metropolitan waste water treatment plant, with a dry weather flow of 455 ML per day, and the other discharges to a country trade waste water treatment plant, with an average flow of 4 ML per day. Assuming none of the polymer is removed in the treatment plants and using the worst case, i.e. 7 kg per day, the concentration discharged is 15 ppb (metropolitan) and 1.75 ppm (country). At the country waste water treatment plant waste is treated to a tertiary level and is decolourised. These processes should trap most of the polymer in the solids and reduce the estimated concentration of the polymer discharged at the country location to below 90 ppb (assuming >95% of polymer removed). Further, as it is stated by the notifier that the amount of waste polymer generated will normally be in the lower range, the concentration of the polymer should be lower by almost an order of magnitude at both metropolitan and country, i.e. approximately 1.5 ppb and 9 ppb respectively. As the polymer would be further diluted in the receiving waters and should not bioaccumulate, there is unlikely to be any environmental effects .

Any spills or accidents that are cleaned up according to the MSDS sheets should not be an environmental hazard.

The low level environmental exposure of the polymer as a result of normal use, together with its expected lack of biological activity, indicate that the overall environmental hazard should be negligible.

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

There is no information on the effects of the notified polymer on human health. It is a high molecular weight polymer with a number average molecular weight > 1000. Therefore, it is unlikely to cross biological membranes and is expected to present a low health hazard. Although no toxicity data were available for the notified polymer the Material Safety Data Sheet (MSDS) for the product (containing approximately 50% of the notified polymer) states that it is a slight skin and an eye irritant which could be attributed to the dispersion rather than the notified polymer.

The notified polymer is non flammable, non explosive and stable. Under normal use conditions it will not pose a combustible, explosive, or a reactive hazard as a component in ACRONAL DS 2294 X, in the processed dispersion or in the impregnated fabric.

The most likely routes of exposure are skin and eye contact during manufacture and processing of the polymer dispersion. Under normal use conditions, and correct handling procedure, the potential for occupational exposure to the notified polymer appears to be low and is not expected to pose a significant health and a safety risk to humans.

Due to the nature and process control of the manufacturing process any leakage of acrylic monomers due to elevated temperatures is considered minimal.

While public contact with materials coated with the notified polymer may be extensive, public exposure to the notified polymer is expected to be negligible. The notifier has indicated that the polymer will be sold only to industrial processors for the treatment of fabrics. After application to the fabric, the high molecular weight polymer self crosslinks to form a stable and inert coating or bonding medium.

In the case of accidental spillage during transport, the public may be exposed to Acronal DS 2294X. This is minimised by the recommended practices for storage and transportation. Emergency procedures for the containment and clean up of accidental spills are available and should be followed.

13. RECOMMENDATIONS

To minimise occupational exposure to the notified polymer in ACRONAL DS 2294 X the following guide lines and precautions should be observed:

. if engineering controls and work practices are insufficient to reduce exposure to a safe level, the following personal protective equipment which comply with Australian Standards should be worn. Safety glasses (AS 1336-1982 (1), AS 1337-1984 (2)), protective gloves (AS 2161-1978 (3)) and overalls;

. good work practices should be implemented to avoid spills;

. good personal hygiene should be observed;

. clean spills promptly; and

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

14. MATERIAL SAFETY DATA SHEET

The Material Safety Data Sheet (MSDS) for ACRONAL DS 2294 X was provided in Worksafe Australia format (4). This MSDS was provided by BASF Australia Ltd as part of their notification statement. It is reproduced here as a matter of public record. 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* (the Act), secondary notification of Polyacrylate 2294 in Acronal DS 2294 X 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. Australian Standard 1336-1982, "Recommended Practices for Eye Protection in the Industrial Environment", Standards Association of Australia Publ., Sydney, 1982

2. Australian Standard 1337-1984, "Eye Protectors for Industrial Applications", Standards Association of Australia Publ., Sydney, 1990.

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

4. National Occupational Health and Safety Commission, *National Code of Practice for the Completion of a Material Safety Data Sheet*, [NOHSC:2011(1994)], AGPS, Canberra, March 1994.