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NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

Polymer in Dispercoll® U 54

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Director
Chemicals Notification and Assessment

FULL PUBLIC REPORT

Polymer in Dispercoll® U 54

1. APPLICANT

Bayer Australia Ltd of 875 Pacific Highway PYMBLE NSW 2073 has submitted a limited notification statement in support of their application for an assessment certificate for Polymer in Dispercoll® U 54.

2. IDENTITY OF THE CHEMICAL

Polymer in Dispercoll® U 54 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.

Other Names:	polyester polyurethane
Trade Name:	Dispercoll® U 54
Structural Formula:	not given as it is a complex polymer of indefinite structure.
Number-Average Molecular Weight (NAMW):	> 10 000
Weight-Average Molecular Weight:	> 10 000
Maximum Percentage of Low Molecular Weight Species	
Molecular Weight < 500:	< 1%
Molecular Weight < 1 000:	< 1%

3. Physico-Chemical Properties

Appearance at 20°C and 101.3 kPa:	milky white liquid (50% aqueous dispersion)
Boiling Point:	100°C at 1 013 kPa (water)
Density:	1.07 $g.cm^{-3}$ at 23 °C
Vapour Pressure:	13 kPa at 50°C

Water Solubility:	miscible
Partition Co-efficient (n-octanol/water):	not determined
Hydrolysis as a Function of pH:	not determined
Adsorption/Desorption:	not determined
Dissociation Constant:	not determined
Flash Point:	not determined
Flammability Limits:	not determined
Autoignition Temperature:	not determined
Explosive Properties:	none
Reactivity/Stability:	combustible and noxious fumes may be formed during thermal decomposition

Comments on Physico-Chemical Properties

Mixed polyester polyurethanes with molecular weights greater than 1 000 $g.mol^{-1}$ are generally not water soluble. The notifier claims that the polymer emulsion is miscible with water. The presence of largely hydrophobic units except for a small amount of sodium salt functionality is noted. The notifier did not supply any data for hydrolysis, partition coefficient, adsorption/desorption and dissociation constant. It is claimed that they are not applicable as the polymer has a water solubility less than 1 ppb. Hydrolysis is theoretically possible due to the hydrolysable polyester groups. However, it is not expected in the environmental pH range (4-9) due to the insolubility of the polymer. The polymer contains some ionisable functionalities, however dissociation would be difficult to measure due to the insolubility of the polymer. The notified polymer is expected to partition to, or be associated with, soil and sediment.

4. PURITY OF THE CHEMICAL

Degree of Purity:	100%
Toxic or Hazardous Impurities:	none
Non-hazardous Impurities (> 1% by weight):	none
Maximum Content of Residual Monomers:	negligible

Additives/Adjuvants: none

5. USE, VOLUME AND FORMULATION

The notified polymer will be imported into Australia as a 50% aqueous dispersion.

Import volumes for the notified polymer are as follows:

Year	*Import Volume (tonnes)*
1	25
2	30
3	35
4	40
5	45

The notified polymer will generally be used in the Adhesives Industry, e.g. footwear, furniture and automotive industries. Dispercoll® U 54 will be blended with other customers' ingredients and/or products resulting in an industrial grade manufacturing adhesive. The notified polymer may be incorporated at concentrations greater than 85%.

6. OCCUPATIONAL EXPOSURE

Process workers receive the notified polymer as a dispersed aqueous solution. The solution containing the notified polymer is pumped into the bottom of the mixing vessel, which is normally closed. After mixing with other materials, the product containing the notified polymer is pumped from the same connection on the vessel through a filter into open top 10 and 20 litre containers or closed head 200 litre drums. The pumping procedure is a manually controlled process. Local exhaust ventilation is provided to remove any vapour build-ups, however considering the moderate vapour pressure of the notified polymer, and the formulation process, inhalation and dermal exposure is likely to be minimal. The likelihood of dermal exposure during cleaning is minimal as the product is flushed through the pump, filter, lines and vessel in a recirculation process before batches are finished.

Worker exposure to the notified chemical may also occur through application of adhesives. Manual application will certainly lead to greater likelihood of exposure to the notified polymer, albeit as an ingredient of the adhesive.

7. PUBLIC EXPOSURE

Although the public may come into contact with Polymer in Dispercoll® U 54, exposure will be negligible. Polymer in Dispercoll® U 54 will be entrapped between

layers of material to which it adheres. The high molecular weight and absence of low molecular weight impurities will limit migration of the notified chemical to surfaces with which the public may come into contact.

In the event of a transport accident, polymer in Dispercoll® U 54 can be adsorbed by inert material such as sand or vermiculite and recovered for disposal. Polymer in Dispercoll® U 54 is water dispersible, residual material may be expected to enter drains and run-offs.

8. ENVIRONMENTAL EXPOSURE

Release

The adhesive formulation process is performed on a batch basis. Possible routes of environmental exposure would be limited to the clean-up of equipment, e.g. imported intermediate bulk containers, mixing vessels and related apparatus. These residues will be washed out with a water/surfactant mix, which will then be transferred to the customer's effluent treatment plant.

The notifier claims that the polymer product is only used directly between substrates that have to be adhered. They further claim that environmental release of the polymer product through ambient air, indoor air, drinking water, recreational water or air is minimal and as such are not able to specify the quantity, concentration and media of release for each situation of use.

It is envisaged that the adhesive product will generally be used in a semi-automatic process where the adhesive is applied using a controlled unit. This process is likely to result in a relatively small volume of losses. However, some manufacturers within the industries stipulated may have workers applying solvent adhesives by brush. If the new product was used in this process expected losses arising would be greater, i.e. due to splashes and drips, but would be localised with any spills, etc. will be cleaned up according to the Material Safety Data Sheet (MSDS), *ie* treated with an absorbent material and then shovelled into disposal drums. The notifier has claimed that residues of polymer adhesive should be minimal when the containers are disposed of to landfill.

The major source of environmental release of the wet polymer is in the unlikely event of an accident during transport and/or handling. Spilt latex should be taken up with an absorbent material. Latex residue may also be precipitated with sodium chloride to remove the polymer coagulate. The notifier claims that the polymer product should not be discharged to sewer as there is a risk that blockage may occur due to polymer deposits.

Fate

The vast majority of notified polymer will be blended into industrial grade manufacturing adhesives. The fate of the polymer adhesive is tied to the fate of the article to which it is applied, e.g. footwear, automotive trims, material off-cuts, etc. Environmental exposure of articles containing the polymer product through leaching in landfill is not expected due to its insolubility. Once the adhesive is dried, the

notified polymer is permanently entrapped by the curing/hardening process, and becomes inert. The resultant matrix structure should limit the hydrolysis or biodegradation potential of the polymer. Biological membranes are not permeable to polymers of very large molecular size and therefore bioaccumulation of the notified polymer, even before curing, is not expected (1, 2). Should small quantities of the polymer product be disposed of to sewer, it should partition to the sludge and be trapped in the solids at the sewage treatment works. The solids are disposed of by landfill or incineration. Incineration products will include water, oxides of carbon, nitrogen and sulphur, and a small amount of sodium salts in the ash.

9. EVALUATION OF TOXICOLOGICAL DATA

Toxicological data are not required for polymers of NAMW > 1000 according to the Act. Hence no data were submitted for the polymer. The absence of low molecular weight impurities, monomers, and solvents other than water suggests a low irritancy potential for this compound.

The notifier's MSDS includes toxicological data obtained from a similar product, stating that the oral LD_{50} for a rat is above 2 000 $mg.kg^{-1}$. Hence, the notified polymer is likely to have a low oral toxicity. Similarly, on the basis of analogue data supplied on the MSDS, the notified polymer is not expected to be a skin or eye irritant.

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

No ecotoxicology data for the notified polymer were provided, which is acceptable for polymers of NAMW greater than 1 000 according to the Act. However, the MSDS quotes ecotoxicity test results for fish and bacteria of a similar product. It is agreed that the analogue product is sufficiently similar for a comparison of ecotoxicity to be made.

Test	Species	Results (Nominal)
Acute Toxicity	Zebra fish (*Brachydanio rerio*)	96 hour LC_0 = 750 $mg.L^{-1}$
Acute toxicity	Golden Orfe (*Leuciscus idus*)	48 hour LC_0 = 1 000 $mg.L^{-1}$
Respiration Inhibition	Activated sludge microorganism (*PS Fluorescans*)	EC_{50} > 30 000 $mg.L^{-1}$

Full ecotoxicity test reports for the "similar product" were not provided.

The ecotoxicity data suggest that the notified polymer will be practically non-toxic to fish and bacteria up to the level of its solubility, ie the notified polymer is only miscible with water (see comments on physico-chemical properties).

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

The main environmental exposure to the notified polymer could occur when disposal of the articles containing the adhesive occurs. The final destination is likely to be landfill, where the polymer can be expected to persist but remain immobile in the hardened form.

Losses during application of the adhesive are difficult to determine and will vary depending on the method of application. However, these losses are expected to be localised within the manufacturing plant. Any spillages will be cleaned up with an absorbent material that is then sent to landfill. Any wet product spilt during use that is not cleaned up will dry to a hardened form and also sent to landfill.

Larger accidental spillages of the polymer should result in negligible hazard as it can easily be cleaned up with an adsorbent material and sent to landfill. Minor spills to waterways will disperse to a dilute concentration, eventually adsorbing to sediment. The ecotoxicity data suggest that the notified polymer will be practically non-toxic to fish and other aquatic organisms up to the limit of its solubility. The low environmental exposure of the notified polymer as a result of the proposed use indicates that the overall environmental hazard should be negligible.

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

The notified chemical is a high molecular weight polymer (NAMW greater than 1 000), therefore it it is unlikely to pass through biological membranes and cause systemic effects. The amounts of polymer with NAMW less than 1 000 and residual monomer concentrations are insignificant. Therefore the polymer is unlikely to pose any health risk. Acute effects such as skin an eye irritation are not expected to occur based on the toxicity profiles of aqueous emulsions that are similar to the notified polymer.

Worker exposure during formulation of adhesives containing the notified polymer is likely to be minimal. It is envisaged that potential for worker exposure would be greatest during unpackaging of the notified polymer and repackaging as a formulated product. However, the notifier states that this is facilitated through the use of pumps, considerably reducing the already minimal risks. The notifier cannot state with certainty the number of industries that will use adhesives containing the notified polymer. It is possible that some applications will occur manually, thus increasing the potential for worker exposure. However, given the expected low toxicity of the polymer, the associated risk is likely to be minimal.

Although public contact with products containing the polyester polymer in Dispercoll® U 54 will be widespread, the polymer will be trapped in the matix of the cured adhesive. Hence, exposure will be minimal. Potential health effects for the public are therefore negligible.

13. RECOMMENDATIONS

To minimise occupational exposure to Polyester polyurethane in Dispercoll® U 54 the following guidelines and precautions should be observed:

- Industrial clothing should conform to the specifications detailed in AS 2919 (3);
- All occupational footwear should conform to AS/NZS 2210 (4);
- 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;
- Good personal hygiene should be practised to minimise the potential for ingestion;
- A copy of the 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* (5).

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. 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.

2. 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.

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

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

5. 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.