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NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

DOWEX* M4195 ANION EXCHANGE RESIN

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Director
Chemicals Notification and Assessment

FULL PUBLIC REPORT

DOWEX* M4195 ANION EXCHANGE RESIN

1. APPLICANT

Dow Chemical (Australia) Limited of 55 Kororoit Creek Road ALTONA VICTORIA 3018 has submitted a notification statement accompanying their application for assessment of a Synthetic Polymer of Low Concern, Dowex* M4195 Anion Exchange Resin.
(* Trademark of the Dow Chemical Company)

2. IDENTITY OF THE CHEMICAL

Claims were made and accepted for the identity of Dowex* M4195 Anion Exchange Resin to be exempt from publication in the Full Public Report. The data items were: chemical name; CAS number; molecular and structural formulae; polymer constituents; residual monomer content; and exact import volume.

Number-Average Molecular Weight (NAMW):	>> 10^6 g/mol
Maximum Percentage of Low Molecular Weight Species	
Molecular Weight < 500:	0.1%
Molecular Weight < 1 000:	0.3%
Additives/Adjuvants:	none
-Method of Detection and Determination:	the notified chemical can be detected by Fourier transformed infra-red spectroscopy

3. PHYSICAL AND CHEMICAL PROPERTIES

Appearance at 20°C and 101.3 kPa:	opaque yellow spheres
Melting Point:	decomposes at 250°C
Glass Transition Temperature:	not applicable
Density:	640 kg/m^3

Water Solubility:	not determined, see comments below
Charge Density:	very low polarity
Hydrolysis as a Function of pH:	not required
Polymer Stability:	stable up to 250°C
Flammability Limits:	the polymer does not have a vapour pressure below its decomposition temperature which is ~ 250°C
Autoignition Temperature:	greater than 500°C
Explosive Properties:	none
Particle Size:	overall 97% of the resin bead > 0.297 mm with a nominal diameter of 0.5 mm

Comments on Physico-Chemical Properties

The water solubility of the polymer has not being determined. The notifier states that the polymer is manufactured as a porous bead containing 48 to 57% adsorbed water. The notifier also states that the most likely outcome of attempting to determine the water solubility by the draft OECD method would be swelling of the beads with absorbed water. *Environment Australia* notes that ionic exchange gels based on the styrene/DVB polymer are known to have low water solubility.

4. PURITY OF THE CHEMICAL

Degree of Purity: high

5. USE, VOLUME AND FORMULATION

The notified polymer will not be manufactured in Australia. It will be imported in 141.5 L (95.2 kg) fibre board drums. The notified polymer is an anion exchange resin (porous bead) intended for use in an automated multi-column ion exchange system to recover residual nickel from cobalt-rich nickel/cobalt sulphate solutions. The columns containing the notified chemical will be used in the mining industry. The notified chemical once packed into columns, will be operational for several years. The nickel/cobalt sulphate solutions will be passed through the columns and the nickel will selectively bind to the notified chemical. The column is eluted with sulphuric acid, to release the nickel, which is recovered for further processing.

The notifier estimates that greater than one tonne per annum of the polymer will be imported over the next five years.

6. OCCUPATIONAL EXPOSURE

The notified polymer, packed in sealed polyethylene-lined fibre board drums (200 L capacity), will be transported from wharves to a metropolitan warehouse until required for dispatch to customers. The notified polymer will remain in its original packaging until it reaches the customer site. Exposure of waterside, storage and transport workers is not expected under normal circumstances.

Process description
The notified polymer will be used in a secondary treatment plant at the mining site to recover nickel from a cobalt-rich nickel/cobalt sulphate solution.

Initially, drums containing the notified polymer are stored under cover in a site warehouse. When required, the sealed drums are moved by fork lifts to the process unit. The notified polymer is transferred to process equipment by manually tipping from the drum. Workers who will have potential exposure to the notified polymer during column packing include plant operators and maintenance personnel.

During loading the notified polymer into columns, plant operators will be involved in the following processes: loading (2 personnel, 30 minutes/ion exchange column or approximately 3 hours for five columns); and recharge of a column (2 personnel, 90 minutes or approximately 8 hours for five columns).

Skin exposure to the notified polymer (beads) may occur during packing of columns where the workers are in direct contact with the resin. As the notified polymer beads are damp there is negligible potential for dust generation or inhalation exposure. Ocular exposure to the notified polymer may occur during loading beads and may cause mechanical injury. The notifier indicates that during use the multi-column ion exchange system is enclosed and automated. Workers are to wear personal protection such as safety glasses, impervious gloves and coveralls during column packing, emptying and refilling. Protective clothing is not specified for workers involved in the use of the columns.

The column packing resin would be replaced over a five to ten year period, as the resin loses effectiveness.

7. PUBLIC EXPOSURE

The notified polymer will not be sold to the public, and therefore, will not enter the public domain. It will be used only at mining sites in Australia. There is negligible potential for public exposure to the notified polymer arising from use, waste disposal and transport.

8. ENVIRONMENTAL EXPOSURE

Release

Under normal conditions release of the notified polymer is not expected during storage and transportation. The Material Safety Data Sheet (MSDS) contains adequate instructions for

handling a spill should one occur.

The notifier estimates that up to 50 g of the notified polymer may remain in the liners of the fibre board cartons once the contents have been removed. The notifier recommends that the containers and liners be buried in onsite landfill, if they cannot be recycled for an alternative use. Spent resin from the columns would also be disposed of to onsite landfill. The notifier has estimated that if the resin was changed annually it would account for a negligible quantity of the mining wastes generated at the mining site annually.

The notifier has indicated that ion exchange resin would also be lost from the process unit during operation cycles as a result of physical attrition during processing. They estimate that between 1 and 5% of the resin will be lost per year. This corresponds to between 3.8 and 19 kg of the resin per year assuming the mine uses a process unit containing 380 kg of resin. The resin lost during use will be discharged into the mines leach dam where it is expected to precipitate to the bottom. It is anticipated that dry tailings and resin in the leach dam will eventually be buried in situ with topsoil and the surface revegetated.

Fate

The majority of the imported resin beads of the notified polymer once spent will end up in landfill on the mine sites where it is used. Here, it is expected to remain immobile within soil.

9. EVALUATION OF TOXICOLOGICAL DATA

Toxicology data are not required for the Synthetic Polymer of Low Concern category of chemicals. However, the Material Safety Data Sheet (MSDS) made reference to skin and eye irritation studies and a laboratory animal feeding study. The notifier provided copies of the original study reports. The summaries of these studies are reported below.

9.1 Acute toxicity

Range finding single-dose oral toxicity studies conducted on laboratory rats showed that the notified chemical exhibited a LD_{50} > 4 000 mg/kg.

9.2 Skin irritation

A study carried out using the notified chemical on the intact skin of rabbits were shown to be non-irritating to rabbit skin.

9.3 Eye irritation

A study carried out using undiluted form of the notified chemical showed very slight conjunctival irritation in rabbits.

9.4 Overall Assessment of Toxicological Data

Based on summary reports, the notified chemical exhibited low acute oral (LD_{50} > 4 000

mg/kg) toxicity in rats. The notified chemical was non-irritant to rabbit skin and a slight eye irritant in rabbits.

As the notified chemical has a high molecular weight, it is not expected to be absorbed by the skin.

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

No ecotoxicological data were provided which is acceptable for polymers of low concern with a NAMW greater than 1000 according to the *Industrial Chemicals (Notification and Assessment) Act 1989.*

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

The notified polymer, an anion exchange resin, will be used on mining sites in relatively small quantities. The ultimate fate of the resin is to be buried in landfill on the mine site, where it is expected to remain immobile within soil.

Based on the information provided with the submission, the potential environmental hazard is low if the notified polymer is used in the typical manner outlined.

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

The notified polymer cannot be determined to be a hazardous substance according to NOHSC Approved Criteria, on the basis of the toxicological data provided for assessment. The notified polymer has a particle size well above the inspirable range. The notified polymer has a high molecular weight and virtually no residual monomers or impurities; therefore there is little chance of dermal absorption of chemical or impurities resulting from contamination with the resin beads. According to the summaries of toxicology data submitted, the notified chemical has very low acute toxicity, slight eye irritation and no skin irritation.

Occupational Health and Safety
The occupational health risk to waterside, storage and transport workers under normal conditions is expected to be negligible.

During loading of the ion exchange resin to columns, skin and eye exposure to the notified polymer may occur at various stages of the process. For example, exposure may occur during manual tipping of the polymer, column packing (loading and recharging) cleaning up of spills and during maintenance. However, as the notified polymer beads are damp there is negligible potential for dust generation. Accidental exposure to the eye may cause mechanical injury. Where exposure to the notified polymer may occur, during loading or emptying, personal protective equipment, such as safety glasses, impervious gloves and coveralls, is provided. During use, the resin beads containing the notified polymer are in sealed equipment operated automatically and the potential for incidental exposure to operating personnel is negligible.

Public Health
The potential for public exposure to the notified polymer is negligible since the notified polymer will only be used only in mine applications. The proposed use is unlikely to pose a significant hazard to public health.

13. RECOMMENDATIONS

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

- Safety glasses should be selected and fitted in accordance with Australian Standard (AS) 1336 (Standards Australia, 1994) to comply with Australian/New Zealand Standard (AS/NZS) 1337 (Standards Australia/Standards New Zealand, 1992);
- Industrial clothing should conform to the specifications detailed in AS 2919 (Standards Australia, 1987);
- Impermeable gloves or mittens should conform to AS/NZS 2161.2 (Standards Australia/ Standards New Zealand, 1998);
- All occupational footwear should conform to AS/NZS 2210 (Standards Australia/Standards New Zealand, 1994c);
- Spillage of the notified chemical should be avoided. Spillages should be cleaned up promptly with absorbents which should be put into containers for disposal;
- Good personal hygiene should be practiced 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 a format consistent with the *National Code of Practice for the Preparation of Material Safety Data Sheets* (NOHSC, 1994).

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

Dow Chemical USA, Internal Report, July 17 1975, copy on file.

NOHSC (1994) National Code of Practice for the Preparation of Material Safety Data Sheets [NOHSC:2011(1994)]. Canberra, Australian Government Publishing Service.

Standards Australia (1987) AS 2919-1987, Australian Standard Industrial Clothing. Sydney, Standards Australia.

Standards Australia (1994) AS 1336-1994, Australian Standard Eye protection in the Industrial Environment. Sydney, Standards Australia.

Standards Australia (1998) AS/NZS 2161.2:1998, Australian/New Zealand Standard Occupational Protective Gloves Part 2: General Requirements. Sydney/Wellington, Standards Australia and Standards New Zealand.

Standards Australia/Standards New Zealand (1992) AS/NZS 1337-1992, Australian/New Zealand Standard Eye Protectors for Industrial Applications. Sydney/Wellington, Standards Australia and Standards New Zealand.

Standards Australia/Standards New Zealand (1994c) AS/NZS 2210-1994, Australian/New Zealand Standard Occupational Protective Footwear. Sydney/Wellington, Standards Australia and Standards New Zealand.