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NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

Polymer in Acrylic Resin KH-317

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Director
Chemicals Notification and Assessment

FULL PUBLIC REPORT

Polymer in Acrylic Resin KH-317

1. APPLICANT

Dulux Australia, McNaughton Road, Clayton Vic 3168

2. IDENTITY OF THE CHEMICAL

Based on the nature of the chemical and the data provided, the notified polymer is considered to be non-hazardous. Therefore, the chemical name, CAS number, molecular formula, structural formula, molecular weight, spectral data and monomer composition have been exempted from publication in the Full Public Report and the Summary Report

Trade name: Acrylic resin KH-317 (polymer in solvent blend)

Number-average molecular weight: >1000

Maximum percentage of low molecular weight species (molecular weight < 1000): ~1

Method of detection and determination: May be detected by infrared spectroscopy

3. PHYSICAL AND CHEMICAL PROPERTIES

The notified chemical is never isolated. It is manufactured overseas in a reaction vessel as a solution in iso-butanol/xylene/aromatic hydrocarbon blend. The following physico-chemical properties relate to the blend, Acrylic Resin KH-317, except where indicated.

Appearance at 20°C and 101.3 kPa: viscous, clear, water white liquid

Odour: solvent odour

Boiling Point: 106°C (iso-butanol)

Specific Gravity: 979 kg/m^3 (1147 kg/m^3 calculated for polymer)

Vapour Pressure: 1.17 kPa at 20°C (iso-butanol)

Flash Point: 27°C (xylene)

Flammability Limits: 1-7% (xylene); 1.7-10.9 (iso-butanol)

Decomposition Products: under extreme heat conditions, the paint film containing the polymer will burn emitting oxides of carbon and nitrogen

Autoignition Temperature: 410°C (iso-butanol); 500°C (xylene)

Explosive Properties: will form explosive mixtures with air

Reactivity/Stability: reacts with strong oxidising agents

Comments on physico-chemical data:

By analogy with similar polymers, this polymer is not volatile under conditions of use. The polymer solution is expected to boil initially at the boiling point of iso-butanol, eg 106°C. The vapour pressure would be that of iso-butanol, ie 1.17 kPa at 20°C.

With regard to solubility and hydrolysis the notifier maintains that "By analogy with similar polymers, the polymer is insoluble in water and is not subject to hydrolysis. However, neither can be measured as the chemical is never isolated from its solvent". Low water solubility is a function of acrylic paint resins and would preclude hydrolysis of the ester functionalities at environmental pH.

No data on partition coefficient (n-octanol/water) were provided as this polymer is not anticipated to cross biological membranes because of its high molecular weight.

No data were supplied on adsorption/desorption. However, as the solvent evaporates from the polymer solution it will become more viscous and sticky and will readily bind to the soil, thereby becoming immobilised.

These explanations are acceptable for this formulation and class of polymer. There are no liable hydrogens likely to dissociate in the environmental pH range.

4. PURITY OF THE CHEMICAL

The notified chemical contains no hazardous impurities at levels necessary to classify it as as a hazardous substance (1). Therefore, information on the purity of the polymer has been exempted from publication in the Full Public Report and the Summary Report.

Maximum content of residual monomers: ~1%

Additives/Adjuvants:

Chemical name	CAS No.	Weight percentage
iso-Butanol	71-36-3	1-9
Xylene	1330-20-7	10-29
Aromatic hydrocarbons	64742-94-5	10-29
Flow control agent*	-	1-9

* This is currently being imported under a Commercial Evaluation Permit.

5. INDUSTRIAL USE

The notified polymer will be imported into Australia as a 45% solution in iso-butanol/xylene/aromatic hydrocarbon blend, known as Acrylic Resin KH-317. Acrylic Resin KH-317 will be used to formulate a film forming component of the automotive coating, Topcoat Clearcoat, which will be used to coat metallic basecoats on the external primed steel of car bodies. The estimated volume of import is 1-10 tonnes in the first year and 10-100 tonnes in years 2 to 5.

6. OCCUPATIONAL EXPOSURE

Acrylic Resin KH-317 (containing 45% notified polymer in iso-butanol/xylene/aromatic hydrocarbon blend) will be imported in 200 L steel drums and transported by road to Dulux Australia, Clayton, Victoria. The polymer solution will be incorporated into the automotive coating, Topcoat Clearcoat and transported to the customer, Toyota Motor Company, Altona, Victoria. At Toyota the coating will be applied to car body parts by automatic spray machine and then heat cured. Once the coating has been heat cured the polymer will become an integral part of the paint film and will no longer be a source of exposure. The painted car bodies will then be assembled into complete cars.

At the paint manufacturing plant, the polymer solution as well as other resins and solvents will be manually transferred from drum containers into a sealed mixer. Three workers will carry out this process 2 hours/day, 30 days/year. An additional 3 workers will carry out quality control testing of each batch (8 hours/day, 30 days/year) and 3 will fill the paint via a gravity feed line into 200 L steel open head drums (8 hours/day, 30 days/year). The notifier states that paint manufacture will employ the use of mixers fitted with regularly maintained exhaust ventilation to capture volatiles at the source, thereby minimising worker exposure during the mixing operations. There is a possibility of spillages to occur during transfer and filling operations, however these will also be conducted under local exhaust ventilation, thereby limiting exposure.

The notifier advises that all workers handling the polymer solution or paint at the manufacturing plant, will be instructed to wear impervious gloves, coveralls and goggles.

Approximately 3 workers will be involved in laboratory development at the manufacturing plant. These workers will manufacture and test the paint for approximately 8 hours/day, 20 days/year.

The formulated paint stored in 20 and 200 L drums is transported to the customer by road.

At the customer site, 1 worker will thin the paint and add it to a circulation tank (1 hour/day, 200 days/year), 13 workers will hand spray the product onto the car bodies (8 hours/day, 200 days/year) and 1 worker will be involved in cleaning the spray equipment (1 hour/day, 200 days/year). The spraying operation will utilise automatic spray equipment in a spray booth, which along with the assembly plant repair area, is equipped with down draft ventilation. Additionally, spray painters will be instructed to wear protective clothing consisting of nylon overalls, calico hoods, nylon gloves and cartridge type respirators. With adequate personal protection and engineering systems in place, worker exposure to paint containing the notified polymer should be minimal.

The notifier states that atmospheric monitoring, in the form of personal air sampling for solvents, will be conducted at both the paint manufacturing plant and at the customer site.

7. PUBLIC EXPOSURE

The potential for public exposure to the notified polymer during coating formulation and application is very low. Operations at the notifier's premises are conducted within bunded areas where spills will be contained. Overspray is trapped by a water scrubbing system from which paint is separated for disposal by landfill. Drums containing coating residues will be incinerated, washed and recycled. The physical characteristics of the polymer should confer low water solubility and vapour pressure on the polymer, thereby restricting its mobility in the event of a transport accident.

Although there will be widespread public contact with the polymer on finished car bodies, by this stage the polymer will be incorporated into an inert, cured paint film from which absorption would be very unlikely.

8. ENVIRONMENTAL EXPOSURE

. Release

The process at the Dulux plant will be conducted in a bunded area under exhaust ventilation with the vapours conducted to the plant incinerator. Spillages and rinsate from cleanup procedures will be treated by a process aimed at reclaiming and reusing solvent. The accumulated sludge will be then dried and consigned to landfill. Estimates of the quantity of paint containing the polymer to be disposed of to landfill from formulation and filling processes are 250 kg per annum.

The potential for release of polymer in the customer's factory occurs where the paint is first thinned then applied via automatic equipment in painting booths to the metal car bodies which are then heat cured. The plant utilises an air ducting system connected to an incinerator for control of solvent vapour emissions and good work practices are encouraged to minimise paint spills. Between 25 and 65% of the polymer as paint overspray from the spray booths will be disposed of as land fill. For the first year this amount is estimated to be up to 2500 kg. Waste generation in subsequent years will depend on paint usage rates. The estimated amounts of wastes are between 4000 and 15000 kg per annum. It is proposed to send this waste to an approved land fill eg. Tullamarine facility in Victoria.

Empty drums containing paint residues are sent to a recycler who cleans the drums by incineration of the residues in the drums. They are then washed and reused. This process is approved by state authorities and will result in disposal of approximately 200 kg of paint per annum in this way.

. Fate

As the notified substance is a polymer with low water solubility, degradation in or leaching from landfill sites is not expected. Incineration of the notified substance is expected to produce water and oxides of carbon and nitrogen.

Most of the notified polymer is not expected to be released to the environment until it has been fully cured into a solid polymer matrix on the surface of the treated car body. The resultant matrix structure will exhibit very slow hydrolysis and biodegradation of the polymer with an expected life in excess of twenty years. Bioaccumulation of the polymer is unlikely due to the high molecular weight of the polymer.

9. EVALUATION OF TOXICOLOGICAL DATA

No toxicity data were provided for the notified polymer, which is acceptable for a synthetic polymer with number-average molecular weight (NAMW) > 1000 under the *Industrial Chemicals (Notification and Assessment) Act 1989* (the Act).

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

No ecotoxicological data were provided, which is acceptable for polymers of NAMW > 1000 according to the Act.

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 when it is incorporated into the paint and applied to the metal car bodies.

The polymer is also unlikely to present a hazard to aquatic organisms due to the end-use application and the polymer's high molecular weight.

The main environmental exposure arises from landfill disposal of a maximum of 15 tonne per annum of recovered waste paint containing the resin. However, since it is stable and immobile in soil, environmental hazard is expected to be low.

The paint containing the polymer resin is applied to the exterior body parts of motor vehicles then heat cured to a hard matrix which would undergo negligible degradation in the environment. On disposal of the motor body, by resmelting the steel for recycling, the polymer would undergo high temperature incineration.

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

The notified polymer in Acrylic Resin KH-317 has a NAMW > 1000 and is therefore unlikely to cross biological membranes and cause significant systemic effects. The polymer contains relatively small amounts of low molecular weight (<1000) polymeric species (~1%) and residual monomers (~1%). The concentration of each residual monomer is well below the cut off concentration for classifying the polymer as a hazardous substance (1). With appropriate engineering controls, the residual monomers and the low molecular weight component of the notified polymer should not pose a significant concern to workers.

The polymer will always be present in the solvent blend iso-butanol/xylene/aromatics. Due to the physico-chemical and toxicological hazards associated with these solvents, all users will be required to employ various control measures to minimise solvent exposure to safe levels. The engineering controls and personal protective equipment which the users will have in place will greatly reduce exposure to the notified polymer itself.

Under normal use conditions, with appropriate control measures and/or precautions to minimise contact, the notified polymer is not expected to present any significant health or safety risk to workers.

There is potential for widespread public contact with the notified polymer on finished car bodies. However, by this stage the notified polymer will be incorporated into an inert, cured paint film from which absorption would be unlikely.

Based on its physical characteristics and use pattern, it is considered that the notified polymer will not pose a significant risk to public health.

13. RECOMMENDATIONS

To minimise occupational exposure to the polymer in Acrylic Resin KH-317 the following guidelines and precautions should be observed.

- If engineering controls are insufficient to reduce exposure to a safe level during paint mixing processes or filling and transfer operations, as well as during product application, the following personal protection equipment should be worn :
  - goggles conforming to AS 1336 (2) and AS 1337 (3);
  - impervious gloves conforming to AS 2161 (4); and
  - protective overalls.
- Good work practices should be implemented to avoid spillages or splashings.
- Any spillages should be promptly cleaned up and disposed according to local or state regulations.
- Good personal hygiene practices, such as washing of hands prior to eating food, should be observed.
- A copy of the Material Safety Data sheet (MSDS) for Acrylic Resin KH-317 and products containing it should be easily accessible to workers.

14. MATERIAL SAFETY DATA SHEET

The MSDS for Acrylic Resin KH-317 (Attachment 1) was provided in Worksafe Australia format (5). The MSDS was provided by Dulux Australia 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 Dulux Australia.

15. REQUIREMENTS FOR SECONDARY NOTIFICATION

Under the *Industrial Chemicals (Notification and Assessment) Act 1989*, secondary notification of the polymer in Acrylic Resin KH-317 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. National Occupational Health and Safety Commission, *Approved Criteria for Classifying Hazardous Substances*, Australian Government Publishing Service Publ., Canberra, 1994.

2. Australian Standard 1336-1982 *Eye protection in the Industrial Environment*, Standard Association of Australia Publ., Sydney, 1982.

3. Australian Standard 1337-1984 *Eye Protectors for Industrial Applications*, Standards Association of Australia Publ., Sydney, 1984.

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

5. National Occupational Health and Safety Commission, *National Code of Practice for the Preparation of Material Safety Data Sheets,* Australian Government Publishing Service Publ., Canberra, 1994.