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NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

Acrylic Resin KH-565

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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 4.1 p.m. each week day except on public holidays.

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Director
Chemicals Notification and Assessment

FULL PUBLIC REPORT

Acrylic Resin KH-565

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, Acrylic Resin KH-565, is considered to be non-hazardous. Therefore, the chemical name, 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-565

Maximum percentage of low molecular weight species (molecular weight < 1000): ~4

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

Spectral data: An infrared spectrum was provided for Acrylic Resin KH-565.

3. PHYSICAL AND CHEMICAL PROPERTIES

The notified polymer is prepared as a solution in n-butanol, xylene, and ethyl benzene and as such is never isolated. The following data relate to the polymer in solvent solution, except where indicated.

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

Odour: solvent odour

Boiling Point:	118°C (n-butanol)
Specific Gravity:	960 kg/m3 (1063 kg/m3 calculated for polymer)
Flash Point:	15°C (ethyl benzene)
Flammability Limits:	1-7% (xylene)
Decomposition Products:	under extreme heat conditions, the paint film containing the polymer will burn emitting oxides of carbon and nitrogen
Autoignition Temperature:	500°C (xylene)
Explosive Properties:	will form explosive mixtures with air
Reactivity/Stability:	reacts with strong oxidising agents

Comments on physico-chemical properties:

No data were provided for vapour pressure on the grounds that "by analogy with similar polymers, this polymer is not volatile. For the polymer solution the vapour pressure would be that of the constituent solvents, eg xylene 1.2 kPa at 20°C".

No data were provided for water solubility on the grounds that "by analogy with similar polymers, the polymer is insoluble in water". The form of manufacture and storage of the polymer in a solvent solution would not allow the testing to take place. Polyacrylates are known to be very insoluble in water.

No data were provided for partition coefficient on the grounds that "the polymer does not cross biological membranes". The high molecular weight of the polymer is likely to prevent it from crossing biological membranes, though some low molecular weight material may do so. Again this test would be difficult to perform and interpret.

No data were provided for hydrolysis on the grounds that "by analogy with similar polymers, this polymer is not subject to hydrolysis". The polymer contains a number of hydrolysable ester groups but hydrolysis under environmental conditions is not expected due to low solubility.

No data were provided for adsorption/desorption on the grounds that "as the solvent evaporates from the polymer solution it will become more and more viscous and sticky and will readily bind to the soil, thereby becoming immobilised." This is acceptable.

No data were provided for dissociation constant on the grounds that "it is considered inapplicable due to the nature of the polymer and its water insolubility". Again measurement and interpretation of a result for this property would be difficult due to the complexity of the substance, though it is noted the polymer contains a small proportion of free carboxylic acid groups.

4. PURITY OF THE CHEMICAL

Degree of purity: 97.86%

Toxic or hazardous impurity/impurities: All hazardous impurities are present at levels below the cut off concentration for classifying the polymer as a hazardous substance (1) and therefore have been exempted from publication in the Full Public Report and the Summary Report.

Non-hazardous impurity/impurities: none > 1% by weight

Maximum content of residual monomers: 2.14

Additives/Adjuvants:

Chemical name:	CAS No.:	Proportion:
AIBN	78-67-1	2.16
ADVN	4419-11-8	0.27
n-butanol	71-36-3	1-9%
xylene	1330-20-7	10-29%
ethyl benzene	100-41-4	10-29%

5. INDUSTRIAL USE

The notified polymer will be imported in the polymer solution Acrylic Resin KH-565 (containing the notified polymer in n-butanol/xylene/ethylbenzene blend). Acrylic Resin KH-565 will be incorporated as 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. Once the appropriate research and development has been completed, the polymer will also be manufactured in Australia. Approximately 1 to 10 tonnes of polymer will be manufactured or imported in the first year, with 10 to 100 tonnes anticipated for each of the following 4 years.

6. OCCUPATIONAL EXPOSURE

Acrylic Resin KH-565 (containing the notified polymer in n-butanol/xylene/ethylbenzene blend) will be imported in 200 L steel drums and transported by road to Dulux Australia, Clayton, Victoria. When the technology is in place, Acrylic Resin KH-565 will also be manufactured by Dulux Australia. 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. The painted car bodies will then be assembled into complete cars.

Polymer manufacture will be conducted in a closed reactor. Reactants, initiators and solvents will be manually transferred from steel drums (or alternatively metered directly from tanks) to the reaction vessel. At regular intervals samples will be taken for quality control. When the reaction is complete, the solution will be allowed to cool and then be gravity fed through a filter medium into 200 L steel open head drums (or possibly to storage tanks). Nine workers will be involved in sampling from the reaction vessel, testing the polymer solution and filling the solution into the steel drums. On average, these workers will be exposed for 8 hours/day, 10 days/year. As the reaction vessel is closed, personnel should not be directly exposed to the notified polymer during its manufacture. Exposure of personnel carrying out the transfer and filling operations should be reduced as this operation will be conducted under local exhaust ventilation.

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 6 workers will be involved in laboratory development at the manufacturing plant, 3 in manufacture of the polymer (exposed 8 hours/day, 10 days/year) and 3 in the manufacture and testing of the paint (exposed 8 hours/day, 20 days/year).

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.

7. PUBLIC EXPOSURE

Based on the proposed use pattern of the notified polymer, public exposure to Acrylic Resin KH-565 in its uncured form will be negligible. Public exposure to the notified polymer will be limited to cured paint surfaces from which it is unlikely to be absorbed.

8. ENVIRONMENTAL EXPOSURE

. Release

Commercial production of the polymer solution and the coating made with the polymer will take place at the Dulux Australia resin plant at Clayton, Victoria. Manufacturing of the polymer solution will take place in a closed reactor. The end-user Toyota will use the product at its new plant at Altona, Victoria.

There is a potential for spillage during the filtration and drum filling stage at the end of the polymer solution manufacture. Spillage may also occur during blending, batch testing and mill cleanup operations during paint manufacture. Releases into the factory environment during resin and paint manufacture will be contained by on site bunding. Due to the non volatile nature of the resin there would be negligible release to the atmosphere. Drum filling and paint manufacture processes are carried out in well ventilated areas where atmospheric concentrations of vapours from the solvents are monitored and extracted from the exhaust air.

Areas in the plant where spill may occur are adequately bunded and cleanup materials are available on site.

The company states that it has developed a "DUSOL" process whereby waste resin and paint can be processed to reclaim the solvents with the residue converted to an inert solid. This process would be used to treat waste from both polymer and paint manufacture with an estimated 250 kg of waste polymer being treated in this manner. The inert solid is expected to be disposed of to landfill, although incineration is another option.

The polymer solution will be stored in 200 L steel drums, and shipped by road transport to the customer. As the polymer is produced as a solution in flammable solvents, it will be stored and transported according to the statutory requirements applying to Class 3 Dangerous Goods.

At the Toyota factory, the paint products are spray applied by a combination of electrostatic and air atomised spray. Transfer efficiencies vary from 35% to 75%, depending on application method. Any overspray is trapped by a high efficiency water scrubbing system. Paint material removed from the scrubbers is

separated out via flotation techniques, and the resultant sludge is then removed to landfill as prescribed by the Victorian EPA.

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. Approximately 50% 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 4000 - 15000 kg per annum. It is proposed to send this waste to an approved land fill eg. Tullamarine facility in Victoria.

Empty paint drums are recycled through a reconditioning plant where drums are first burnt, and then washed . An estimated maximum of 200 kg per annum are disposed of by this manner (an approved Victorian EPA method).

. **Fate**

On application to landfill the polymer is expected to remain immobile and inert. While the polymer contains ester groups which are theoretically vunerable to hydrolysis and metabolism, these processes are unlikely under landfill conditions due to low solubility.

The manufacturer states that the resin in the paint formulation when applied and heat cured is in a form that is not readily susceptible t breakdown in the environment. Under extreme heat conditions (eg. fire) the paint film containing the polymer would burn emitting carbo and nitrogen oxides.

Slow deterioration of the paint film will occur as a result of UV action, but the company expects that this loss will be "insignificant over the life of the vehicle. No loss of monomers, impurities or additives occur over the life of the car.

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, as amended* (the Act).

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

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

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 car bodies.

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

The main environmental exposure arises from landfill disposal of approximately 2750 kg (total waste) per annum in the first year and 4250 - 15250 kg in subsequent years, of recovered waste resin. However, since it is immobilised prior to disposal, environmental hazard is expected to be low.

Accidental spillage during transport is another possible source of environmental hazard. Both land and aquatic contamination could result. If a land spill occurred, the polymer would bind to the soil and become immobilised. Contaminated soil could then be collected and disposed of in land fill. Spillage into water also should not pose a problem, as the polymer would settle to the bottom of the water body and bind to the sediment. It is unlikely to pose a hazard to aquatic organisms, as its high molecular weight makes transport across biological membranes unlikely.

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

The notified polymer in Acrylic Resin KH-565 has a NAMW > 1000 and is therefore unlikely to cross biological membranes and cause significant systemic effects. The polymer contains ~4% (w/w) low molecular weight (<1000) polymeric species and a number of hazardous impurities. The concentration of each impurity however, is well below the cut off concentration for classifying the polymer as a hazardous substance (1). With appropriate engineering controls, the impurities and the low molecular weight component of the notified polymer should not pose a significant concern to workers.

The polymer is produced in the solvents butanol, xylene, and ethyl benzene and is never isolated. Due to the physico-chemical properties of the additives, the solution is flammable, reacts with strong oxidising agents, may form explosive mixtures with air, and may form toxic products upon combustion. Therefore during the manufacture of the polymer, and paint containing the polymer, special care must be exercised when handling and storing the solution. Furthermore, the toxic properties of the solvents warrant special care by all workers to avoid direct contact with the solution and inhalation of any vapours. The engineering controls and personal protective equipment which the notifier has in place, should however reduce airborne concentrations of the solvents to well below the exposure standard for each.

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 hazard to workers.

Under normal conditions of use, public exposure to the notified polymer in uncured Acrylic Resin KH-565 is expected to be negligible, since its application is restricted to one automotive industrial site. Public exposure to the notified polymer will be limited to cured paint surfaces from which it is unlikely to be absorbed.

13. RECOMMENDATIONS

To minimise occupational exposure (and public/environmental if recommendations have been made by these agencies) to Acrylic

Resin KH-565 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 :

    . respiratory protection conforming to AS 1715 (2) and AS 1716 (3);

    . goggles conforming to AS 1336 (4) and AS 1337 (5);

. impervious gloves conforming to AS 2161 (6);and

    . protective clothing conforming to AS 3765.1 (7) or AS 3765.2 (8).

. 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 for Acrylic Resin KH-565 and products containing it should be easily accessible to workers.

14. MATERIAL SAFETY DATA SHEET

The Material Safety Data Sheet (MSDS) for Acrylic Resin KH-565 was provided in Worksafe Australia format (9). This 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*, as amended (the Act), secondary notification of Acrylic Resin KH-565 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, *Guidance Note for Determining and Classifying a Hazardous Substance*, Australian Government Publishing Service Publ., Canberra, 1991.

2. Australian Standard 1715- 1991 *Selection, use and maintenance of Respiratory Protective Devices*, Standards Association of Australia Publ., Sydney 1991.

3. Australian Standard 1716-1991 *Respiratory Protective Devices*, Standards Association of Australia Publ., Sydney, 1991.

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

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

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

7. Australian Standard 3765.1-1990 *Clothing for Protection against Hazardous Chemicals Part 1 Protection against General or Specific Chemicals* Standards Association of Australia Publ., Sydney, 1990.

8. Australian Standard 3765.2-1990 *Clothing for Protection against Hazardous Chemicals Part 2 Limited protection against specific chemicals*. Standards Association of Australia Publ., Sydney, 1990.

9. National Occupational Health and Safety Commission, *Guidance Note for Completion of a Material Safety Data Sheet*, 3rd Edition, Australian Government Publishing Service Publ., Canberra, 1991.