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**NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME**

**FULL PUBLIC REPORT**

**Polymer in Acrylic Resins RC-0748 and RC-76-7899**

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Director
Chemicals Notification and Assessment

# FULL PUBLIC REPORT

## Polymer in Acrylic Resins RC-0748 and RC-76-7899

## 1. APPLICANT

PPG Industries Australia Pty Ltd of McNaughton Road, Clayton, Victoria 3169 has submitted a notification statement in support of their application for an assessment certificate for the polymer in Acrylic Resins RC-0748 and RC-76-7899 as a synthetic polymer of low concern (PLC).

## 2. IDENTITY OF THE CHEMICAL

The chemical name, CAS number, molecular and structural formulae, number average molecular weight, identification data and details of the polymer composition have been exempted from publication in the Full Public Report and the Summary Report.

The polymer identity is the same in Acrylic Resin RC-0748 and Acrylic Resin RC-76-7899 (i.e. both contain the notified polymer), since each shares the same monomeric units and molecular formula, but they differ slightly in molecular weight. Each acrylic resin solution also contains the same solvents and shares similar physico-chemical properties.

## 3. PHYSICAL AND CHEMICAL PROPERTIES

The data presented are for Acrylic Resin RC-0748 and Acrylic Resin RC-76-7899.

| | |
|---|---|
| **Appearance at 20°C and 101.3 kPa:** | each acrylic resin solution is a clear, viscous liquid |
| **Boiling Point:** | approximately 106-143°C; see comments below |
| **Specific Gravity:** | Acrylic Resin RC-0748 = 0.97 (from Material Safety Data Sheet)<br>Acrylic Resin RC-76-7899 = 1.0 (from Material Safety Data Sheet) |
| **Vapour Pressure:** | no data presented; see comments below |
| **Water Solubility:** | estimated as <1 mg/L; see comments below |
| **Partition Co-efficient (n-octanol/water):** | no data presented |
| **Hydrolysis as a Function of pH:** | no data presented |
| **Adsorption/Desorption:** | no data presented |

| | |
|---|---|
| **Dissociation Constant:** | no data presented |
| **Particle Size:** | not applicable; the polymers only exist in solution |
| **Flash Point:** | Acrylic Resin RC-0748 = 29°C (from MSDS)<br>Acrylic Resin RC-76-7899 = 24°C (from MSDS) |
| **Flammability Limits:** | similar to those for the solvents xylene and iso-butanol (1-10.9%); see comments below |
| **Autoignition Temperature:** | >400°C; see comments below |
| **Explosive Properties:** | no data presented |
| **Reactivity/Stability:** | stable at ambient/room temperatures;<br>will react with oxidising agents |

**Comments on Physico-Chemical Properties**

The acrylic resin solutions RC-0748 and RC-76-7899 both contain the notified polymer, although its molecular weight is slightly different in each case.

The boiling and melting points of the resin solutions were not determined. By analogy with similar polymers and due to the high molecular weight, the notified polymer is not volatile under the conditions of use. The solutions are expected to boil in the range of the constituent solvents, xylene and iso-butanol (106-143°C).

No vapour pressure data were presented. The polymer is expected to be of low vapour pressure, by analogy with similar polymers, and exhibit negligible release to the atmosphere.

The polymer is expected to be of low solubility in water because it is non-ionic, of high molecular weight and contains a high level of hydrophobic (aliphatic and aromatic) groups. It is unlikely to be released to the aquatic environment during the normal course of use as it is converted into an inert coating of very high molecular weight during the drying process.

The polymer contains ester linkages which could be expected to undergo hydrolysis under extreme pH conditions. However, since the polymer will be securely bound within the lacquer and has very low water solubility, the possibility for hydrolysis in the environmental pH range of 4 to 9 is minimal.

The polymer contains a low percentage of free carboxylic acid and hydroxyl groups likely to have typical acidity.

Flammability limits, autoignition temperature and explosive properties were not available for the notified polymer. Data presented above relate to the resin solutions and are assumed to be similar to those for a mixture of the solvents xylene and iso-butanol. The resin solutions are flammable but expected to be stable under normal use conditions.

The polymer meets the proposed criteria for a PLC in all respects. It contains hydroxyl

functional groups which enable it to cross-link with other polymeric substances in the paint to form very stable, higher molecular weight paint films that adhere firmly to the primer layers to which they are applied. There is no loss of monomers during the life of a coating. The functional groups are not biologically active and biodegradation of the polymer, whether in solution or as a dry paint film, is likely to be an extremely slow process.

## 4. PURITY OF THE CHEMICAL

The notified polymer is dissolved in the solvent system at a concentration of greater than 60% by weight. Any impurities, including the residual monomers, are at negligible concentrations. The acrylic resin solutions are reformulated into paints containing polymer at concentrations of up to 15% by weight.

## 5. USE, VOLUME AND FORMULATION

The polymer is to be used as a resin in automotive refinish coatings. It will initially (≤2 years) be imported as a component of paint solutions at concentrations of up to 15% by weight. It is expected that both polymer and paint solutions will in future be manufactured at the PPG Australia resin plant in Clayton, Victoria. During manufacture, the polymer is synthesised in solution forming a clear, viscous liquid. It is contained within the solvents xylene and iso-butanol.

The estimated import volume (combined) is 10-30 tonnes for the first year and 300-1000 tonnes for each of the next four years.

Resin solutions and reformulated paint products will be stored at the PPG warehouse in Clayton, before distribution to customers. Resin solutions will be stored in 200 litre steel drums and paints will be stored in tinplate paint cans and pails of 1, 3.5 and 20 litre capacities. Transportation of paint cans to distributors throughout Australia will be via road.

## 6. OCCUPATIONAL EXPOSURE

According to the notifier, four main groups of workers will be exposed to the polymer :

1. those involved in laboratory development;
2. those involved in resin manufacture;
3. those involved in paint manufacture (formulation); and
4. those involved in paint application.

For each group, the most likely means of exposure to the polymer and its solutions will be skin contact and inhalation of solvent vapours. Waterfront, transport and warehouse workers are not expected to be exposed to the notified chemical except in the case of an accident involving spillage of the paint or resin solution.

*Laboratory development*

Group 1 workers (approximately 6) will be involved in small scale manufacturing of polymer and paint, as well as product testing. The maximum extent of exposure for an individual is expected to be 8 hours per day for 10-20 days each year.

Paint testing is to be performed in a ventilated spray booth equipped with a fume extraction system. Spills that occur during the mixing, gun filling and spraying stages may result in dermal exposure to the worker. The protective clothing worn by laboratory staff involved in the handling of polymer solution and paint would include impervious gloves, coveralls or laboratory coat and goggles or safety glasses.

*Resin manufacture*

The polymer manufacture, when commenced, will involve 9 workers for up to 8 hours per day, 10 days per year (Group 2). The reactants and solvents will be added to an enclosed reactor, and the resultant polymer solution will be filtered and filled into 200 litre steel drums. During the filling process, there is potential for dermal exposure to the polymer solution in the form of drips and spills. As the polymer solution will be viscous, the formation of aerosols is unlikely.

The filling will be carried out under local exhaust ventilation to prevent exposure to the solvents. Workers will wear impervious gloves, coveralls and goggles, with additional personal protective equipment being used as required.

*Paint manufacture*

Group 3 workers (approximately 9) will be involved in paint preparation, QC testing and the filling of paint drums. The maximum extent of exposure for an individual is expected to be 8 hours per day for 30 days each year.

At the PPG facility there are procedures for minimising the exposure of workers (Groups 2 and 3) to the polymer and its solutions. For the resin synthesis, reactants and solvents are charged to a closed reactor system. Paint manufacture employs the use of high speed mixers fitted with local exhaust ventilation to capture volatiles at the source. A regular maintenance program is carried out and includes measurement of air flows at determined intervals. Spills that occur during the blending and batching stages are contained to the plant through existing bunding. Despite these precautions, however, skin contamination may occur in the event of any spillage during transfer of resin solution to the high speed mixer and during any adjustment of the paint formulation in the mixer.

Both resin solution and paint are filled into containers under exhaust ventilation that captures vapours. Any spills that occur during the filling stage are contained to the plant through existing bunding. However, skin contamination may occur during clean up of spills (e.g. from overfilling of containers).

*Paint application*

Group 4 workers (approximately 6000) will be involved in the activation, thinning and application of the paint products. The cleaning of spray equipment will also be performed. The maximum extent of exposure for an individual is expected to be 4 hours per day for 220

days each year. Training courses are run for end users on the correct way to handle, apply and dispose of the coating system.

Typically the spray painter will measure the appropriate amounts of the different components required in a particular formulation into an open container and pour this mixture into a spray gun. The spraying of the automobile will be carried out in a laminar flow downdraft spray booth which is designed to rapidly remove aerosol particles and solvent vapours from the atmosphere. Several possible booth designs may be used. In a dry floor booth, the overspray will be collected in filters contained in the floor of the booth; any unremoved particulates will reach the exhaust stack with the solvent vapours. In a wet floor booth, overspray will collect in a pool of water below the grill floor or in a wet scrubber in the exhaust and will be removed with a filter. The residual solids will be disposed of to secure landfill. The spray booths are subject to AS/NZS/4114.1:1995 *Spray Painting Booths – Design, Construction and Testing* and AS/NZS/4114.1:1995 *Spray Painting Booths – Selection, Installation and Maintenance* (NOHSC, 1991). After application of the paint, the automobile will be heated to cure the coating.

Residual paint mixture will be washed from the equipment manually, using recycled paint solvent. The washings will be disposed of by solvent recyclers. Once residual paint has dried, the notified polymer will be irreversibly bound within the cured matrix and not separately available for either exposure to workers, or for dermal absorption.

Skin contamination may occur during paint mixing prior to spraying and whilst cleaning the spray equipment after application. Both inhalation of vapours and skin contamination may occur during spray application.

Prevention of exposure during paint application is achieved through a combination of engineering controls, personnel protective equipment and safety education through training courses. Cans of paint are handled by operators protected by anti-static flame retardant overalls, anti-static footware, impervious gloves and eye protection conforming to Australian Standard AS/NZS 1337 and Australian Standard 1336 (Standards Australia/Standards New Zealand, 1992; Standards Australia, 1994). The spray painter wears an air-fed breathing mask conforming to AS/NZS 1715 and AS/NZS 1716 (Standards Australia/Standards New Zealand, 1994a,b), in addition to the clothing specified above.

Paint wastes, generated from cleaning of the spray gun and mixing equipment, will be collected and disposed of in the same manner as wastewater is from the spray booth. Cleaning of waste from spray booths is to be carried out by licensed waste disposal contractors. The waste is then treated and sent to trade waste landfill. It is expected that the waste contractors would wear personal protective equipment, for example, overalls and gloves.

## 7. PUBLIC EXPOSURE

The notified polymer in acrylic resins RC-0748 and RC-76-7899 will only be used in automobile coatings and paint containing the polymer (up to 15% by weight) will only be applied by professional spray painters. Although members of the public will make dermal contact with automobiles coated with paints containing the notified polymer, exposure will be negligible because of high molecular weight (>1000) and the cured state of the polymer in the

coatings.

## 8. ENVIRONMENTAL EXPOSURE

### Release

There is potential for release of the notified polymer during manufacture, coating formulation and coating application. The manufacturing and formulation processes will take place at the PPG plant and any spills that occur will be contained by plant bunding. The paint is applied to motor vehicles with approximately 30% efficiency, in a spray booth using control measures, such as a filtering system and masking materials. Cleaning of the spray gun and mixing equipment will generate waste which will be collected and disposed of in the same manner as waste water from the spray booth.

The notifier estimates that up to 20 tonnes per year of waste polymer would be generated at the PPG plant during manufacturing and formulation processes. Coating application is expected to produce 21 tonnes of polymer waste during the first year and 140 tonnes of waste during subsequent years.

Some residue will also remain in the containers after use. It is estimated that 600kg in the first year and 4000kg annually in subsequent years (2% of the container contents) will remain as residue in the containers.

### Fate

Once applied to a metal panel of a vehicle, the notified polymer will be incorporated in an inert film and will not present a significant hazard. Any fragments, chips or flakes of the paint will be of little concern as they are expected to be inert. The metal panels coated with the polymer are likely to be either recycled for steel reclamation or placed into landfill at the end of their useful life. When recycled the polymer would be destroyed in blast furnaces and converted to water vapour and oxides of carbon.

The solid waste generated in the manufacturing, formulation and application of the coating will be disposed of to landfill (although incineration is an option). It is assumed that polymer recovered as an insoluble solid from wastewater used for cleaning is also disposed to landfill. The containers and their residue will also be disposed in this manner.

When deposited into landfill within used paint cans or on discarded panels, the organic components of the coating will be inert and immobile, but may slowly degrade through biological and abiotic processes. Leaching of the polymer from a landfill site is unlikely, however, given the low water solubility of the substance.

The polymer is not expected to cross biological membranes, due to its low solubility and high molecular weight, and should not bioaccumulate.

## 9. EVALUATION OF TOXICOLOGICAL DATA

No toxicological data were provided for the notified polymer. This is acceptable for polymers of number-average molecular weight (NAMW) of greater than 1000 daltons.

Two Material Safety Data Sheets (MSDS), one for Acrylic Resin RC-0748 and one for Acrylic Resin RC-76-7899, were included in the notification dossier. Toxicological and health hazard information on the solvents in Acrylic Resins RC-0748 and RC-76-7899 (i.e. xylene and iso-butanol) were provided on each. According to the notifier, the potential adverse health effects relate to those of the solvents, particularly xylene.

## 10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

No ecotoxicological data were provided for the notified polymer. This is acceptable for polymers of number-average molecular weight (NAMW) of greater than 1000 daltons.

## 11. ASSESSMENT OF ENVIRONMENTAL HAZARD

The polymer cross-links with other paint components to form a very high molecular weight and stable film that adheres firmly to the primer layer to which it is applied. The polymer, as part of this surface coating, will therefore share the fate of the vehicle panel. The paint will slowly deteriorate under the action of UV light, but this process will be negligible over the life of the motor vehicle. When the vehicle panel is recycled, the polymer will be destroyed through incineration.

The majority of notified polymer associated with waste from the application of the coating to the automotive surface should not enter the environment until it is disposed to landfill. Leaching of the polymer from landfill sites is not expected because of the lack of mobility due to the low water solubility and high binding affinity to soil, or because of the cross-linking in the cured coating.

In the event of accidental spillage of the polymer solution into a waterway, the polymer is not expected to disperse into the water, but settle out onto sediments. If the polymer is spilt on land, either during usage or transport, it is expected to become immobilised in the soil layer. Contaminated soil can then be collected and disposed of to landfill.

Given the above, environmental exposure and the overall environmental hazard is expected to be low. The notified acrylic resins are not likely to present a hazard to the environment when they are stored, transported and used in the typical manner.

## 12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

The notified polymer itself is neither a hazardous substance (according to the National Occupational Health and Safety Commission *Approved Criteria for Classifying Hazardous Substances* (NOHSC, 1994b)), nor a dangerous good. Systemic effects are unlikely because the polymer itself is of too high a molecular weight to traverse biological membranes and the residual monomer content is low. However, the acrylic resin solutions RC-0748 and RC-76-7899 are both hazardous (e.g. harmful by inhalation and in contact with skin

[R20/21], irritating to the skin [R38]) and flammable (Class 3 Dangerous Goods). These characteristics are due to the high levels of organic solvents (xylene and iso-butanol) present. Oral ingestion can result in nausea, vomiting and central nervous system depression. Therefore, appropriate precautions should be taken in their handling and storage.

*Occupational Health and Safety*

There is little potential for substantial occupational exposure to the notified polymer in the transport and storage of the paint components containing this polymer. There will be exposure during the manufacture and reformulation of the polymer, during the local production of the paint components, and in the use and disposal of the paints.

During manufacture and reformulation, the main exposure route for the notified polymer will be dermal. The paints and polymer solutions will be viscous, and ready formation of aerosols is not expected. The polymer is not expected to be hazardous by dermal exposure as the high molecular weight will preclude absorption through the skin. Protective measures used to prevent exposure to the hazardous solvents should provide sufficient protection against the notified chemical.

The greatest occupational exposure associated with the notified polymer will come from the use and disposal of the paints containing the acrylic resin solutions. The presence of hazardous substances in such formulations requires the use of stringent engineering controls, such as a correctly constructed and maintained spray booth, and of a high level of personal protective equipment, such as impermeable overalls and gloves and a full face shield and respirator. The use of any paint containing acrylic resin solutions RC-0748 and RC-76-7899 should be in accordance with the National Occupational Health and Safety Commission *Draft National Code of Practice for Spray Painting* (NOHSC, 1991).

The notifier has indicated that all paint applications will involve spraying in a well ventilated, down draft spray booth, with a minimum four air changes per minute. Paint over-spray, accounting for 70% of paint used, will be trapped onto spraybooth masking materials and solvent will be ventilated via a stack into the atmosphere. Given these measures, standard personal protective equipment will provide an adequate level of protection from the notified polymer, which is likely to be less intrinsically toxic than most of the solvents, pigments and other paint resins. Health risks from inhalation and skin contact are therefore expected to be minimal due to the low toxicity and vapour pressure of the notified polymer, as well as the infrequency of exposure.

There are NOHSC exposure standards for xylene and iso-butanol (NOHSC, 1995). The employer is responsible for ensuring that these exposure standards, and exposure standards pertaining to other final paint mix additives, are not exceeded in the workplace.

Wastes containing the notified polymer may be hazardous substances on the basis of the solvent and other resin contents. During their disposal, the precautions described previously should be adequate for protection from the notified polymer. In addition, much of the polymer will be crosslinked, hardened and immobilised by the time of disposal.

In the event of an accidental spill of resin solution or paint formulation, the notified polymer will remain part of the resin or paint and become attached to a solid absorbent (e.g. soil,

sand or other inert material). The material can be collected and sealed in a suitable vessel for disposal. The MSDS explains the recommended clean-up procedures. Care should be taken, however, as spills will be slippery and inhaled vapours may be harmful. All ignition sources should be extinguished.

The types and prevalence of injuries and diseases relating to workers exposed to the notified polymer and its corresponding solutions were not available. It is expected that potential health effects are similar to those of the solvents, which are well documented and presented on each MSDS. No adverse health effects (symptoms) are known of the polymer. When part of an inert fully cured paint film, the notified polymer will not be available for exposure or absorption and, therefore, is not considered to be a risk to human health.

*Public Health*

There is negligible potential for public exposure to the notified polymer arising from use in paints. There may be public contact with the notified polymer on the painted surfaces of vehicles, but its adhesion to the substrate and the physico-chemical properties of the cured paint will be sufficient to preclude absorption across the skin or other biological membranes. Hence, as part of a fully cured paint film, the notified polymer is of negligible risk to humans. Based on the intended use pattern and its physico-chemical properties, the notified polymer in acrylic resins RC-0748 and RC-76-7899 does not appear to pose a significant hazard to public health.

## 13. RECOMMENDATIONS

To minimise occupational exposure to the polymer in Acrylic Resins RC-0748 and RC-76-7899, the following guidelines and precautions should be observed :

- Safety goggles 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) and AS 3765.1 (Standards Australia, 1990);
- Impermeable gloves 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);
- Respirators should conform to AS 1715 and AS 1716 (Standards Australia/Standards New Zealand, 1994a,b);
- 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 practised to minimise the potential for ingestion;
- A copy of the appropriate MSDS should be easily accessible to employees;
- Employers should ensure that NOHSC exposure standards for all of the components of the final paint mix are not exceeded in the workplace.

## 14. MATERIAL SAFETY DATA SHEET

The MSDS for each acrylic resin solution (Acrylic Resin RC-0748 and Acrylic Resin RC-76-7899) was provided in accordance with the *National Code of Practice for the Preparation of Material Safety Data Sheets* (NOHSC, 1994c).

The MSDS were provided by the applicant as part of the notification statement. They are reproduced here as a matter of public record. The accuracy of the 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

National Occupational Health and Safety Commission (NOHSC, 1991) *Draft National Code of Practice for Spray Painting*. Australian Government Publishing Service, Canberra.

National Occupational Health and Safety Commission (NOHSC, 1994a) List of Designated Hazardous Substances [NOHSC:10005(1994)]. Australian Government Publishing Service, Canberra.

National Occupational Health and Safety Commission (NOHSC, 1994b) Approved Criteria for Classifying Hazardous Substances [NOHSC:1008(1994)]. Australian Government Publishing Service, Canberra.

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

National Occupational Health and Safety Commission (NOHSC, 1995) Adopted National Exposure Standards for Atmospheric Contaminants in the Occupational Environment [NOHSC:1003(1995)]. In *Exposure Standards for Atmospheric Contaminants in the Occupational Environment: Guidance Note and National Exposure Standards*, Australian Government Publishing Service, Canberra.

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

Standards Australia (1990) Australian Standard 3765.1-1990, Australian Standard Clothing for Protection Against Hazardous Chemicals Part 1: Protection Against General or Specific Chemicals. Standards Australia, Sydney.

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

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

Standards Australia/Standards New Zealand (1994a) Australian/New Zealand Standard 1715-1994, Australian/New Zealand Standards for the Selection, Use and Maintenance of Respiratory Protective Devices. Standards Australia and Standards New Zealand, Sydney/Wellington.

Standards Australia/Standards New Zealand (1994b) Australian/New Zealand Standard 1716-1994, Australian/New Zealand Standard Respiratory Protective Devices. Standards Australia and Standards New Zealand, Sydney/Wellington.

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

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