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NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

Polymer in Alkyd Resin HA-1204

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Director
Chemicals Notification and Assessment

FULL PUBLIC REPORT

Polymer in Alkyd Resin HA-1204

1. APPLICANT

PPG Industries Australia Pty Ltd of McNaughton Road, Clayton, Victoria 3168 has submitted a limited notification statement in support of their application for an assessment certificate for the Polymer in Alkyd Resin HA-1204. The monomers are in a combination not previously listed in the Australian Inventory of Chemical Substances.

2. IDENTITY OF THE CHEMICAL

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.

Trade Name: Alkyd Resin HA-1204

1. PHYSICAL AND CHEMICAL PROPERTIES

The following data are for the 50% solution of polymer in light aromatic hydrocarbon solvent, denoted as Alkyd Resin HA-1204.

Appearance at 20°C and 101.3 kPa:	Alkyd Resin HA-1204 is a clear, viscous liquid
Boiling Point:	155°C; see comments below
Specific Gravity:	polymer solution = 1.04 polymer = 1.21 (calculated)
Vapour Pressure:	no data presented; see comments below
Water Solubility:	no data presented; see comments below
Partition Co-efficient (n-octanol/water):	no data presented

Hydrolysis as a Function of pH:	no data presented, see comments below
Adsorption/Desorption:	no data presented
Dissociation Constant:	no data presented
Flash Point:	43°C (polymer solution)
Flammability Limits:	Upper Explosive Limit = 7% Lower Explosive Limit = 0.8%; see comments below
Autoignition Temperature:	450°C; see comments below
Explosive Properties:	no data presented
Reactivity/Stability:	stable at ambient/room temperatures; will react with oxidising agents

Comments on Physico-Chemical Properties

According to the notifier, the polymer itself is never isolated from the *in situ* manufactured polymer solution.

The boiling point of the polymer solution was not determined. It is expected to boil at 155°C, which is the boiling point of the constituent solvent (light aromatic naphtha fraction).

No vapour pressure data were presented for the notified polymer. The polymer is expected to be of low vapour pressure, by analogy with similar polymers, and exhibit negligible release to the atmosphere. For the polymer solution the vapour pressure would be similar to that of the solvent (0.2 kPa at 20°C).

The water solubility of the polymer was not determined. 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.

No hydrolysis data were available for the notified polymer. As the polymer contains ester groups there is potential for hydrolysis, but this is unlikely at environmental pHs (4-9) due to its expected low water solubility.

No adsorption/desorption data were available for the notified polymer. As solvent evaporates from the polymer solution it becomes more viscous and sticky and should readily bind to soil and sediment.

The determination of a partition coefficient could not be undertaken as the notified polymer is

expected to be insoluble in water and will largely partition into *n*-octanol rather than water.

Due to its very low water solubility, the notified polymer is expected to become associated with the organic component of soils and sediments. Since it is of high molecular weight it is not expected to cross biological membranes and will not bioaccumulate.

Flammability limits, autoignition temperature and explosive properties were not available for the polymer. Data presented above correspond to the polymeric solution, which were assumed to be similar to those for the solvent. The polymer solution is a flammable liquid but expected to be stable under normal use conditions.

The polymer crosslinks with other paint components to form a very stable, high molecular weight paint film that firmly adheres to the primer layer to which it is applied. There is no loss of monomers, additives or impurities during the life of the coating.

4. PURITY OF THE CHEMICAL

Alkyd Resin HA-1204 is a solution that contains 50% by weight of the notified polymer. The remainder is an aromatic hydrocarbon solvent (i.e. light aromatic naphtha fraction). The polymer itself is never isolated from the *in situ* manufactured polymer solution. Any impurities, including the residual monomers, are at negligible concentrations. It is reformulated into paint containing the polymer at concentrations of up to 15% by weight.

5. USE, VOLUME AND FORMULATION

The notified 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 solution (i.e. Alkyd Resin HA-1204) and paint will in future be manufactured at the PPG Australia resin plant in Clayton, Victoria. Paints containing the polymer will then be exported in to the Asia Pacific region.

The estimated import volume is 1-10 tonnes for the first year and 10-100 tonnes for each of the next four years. Export of up to 80% of the polymer as paint is anticipated beyond year 2.

Solutions of the notified polymer and reformulated paint products containing the notified polymer will be stored at the PPG warehouse in Clayton, before distribution to customers. Polymer solution will be stored in 200 litre steel drums and paint will be stored in tinplate paint cans and pails of 5 and 15 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;
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.

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. Any spills that occur during the mixing, gun filling and spraying stages, while unlikely with good work practices, will result in minimal exposure to the user if the worker wears the specified protective clothing. The minimum protective clothing issued to workers involved in the handling of polymer solution and paint, includes impervious gloves, coveralls and goggles.

Resin manufacture

Group 2 workers (approximately 9) will be involved in sampling and testing of polymer from the reaction vessel, as well as the filling of polymer drums, post synthesis. The maximum extent of exposure for an individual is expected to be 8 hours per day for 10 days each year.

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 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 polymer 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).

Waste resin and paint (up to 2000 kg/year) are dissolved and converted to an inert solid that can be landfilled. The process meets all current local environmental statutory requirements. Disposal can also be performed by incineration.

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.

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 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 (Standards Australia/Standards New Zealand, 1992; Standards Australia, 1994). Paint mixing and spraying is performed in a well ventilated, down draft spray booth with a minimum volume of four air changes per minute. Solvent in the ventilation system is vented via a stack to the atmosphere. Overspray is trapped in the spray booth or on masking materials such as kraft and newspaper. 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 waste water is from the spray booth. An estimate of the waste is up to 7000kg of polymer over the first year and 14000kg of polymer for the subsequent four years. 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.

7. PUBLIC EXPOSURE

The notifier has stated that paint containing the notified polymer will be applied in an industrial environment; no reference is made regarding sale to the public. Once applied, the notified polymer is incorporated in a coating formulation that is intended for use on the exterior of car bodies.

8. ENVIRONMENTAL EXPOSURE

Release

There is potential for release of the notified chemical during the polymer manufacture, the paint formulation and the paint application. The manufacturing and formulation processes will take place at the PPG plant and any spills that occur will be contained by the plant bunding. Polymer waste will be collected at the site, treated and disposed of as an inert residue. The notifier estimates that up to 2000kg per year of waste polymer would be generated at the production site.

Paint is applied to motor vehicles with approximately 30% efficiency in a spray booth with control measures, such as filters and paper masking in place. The resulting surface coat is heat cured. Cleaning of the spray gun and mixing equipment will generate waste that will be collected and disposed of in the same manner as wastewater from the spray booth.

During paint application it is expected that 7000kg of waste polymer will be generated in the first year and 14000 kg of waste will be generated in subsequent years. Some residue will also remain in the 'empty' containers after use. For the first year it is estimated that 200kg will remain as residue in the containers and 400kg in the subsequent years (2% of the container contents).

Fate

The notified polymer, as part of the automotive surface coating, will share the fate of the vehicle panel, potentially being recycled as scrap. Incineration of the paint film would emit noxious fumes, including oxides of carbon.

The solid waste generated from the manufacturing, formulation and application of the paint will be disposed of to landfill (although incineration is an option). Presumably the polymer is recovered as an insoluble solid from the wastewater used for cleaning and also disposed to landfill. The containers and their residue will also be disposed in this manner. Leaching of the polymer from landfill sites is unlikely, given the low solubility of the substance.

Hydrolysis, although theoretically possible because of the presence of ester groups in the polymer, is also unlikely given the mild environmental pH range (4-9) of natural waters. The polymer is not expected to cross biological membranes, due to its low water solubility and high molecular weight, and as such should not bioaccumulate (Connell, 1989).

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.

The MSDS included toxicological and health hazard information on the solvent in Alkyd Resin HA-1204 (i.e. light aromatic naphtha fraction). It is likely that this solvent would be the principal toxic agent in this polymeric solution.

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

No ecotoxicological data were provided for the notified polymer. This is acceptable for polymers of NAMW of greater than 1000 daltons.

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

The notified polymer crosslinks with other paint components to form a very high molecular weight and stable paint 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 film will slowly deteriorate under the action of UV light, but this is negligible over the life of the motor vehicle. When the vehicle panel is recycled, the polymer would be destroyed through incineration.

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

If accidental spillage of the polymer solution (or paint) into waterways does occur, the notified polymer is not expected to disperse into the water, but settle out onto sediments. If spillage occurs on land, either during transport or usage, it is expected that the polymer would become immobilised in the soil layer. Contaminated soil can then be collected and disposed to landfill.

Given the above considerations, the notified polymer is not expected to display significant environmental exposure, nor present a hazard to the environment, when it is 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. Due to its high molecular weight and low residual monomer content, it is unlikely to traverse biological membranes. However, the polymeric solution is both hazardous (e.g. harmful by inhalation [R20] and irritating to respiratory system and skin [R37/38]) and flammable (Class 3 Dangerous Good), due to the organic solvent (i.e. light aromatic naphtha fraction) present. Therefore, appropriate precautions should be taken in the handling and storage of Alkyd Resin HA-1204 solution.

The types and prevalence of injuries and diseases relating to workers exposed to the notified polymer and its solution were not available. It is expected that potential health effects are similar to those of the solvent, which are well documented and presented on the MSDS. No adverse health effects (symptoms) are known for the polymer itself. 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.

Occupational Health and Safety

The greatest occupational exposure associated with the notified polymer will come from the use and disposal of the paints containing Alkyd Resin HA-1204 solution. 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 Alkyd Resin HA-1204 solution 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.

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.

Public Health

As part of a fully cured paint film, the notified polymer is of negligible risk to humans. Hence, based on the intended use pattern of Alkyd Resin HA-1204, it is considered that the polymer will not pose a significant hazard to public health.

13. RECOMMENDATIONS

To minimise occupational exposure to the Polymer in Alkyd Resin HA-1204, 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 MSDS should be easily accessible to employees .

14. MATERIAL SAFETY DATA SHEET

The MSDS for the notified polymer solution (Alkyd Resin HA-1204) was provided in accordance with the *National Code of Practice for the Preparation of Material Safety Data Sheets* (NOHSC, 1994c).

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 polymer 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

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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.

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