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NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME (NICNAS)

FULL PUBLIC REPORT

Polymer in RW3131

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Director
Chemicals Notification and Assessment

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1. APPLICANT AND NOTIFICATION DETAILS

APPLICANT(S)
BASF Akzo Nobel Automotive OEM Coatings Pty Ltd
McIntyre Road
SUNSHINE VIC 3020

and

Akzo Nobel Pty Ltd
McIntyre Road
SUNSHINE VIC 3020

NOTIFICATION CATEGORY
Limited: Polymer with NAMW ≥ 1000 (greater than 1 tonne per year).

EXEMPT INFORMATION (SECTION 75 OF THE ACT)
Data items and details claimed and accepted as exempt from publication:

- Chemical identity information
- Molecular weight data
- Purity and impurity information
- Composition of RW3131
- Manufacturing process

VARIATION OF DATA REQUIREMENTS (SECTION 24 OF THE ACT)
Variation to the schedule of data requirements is claimed for a number of physicochemical properties.

PREVIOUS NOTIFICATION IN AUSTRALIA BY APPLICANT(S)
None

NOTIFICATION IN OTHER COUNTRIES
USA

2. IDENTITY OF CHEMICAL

CHEMICAL NAME
RW3131 polymer

OTHER NAME(S)
Modified epoxy resin

MARKETING NAME(S)
Not applicable

SPECTRAL DATA

ANALYTICAL METHOD	Infrared Spectrum

Remarks IR spectrum of RW3131 for reference in QC

METHODS OF DETECTION AND DETERMINATION

ANALYTICAL METHOD
Infra-red spectroscopy
Ultra-violet spectroscopy
Nuclear magnetic resonance spectroscopy (NMR)

Remarks The exact nature of the assay method would be sample specific depending on the form of the polymer.

3. COMPOSITION

HAZARDOUS IMPURITIES/RESIDUAL MONOMERS
None

NON HAZARDOUS IMPURITIES/RESIDUAL MONOMERS (> 1% by weight)
None

4. INTRODUCTION AND USE INFORMATION

MODE OF INTRODUCTION OF NOTIFIED CHEMICAL (100%) OVER NEXT 5 YEARS

Polymer in	*1*	*2*	*3*	*4*	*5*
Tonnes	10-100	100-1000	100-1000	100-1000	100-1000

USE
RW3131, the emulsion containing the notified polymer (at approximately 20%), will be supplied to a car manufacturer for use in an automotive primer for car bodies and parts. The concentration of notified polymer in the primer is less than 20%.

5. PROCESS AND RELEASE INFORMATION

5.1. Distribution, Transport and Storage

TRANSPORTATION AND PACKAGING
RW3131 emulsion containing the notified polymer will be stored at Akzo Nobel in bulk and sealed 200L lined drums. RW3131 will be transported by bulk tanker or drum to the customer's site where it will also be stored in bulk or sealed 200L lined drums prior to use. In the initial evaluation trial, typical quantities of 7-10 L will be transported to the customer.

5.2. Operation Description

The notified polymer in RW3131 is manufactured as an intermediate emulsion in a closed reactor and then blended with other additives in a largely automated process to produce the final RW3131 emulsion. Any transfer of emulsion will be carried out in a closed system via dedicated pumps and lines. Samples are taken for batch adjustment and quality control testing. The emulsion is stored on-site in bulk until transport to the paint customer's site. Local exhaust ventilation will be employed in the sampling, testing and bulk filling areas.

At the customer's site, RW3131 is transferred from either bulk storage or drums via sealed lines to the paint mixing vessel to be blended with other components. During the process, primer samples are taken to the laboratory for batch adjustment. The finished primer is then filtered and pumped into the application tank ready for coating of car bodies and parts. Application is by electrolytic deposition

followed by curing and baking in an oven. If repairs to vessels or machinery are required, the affected areas are isolated and cleaned before and after maintenance.

5.3. Occupational exposure

Number and Category of Workers

Category of Worker	*Number*	*Exposure Duration*	*Exposure Frequency*
Polymer manufacture		hrs/day	days/year 80-
• reactor operators	25	12	100
• maintenance personnel	2	1-2	80-100
• QC personnel	5	12	80-100
• storage personnel	2	2-4	100-130
Primer formulation and application			
• electrocoat tank operators	10	2	210
• application/curing operators	10	1-2	20
• maintenance operators	2	1-2	20
• laboratory technicians/chemists	5	2	210
Other			
• external transporters	10	12	30-40

Exposure Details

Polymer Manufacture

Manufacture of the notified polymer takes place within a closed reactor; therefore reactor operators are not expected to come into contact with the notified polymer. The polymer is then blended with other additives to produce the RW3131 emulsion containing the notified polymer at approximately 20%. Reactor operators are also responsible for the collection of QC samples from purpose built taps during which skin contact with the notified polymer may occur. Local exhaust ventilation is employed during sampling and workers wear coveralls, gloves, goggles and respirators when sampling.

QC testing is carried out in a laboratory with local exhaust ventilation and staff normally wear laboratory coats, gloves and eye protection during testing.

Maintenance personnel performing repairs on the reaction vessel, transfer lines and pumps may be exposed dermally to small quantities of the notified polymer. The vessels are emptied before repair and lines and pumps are isolated prior to repair thereby limiting the volume of polymer emulsion to which maintenance staff may be exposed. Maintenance staff wear gloves and safety glasses during repairs.

Once manufactured, the polymer emulsion is stored in bulk prior to transport, and transported to users' sites in bulk. Incidental exposure to the polymer emulsion may occur during connection/disconnection of hoses during transfer of the polymer emulsion and filling of bulk tankers.

Formulation (Paint Manufacture)

At the customers' site, the polymer emulsion is transferred to a paint tank via a sealed pipe. Skin contact may occur during the opening of the drums and connection of the transfer pipes. Incidental skin contact with the polymer emulsion may also occur during batch adjustment and QC sampling and testing. Electrocoat tank operators will wear coveralls, gloves and goggles. QC personnel would be expected to wear laboratory coats, gloves and eye protection during sampling and testing.

Maintenance workers responsible for the repairs and maintenance on transfer lines and pumps may be exposed to the polymer emulsion in the event of repairs being required while a batch is in process.

Application

Once the primer containing the notified polymer is mixed, it is applied to the car bodies and parts by cathodic electrodeposition in an automated process. This is followed by curing of the paint by oven baking under exhaust ventilation. Consequently, incidental skin contact only would be anticipated during these processes. In some instances, internal transportation of drummed paint may be required prior to application, for example, by forklift. In these circumstances, incidental skin contact may occur during transfer.

After curing, paint containing the notified polymer is locked into the paint matrix and is unavailable for exposure.

5.4. Release

RELEASE OF CHEMICAL AT SITE

Manufacturing occurs at one site in Victoria. Release of the notified polymer to the environment during manufacturing is expected to be minimal owing to the automated nature of the manufacturing processes. Spills occurring during manufacturing will be contained in a bunded area and collected for disposal. Waste water streams derived from the manufacturing process are passed through an interceptor pit and are contained in the pit for treatment prior to discharge to the sewer as trade waste.

Based on release estimations provided in the European Technical Guidance Document (EC, 2003), with a manufacturing volume of 1000 tonnes per annum, 3000 kg per annum would be released to water (0.3%) and 100 kg p.a. to soil. Assuming manufacture occurs on 300 days per year (when the maximum expected volume is being produced), release to sewer would be in the order of 10 kg per day.

However, details provided in the submission indicate actual release to sewer will be non-existent. While the notified polymer is solubilised due to acidified functional groups, this is reversed at high pH. Prior to release from the interceptor pit, a caustic agent is added to the waste water which flocculates the chemical. The flocculated solids are removed and taken to an appropriate land fill.

Releases to air are expected to be negligible.

RELEASE OF CHEMICAL FROM USE

End use (application) occurs at one site, where the application process is fully contained. Cars are coated in a dip tank, and excess paint is washed from the car after exiting the tank. These washings cascade back into the application tank, which is cleaned every year. Cleaning involves transferring the contents of the tank to storage, and then washing up to 1000 litres of bath paint to the trade waste pit. Spills and leaks occurring during normal operations are also washed into the trade waste pit. The notifier estimates that up to 80 kg per year of notified polymer may end up in the trade waste pit as a result of tank cleaning and operational spills and leaks. The waste is processed by flocculation and settling of the polymer. The polymer is not expected to be volatile and hence no release to the atmosphere is expected. Up to 100 kg of polymer may remain as residues in drums.

Bulk delivery tankers are washed once the tanker is emptied at the customer site, and again when it returns to the manufacturing site. In both cases, the wash water is added back into the process vessel and not into waste streams.

No release of the polymer into the environment is expected once the primer is used to coat motor vehicles. The notified polymer will be incorporated into the primer matrix, which upon curing, will become inert.

5.5. Disposal

Solid wastes generated during manufacturing and formulation of the polymer product are removed from the interceptor pit and taken to an appropriate landfill site for disposal. The remaining waste water is released to the sewer in accordance with the statutory license requirements for the site.

Waste generated at customer sites during paint application will be disposed of by a licensed waste management company. It is expected that the company will separate the solids and liquids for disposal into landfill and by incineration respectively. Drum residues are also disposed of through a waste disposal contractor, who normally incinerates any residues.

5.6. Public exposure

The notified polymer is not available to the public and will be used in industrial scenarios only. The public is likely, however, to make contact with the cured polymer as paintwork on finished motor vehicles and components.

6. PHYSICAL AND CHEMICAL PROPERTIES

The notified polymer is never isolated, therefore, the physical and chemical properties below are for the RW3131 emulsion, unless otherwise stated.

Appearance at 20°C and 101.3 kPa Milky liquid

Melting Point/Freezing Point Not Available

Density 1050 kg/m^3

METHOD Not stated

Vapour Pressure Likely to be very low for this high molecular weight polymeric salt.

Water Solubility No result available.

METHOD n/a
Remarks The chemical is part of a water dispersible emulsion. The notifier claims this is not a property routinely measured given the lifecycle of the polymer. The submission states the polymer is insoluble in water, yet in contrast, also states it is solubilized due to acidified functional groups. DEH modelling (WSKOW v1.40) on the non-ionised polymer indicates negligible solubility. However, this modelling is not really suitable to ionised substances. When charged, expected at pH <4, the polymer will be more soluble.
TEST FACILITY n/a

Hydrolysis as a Function of pH

METHOD n/a
Remarks The likely lack of solubility precludes testing this endpoint. However, the polymer would be expected to be stable to hydrolysis in the environmental pH range. There are no groups generally considered as hydrolysable.
TEST FACILITY n/a

Partition Coefficient (n-octanol/water) Not tested.

METHOD n/a
Remarks No information was provided in the submission. DEH modelling (KOWWIN v 1.66) on the non-ionised polymer indicate a very high LogKow (>10).
TEST FACILITY n/a

Adsorption/Desorption Not tested
– screening test

METHOD n/a
Remarks The submission states the polymer is "possibly able to adsorb onto soil particles to some extent." Despite low solubility and high octanol/water partition coefficient, DEH modelling (PCKOCWIN v 1.66) on the non-ionised polymer indicate a low Koc of 1 (Log Koc = 0). This result should be treated with caution. While the chemical is expected to be insoluble at pH >4 (ie, it will probably not be ionised), at pH <4, N^+ will result in binding.
TEST FACILITY n/a

Dissociation Constant Not tested

METHOD n/a
Remarks The polymer has primary, secondary and tertiary N^+ resulting in typical basicity.
TEST FACILITY n/a

Particle Size	Not applicable as the polymer is not isolated.
Flash Point	Not applicable as the polymer is in a non-flammable aqueous emulsion.
Flammability Limits	Not available. The polymer is not flammable, but it is combustible.
Autoignition Temperature	Not available
Explosive Properties	Not applicable. The polymer does not exist as a powder, a dust of which may be expected to be combustible.
Reactivity	The notified polymer is known to be stable up to temperatures of 150-175^{o}C. It will thermally degrade at a temperature above this however the specific temperature is unknown. The notified polymer is known to be incompatible with strong mineral acids, strong alkalis and strong oxidising agents.

7. TOXICOLOGICAL INVESTIGATIONS

No toxicological data were submitted.

8.2. Ecotoxicological investigations

No ecotoxicity data were submitted.

9. RISK ASSESSMENT

9.1. Environment

9.1.1. Environment – exposure assessment

When the polymer is incorporated into the primer product and used to coat motor vehicles, negligible environmental exposure of the notified polymer is expected. The polymer will be cured to form a hard, inert surface coating. Subsequent layers of surface coating will also cover the primer. At the end of their useful life, the metal panels coated with the primer are likely to be either recycled for steel reclamation or placed into landfill.

Section 5.4 details likely releases of the polymer during manufacture and end use of the notified polymer. Waste associated with water generated at both the polymer manufacture and paint application sites is passed through interceptor pits and contained for treatment prior to discharge to the sewer as trade waste.

The notified polymer is dispersible in water, and its solubility may be raised due to acidified functional groups. However, in the interceptor pits, which are treated with caustic agents, the polymer is not expected to remain in the water compartment, but rather is expected to flocculate and form solids. These can be removed for disposal in landfill, where the polymer will occur in a dried out and polymerised form and hence is not expected to be mobile and leach from the soil.

While information in the submission indicates no release of the polymer to sewer during manufacture, default release estimations in Section 5.4 show up to 10 kg per day can be assumed as a worst case. Release will be to one of the Melbourne water treatment facilities, and conservatively estimating 250 ML per day in the STP, a predicted concentration in effluent of 0.04 ppm can be derived. With releases from the STP being coastal, a dilution factor of 10 can be assumed, resulting in a PEC in surface water of 4 μg/L (ppb).

No release to water is anticipated during application of the primer. Release to the terrestrial compartment will be restricted to landfills.

No data were submitted with respect to degradation of the notified polymer. Modelling (BIOWIN v4.00) indicates the polymer will be persistent in the environment, and cannot be considered biodegradable. However, it is unlikely to bioconcentrate with a modeled BCF (BCFWIN v2.14) of 3.16.

Some of the notified polymer may be destroyed by incineration. Container residues, disposed of through a licensed waste disposal contractor, are also expected to be incinerated. Recycled car panels containing the polymer are likely to be destroyed in blast furnaces thereby incinerating the polymer in the primer. Incineration of the polymer is expected to destroy the polymer, producing water vapour and oxides of carbon and nitrogen.

9.1.2. Environment – effects assessment

No ecotoxicity data were submitted.

Structure activity relationships (SARs) are available for polycationic polymers which are highly water soluble or dispersible and contain nitrogen which may be protonated and/or quaternarized (Clements, 1996). The calculations used to predict toxicity to fish and daphnids are based on the number of positive charges per 1000 MW.

The following results are predicted:
Fish (96 h)
LC50 = 3.5 mg/L

Daphnia (48 h)
LC50 = 17.4 mg/L

Algae
EC50 = 0.58 mg/L
NOEC = 0.23 mg/L

A predicted no effect concentration (PNEC) cannot be derived as only modeled results are available.

No SARs are available to predict effects on terrestrial organisms.

9.1.3. Environment – risk characterisation

Aquatic
While no PEC/PNEC ratio can be derived, a comparison of the worst case PEC (4 ppb) to modeled ecotoxicity data show expected concentrations in water to be two orders of magnitude less than the most sensitive modeled EC50 value (580 ppb for algae). Considering this, and the very low exposure to receiving waters from the notified polymer, the potential risk to the environment is considered low.
Terrestrial
No ecotoxicity data are available for terrestrial organisms. However, based on exposure arguments, the notified polymer is not expected to pose a significant risk to the terrestrial environment.

9.2. Human health

9.2.1. Occupational health and safety – exposure assessment

Manufacture of RW3131
As the notified polymer is manufactured in a closed system, worker exposure is likely to be confined to skin contact to drips and spills during the transfer of RW3131 emulsion from the mixer to storage or drums. Skin contact to small amounts of emulsion by laboratory personnel may occur when sampling the emulsion for quality control purposes. Similarly, maintenance workers may experience incidental skin contact during cleaning and repair work. Overall, worker exposure to the notified polymer during manufacturing operations is expected to be low.

Manufacture of primer containing the notified polymer
Incidental worker exposure to the notified polymer may occur when weighing and transferring the RW3131 emulsion to the paint formulation vessel. Worker exposure is not expected during mixing unless the blending vessel is open. Skin contact to small amounts of notified polymer by laboratory personnel may occur when sampling the primer for batch adjustment purposes. Similarly, maintenance workers may experience incidental skin contact during cleaning and repair work. Overall, worker exposure to the notified polymer during primer manufacture is expected to be low.

Application of primer
Incidental worker exposure to the notified polymer may occur when transferring the primer to the application tank. The electrolytic deposition process is largely enclosed, however, incidental skin contact with the notified polymer may occur during the dipping process. Once the primer is baked onto the car body or part, the notified polymer is bound within the paint matrix and not available for exposure. Overall, worker exposure to the notified polymer during application is expected to be low.

Transport and storage
Incidental exposure may occur during transfer to storage vessels in the event of a spill or leak. However, under routine circumstances, worker exposure to the notified polymer during transport and storage is expected to be minimal.

9.2.2. Public health – exposure assessment

Members of the public are unlikely to come into contact with the notified polymer unless there is an accident during transport or storage. The public will be exposed to painted car body parts, however, at this stage, the notified polymer is bound within the paint matrix and not available for exposure.

9.2.3. Human health - effects assessment

No toxicological data were provided for the notified polymer or the form in which it is manufactured (the aqueous emulsion RW3131). The polymer has a high molecular weight, however, as it has high concern amino groups, it may have irritant properties.

RW3131, which contains the notified polymer at approximately 20%, also contains 2- butoxyethanol, which is a hazardous substance. However, the content of 2-butoxyethanol is below its concentration cut-off level and, although the RW3131 emulsion MSDS indicates irritant properties, the MSDS also states that RW3131 is not a hazardous substance according to the NOHSC Approved Criteria for Classifying Hazardous Substances (NOHSC, 1999).

The notified polymer has been produced and used in the USA for approximately five years without any adverse health effects being reported.

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9.2.4. Occupational health and safety – risk characterisation

The notified polymer is manufactured and emulsified in closed vessels. The resulting polymer emulsion is then transferred to an emulsification tank where water and lactic acid are added to form the final polymer emulsion. After sampling for quality analysis, the principal emulsion is then stored prior to transport in 200 kg drums.

The notified polymer is never isolated and therefore exposure to the polymer for process, maintenance and laboratory workers would only occur from contact with polymer emulsion containing approximately 20% notified polymer. Given the engineering controls and personal protective equipment worn by the manufacturing workers, the low probability of exposure and likely low systemic toxicity of the notified polymer renders the overall health risk for workers involved in polymer manufacture low.

The notified polymer is transported in drums for end-use as the 20% aqueous based polymer emulsion. The potential for exposure to the notified polymer during storage and transport would be considered low and would only be envisaged following accidental puncture of the bulk containers. Therefore, the health risk for transport workers would be assessed as low.

At the end-user's site the polymer emulsion is blended with other materials to form a primer which will be used to coat automotive bodies and parts by dipping and cathodic electrodeposition. At this point, exposure to diluted notified polymer would only occur as a result of contact with the final paint. As this process is automated, the possibility of exposure is low and would be envisaged only following accidental spillage during routine operations, maintenance or laboratory analysis. Given the likely low toxicity of the notified polymer, and the low concentration of the notified polymer in the paint mix, the health risk to workers involved in end use would be assessed as low.

Following curing of the paint, the polymer will be cross-linked with other paint components to form a high molecular weight stable film. In this form, the polymer is essentially unavailable for absorption and thus the health risk to workers from the notified polymer after paint curing would be negligible.

9.2.5. Public health – risk characterisation

The notified polymer and the emulsion containing it are not freely available to the public. The low likelihood of exposure to the notified polymer and the low toxicity of the notified polymer suggest that the notified polymer will not pose a risk to public health when used in the proposed manner.

10. CONCLUSIONS – ASSESSMENT LEVEL OF CONCERN FOR THE ENVIRONMENT AND HUMANS

10.1. Hazard classification

Based on the available data, the notified polymer is not classified as hazardous under the NOHSC *Approved Criteria for Classifying Hazardous Substances* (NOHSC, 1999b).

There are insufficient data available to allow environmental classification under the GHS.

10.2. Environmental risk assessment

The chemical is not considered to pose a risk to the environment based on its reported use pattern.

10.3. Human health risk assessment

10.3.1. Occupational health and safety

There is low concern to occupational health and safety under the conditions of the occupational settings described.

10.3.2. Public health

There is no significant concern to public health when used in the intended manner.

11. MATERIAL SAFETY DATA SHEET

11.1. Material Safety Data Sheet

The MSDS of the products containing the notified polymer provided by the notifier were in accordance with the NOHSC *National Code of Practice for the Preparation of Material Safety Data Sheets* (NOHSC, 2003). It is published here as a matter of public record. The accuracy of the information on the MSDS remains the responsibility of the applicant.

11.2. Label

The label for the product containing the notified polymer provided by the notifier was in accordance with the NOHSC *National Code of Practice for the Labelling of Workplace Substances* (NOHSC, 1994). The accuracy of the information on the label remains the responsibility of the applicant.

12. RECOMMENDATIONS

CONTROL MEASURES

Occupational Health and Safety

- Employers should implement the following engineering controls to minimise occupational exposure to the notified polymer in principal emulsion and the final cathodic electrodeposition primer:
  - Local exhaust ventilation

- Employers should ensure that the following personal protective equipment is used by workers to minimise occupational exposure to the notified polymer in principal emulsion and the final cathodic electrodeposition primer:
  - Protective eyewear, impermeable gloves and chemical resistant industrial clothing and footwear.

Guidance in selection of personal protective equipment can be obtained from Australian, Australian/New Zealand or other approved standards.

- A copy of the MSDS should be easily accessible to employees.

- If products and mixtures containing the notified polymer are classified as hazardous to health in accordance with the NOHSC *Approved Criteria for Classifying Hazardous Substances* (NOHSC,1999b), workplace practices and control procedures consistent with provisions of State and Territory hazardous substances legislation must be in operation.

Environment

- Prevent uncontrolled release into the environment. Disposal

- Dispose of unused product, or waste material containing the notified chemical to landfill or in accordance with local regulations.

Emergency procedures

- Contain liquid spills and prevent product from flowing into drains.

- Dike and contain spills with inert material and transfer to containers for recovery or disposal.

12.1. Secondary notification

The Director of Chemicals Notification and Assessment must be notified in writing within 28 days by the notifier, other importer or manufacturer:

(1) Under Section 64(2) of the Act:

– if any of the circumstances listed in the subsection arise. The Director will then decide whether secondary notification is required. No additional secondary notification conditions are stipulated.

13. BIBLIOGRAPHY

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