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**NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME  
(NICNAS)**

**PUBLIC REPORT**

**Polymer in RW4769**

This Assessment has been compiled in accordance with the provisions of the *Industrial Chemicals (Notification and Assessment) Act 1989* (Cwlth) (the Act) and Regulations. This legislation is an Act of the Commonwealth of Australia. The National Industrial Chemicals Notification and Assessment Scheme (NICNAS) is administered by the Department of Health, and conducts the risk assessment for public health and occupational health and safety. The assessment of environmental risk is conducted by the Department of the Environment.

For the purposes of subsection 78(1) of the Act, this Public Report may be inspected at our NICNAS office by appointment only at Level 7, 260 Elizabeth Street, Surry Hills NSW 2010.

This Public Report is also available for viewing and downloading from the NICNAS website or available on request, free of charge, by contacting NICNAS. For requests and enquiries please contact the NICNAS Administration Coordinator at:

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## SUMMARY

The following details will be published in the NICNAS *Chemical Gazette*:

ASSESSMENT REFERENCE	APPLICANT(S)	CHEMICAL OR TRADE NAME	HAZARDOUS CHEMICAL	INTRODUCTION VOLUME	USE
LTD/1680	Akzo Nobel Pty Ltd	Polymer in RW4769	ND*	≤ 200 tonnes per annum	Component of automotive paints and coatings

\*ND = not determined

## CONCLUSIONS AND REGULATORY OBLIGATIONS

### **Hazard classification**

As no toxicity data were provided, the polymer cannot be classified according to the *Globally Harmonised System for the Classification and Labelling of Chemicals* (GHS), as adopted for industrial chemicals in Australia, or the *Approved Criteria for Classifying Hazardous Substances* (NOHSC, 2004).

### **Human health risk assessment**

Under the conditions of the occupational settings described, the notified polymer is not considered to pose an unreasonable risk to the health of workers provided that recommended OHS controls are being adhered to.

When used in the proposed manner, the notified polymer is not considered to pose an unreasonable risk to public health.

### **Environmental risk assessment**

On the basis of the PEC/PNEC ratio and the assessed use pattern, the notified polymer is not considered to pose an unreasonable risk to the environment.

### **Recommendations**

#### **CONTROL MEASURES**

##### **Occupational Health and Safety**

- A person conducting a business or undertaking at a workplace should implement the following engineering controls to minimise occupational exposure to the notified polymer as manufactured in the solution and as diluted for use in the automotive coating products:
  - Automated and enclosed processes using local exhaust ventilation, where possible.
- A person conducting a business or undertaking at a workplace should ensure that the following personal protective equipment is used by workers to minimise occupational exposure to the notified polymer as manufactured in the solutions and as diluted for use in the automotive coating products:
  - Impervious gloves
  - Coveralls
  - Goggles

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

- A copy of the (M)SDS should be easily accessible to employees.
- If products and mixtures containing the notified polymer are classified as hazardous to health in accordance with the *Globally Harmonised System for the Classification and Labelling of Chemicals* (GHS) as adopted for industrial chemicals in Australia, workplace practices and control procedures consistent with provisions of State and Territory hazardous substances legislation should be in operation.

## Disposal

- The notified polymer should be disposed of to landfill.

## Emergency procedures

- Spills or accidental release of the notified polymer should be handled by physical containment, collection and subsequent safe disposal.

## Regulatory Obligations

### *Secondary Notification*

This risk assessment is based on the information available at the time of notification. The Director may call for the reassessment of the chemical under secondary notification provisions based on changes in certain circumstances. Under Section 64 of the *Industrial Chemicals (Notification and Assessment) Act (1989)* the notifier, as well as any other importer or manufacturer of the notified polymer, have post-assessment regulatory obligations to notify NICNAS when any of these circumstances change. These obligations apply even when the notified polymer is listed on the Australian Inventory of Chemical Substances (AICS).

Therefore, the Director of NICNAS must be notified in writing within 28 days by the notifier, other importer or manufacturer:

- (1) Under Section 64(1) of the Act; if
  - the polymer has a number-average molecular weight of less than 1000 Da;
  - additional information becomes available as to the sensitisation or corrosion/irritation potential of the notified polymer;
  - the coating process is not isolated from workers;

or

- (2) Under Section 64(2) of the Act; if
  - the function or use of the polymer is proposed to change from a component of automotive paints and coatings;
  - the amount of polymer being introduced has increased, or is likely to increase, significantly;
  - the method of manufacture of the polymer in Australia has changed, or is likely to change, in a way that may result in an increased risk of an adverse effect of the polymer on occupational health and safety, public health, or the environment;
  - additional information has become available to the person as to an adverse effect of the polymer on occupational health and safety, public health, or the environment.

The Director will then decide whether a reassessment (i.e. a secondary notification and assessment) is required.

No additional secondary notification conditions are stipulated.

### *Material Safety Data Sheet*

The MSDS of the product containing the notified polymer provided by the notifier was reviewed by NICNAS. The accuracy of the information on the MSDS remains the responsibility of the applicant.

## **ASSESSMENT DETAILS**

### **1. APPLICANT AND NOTIFICATION DETAILS**

#### APPLICANT(S)

Akzo Nobel Pty Ltd (ABN: 59 000 119 424)  
8 Kellaway Place WETHERILL PARK NSW 2164

#### NOTIFICATION CATEGORY

Limited: Synthetic polymer with Mn ≥ 1000 Da.

**EXEMPT INFORMATION (SECTION 75 OF THE ACT)**

Data items and details claimed exempt from publication: chemical name, other names, CAS number, molecular and structural formulae, molecular weight, analytical data, degree of purity, polymer constituents, residual monomers, impurities, additives/adjuvants, manufacture volume and identity of manufacturer/recipients

**VARIATION OF DATA REQUIREMENTS (SECTION 24 OF THE ACT)**

Variation to the schedule of data requirements is claimed as follows: all physico-chemical endpoints

**PREVIOUS NOTIFICATION IN AUSTRALIA BY APPLICANT(S)**

None

**NOTIFICATION IN OTHER COUNTRIES**

None

**2. IDENTITY OF CHEMICAL****MARKETING NAME(S)**

RW4769 (containing the notified polymer at 10-30%)

**MOLECULAR WEIGHT**

> 1,000 Da

**ANALYTICAL DATA**

Reference GPC spectra were provided.

**3. COMPOSITION****DEGREE OF PURITY**

> 90%

**DEGRADATION PRODUCTS**

The notified polymer is not expected to degrade under normal conditions of use.

**4. PHYSICAL AND CHEMICAL PROPERTIES**

APPEARANCE AT 20 °C AND 101.3 kPa: white liquid\*

Property	Value	Data Source/Justification
Melting Point/Freezing Point	< 20 °C	Estimated
Boiling Point	168-172 °C at 101.3 kPa	MSDS*
Density	1050 kg/m <sup>3</sup> at 20°C	MSDS*
Vapour Pressure	Not determined	Expected to be low based on the high molecular weight.
Water Solubility	Not determined	The notified polymer is expected to be water dispersible based on its amphiphilic structure.
Hydrolysis as a Function of pH	Not determined	Contains hydrolysable functionalities, however, hydrolysis is expected to be slow under environmental conditions (pH 4 – 9).
Partition Coefficient (n-octanol/water)	Not determined	Expected to partition to the interface between octanol and water, based on its amphiphilic structure.
Adsorption/Desorption	Not determined	Expected to partition to surfaces from water in the environment based on its potential cationicity and high molecular weight.
Dissociation Constant	Not determined	The notified polymer has a potential to ionise under environmental conditions (pH 4 – 9).
Particle Size	Not determined	Manufactured in solution
Flash Point	Not determined	Expected to be high based on high molecular weight.

Flammability	Not determined	Not expected to be flammable under normal conditions of use
Autoignition Temperature	Not determined	Not expected to autoignite under normal conditions of use.
Explosive Properties	Not determined	Contains no functional groups that would imply explosive properties.
Oxidising Properties	Not determined	Contains no functional groups that would imply oxidising properties.

\*For the product containing the notified polymer at 10-30%

## DISCUSSION OF PROPERTIES

### *Reactivity*

The notified polymer is expected to be stable under normal conditions of use.

### **Physical hazard classification**

Based on the limited submitted physico-chemical data depicted in the above table, the notified polymer is not recommended for hazard classification according to the *Globally Harmonised System for the Classification and Labelling of Chemicals (GHS)*, as adopted for industrial chemicals in Australia.

## 5. INTRODUCTION AND USE INFORMATION

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

The polymer solution containing 10-30% notified polymer will be manufactured in Australia.

### MAXIMUM INTRODUCTION VOLUME OF NOTIFIED CHEMICAL (100%) OVER NEXT 5 YEARS

<i>Year</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>Tonnes</i>	50-200	50-200	50-200	50-200	50-200

### PORT OF ENTRY

Manufactured

### TRANSPORTATION AND PACKAGING

After manufacture and/or formulation, the solutions containing the notified polymer at up to 30% will be distributed to car manufacturing facilities by road in bulk tanks.

### USE

The notified polymer will be used as a component of automotive paints and coatings at concentrations of < 10%.

### OPERATION DESCRIPTION

#### *Manufacture*

The notified polymer will be manufactured from its starting materials in closed reactors. When polymerisation is complete the resulting solution containing the notified polymer at 10-30% concentration will be transferred into bulk tanks. Samples of the polymer solution containing the notified polymer will be taken for quality control testing.

#### *Formulation*

During formulation, the polymer solution (10-30% notified polymer) will be pumped into a closed mixing system. Following mixing with other ingredients, a sample of the formulation (10-30% notified polymer) will be taken for quality control purposes. After approval by quality analysis, the formulated coating will be filtered and filled into bulk tanks.

#### *End use*

The formulated coating (10-30% notified polymer) will be pumped via vacuum pump into the application tank and mixed with other ingredients. A sample may be taken for quality control purposes. The coating containing < 10% notified polymer will then be automatically applied to car bodies in a process isolated from workers that is likely to involve the dipping of car bodies into tanks containing the coating. The coating will be cured on the car bodies by baking.

## 6. HUMAN HEALTH IMPLICATIONS

### 6.1. Exposure Assessment

#### 6.1.1. Occupational Exposure

##### CATEGORY OF WORKERS

<i>Category of Worker</i>	<i>Exposure Duration (hours/day)</i>	<i>Exposure Frequency (days/year)</i>
Reactor Operator, QC Samplers	8	80-100
Maintenance Workers	1-2	80-100
Laboratory Staff	8	80-100
Storage & Internal Transport	2-4	100-130
Formulation, Dispersing	4	30
Formulation, Makeup	2	30
Formulation, QC	8	30
Formulation, Packaging	8	30
Application, Coater Trays	8	200
Application, Dip Coating	8	200
Application, Equipment Cleaning	2	200

##### EXPOSURE DETAILS

##### *Transport and storage*

During transport and storage, workers are not expected to be exposed to the notified polymer under normal conditions unless a spill event occurs. In the case of a spill, workers may have dermal, ocular or inhalation exposure to solutions containing the notified polymer at up to 30%.

##### *Manufacture*

During manufacture of the notified polymer, dermal and ocular exposure of workers to the notified polymer at up to 30% concentration may occur during quality control analysis, connection and disconnection of transfer lines, and cleaning and maintenance of equipment. Exposure is expected to be minimised through the use of enclosed systems and personal protective equipment (PPE) such as coveralls, safety glasses and impervious gloves.

##### *Coating Formulation*

Dermal and ocular exposure to the notified polymer at concentrations up to 30% may occur during transfer, removal and testing of the coating formulation. Dermal and ocular exposure to the notified polymer at up to 30% concentration may also occur during formulation, packaging and transfer of the formulated coating, and during general cleaning and maintenance of the coating equipment. Inhalation exposure is not expected to occur due to its expected low vapour pressure. Under normal conditions of operation, exposure to the notified polymer would be limited by the use of local exhaust ventilation and personal protection equipment (PPE), including coveralls, safety glasses and impervious gloves.

##### *Coating Application*

Exposure to the notified polymer at up to 10% is likely to be low during the largely automated and isolated coating and curing processes. Under normal conditions of operation, exposure to the notified polymer would also be reduced by use of PPE such as impervious gloves, coveralls and goggles. Once the coatings are applied to the metal surfaces and cured, the notified polymer is expected to be bound within an inert matrix and will not be bioavailable for exposure.

#### 6.1.2. Public Exposure

The notified polymer is intended for industrial use only and exposure of the general public is not expected. Once the coating processes are complete, the notified polymer will be cured into inert coatings on motor vehicles and automotive parts, and will not be bioavailable for exposure.

### 6.2. Human Health Effects Assessment

No toxicity data were submitted.

Based on the high molecular weight ( $> 1000$  Da) of the notified polymer, the potential of the notified polymer to cross the gastrointestinal (GI) tract or to be dermally absorbed after exposure is expected to be limited. However, the polymer contains a proportion of low molecular weight species ( $< 1000$  Da) that may be absorbed.

The notified polymer contains structural alerts for sensitisation and corrosion/irritation effects. Therefore, the potential for skin sensitisation or corrosion/irritation effects of the notified polymer cannot be ruled out, regardless of the relatively high molecular weight of the notified polymer.

#### **Health hazard classification**

As no toxicity data were provided, the notified polymer cannot be classified according to the *Globally Harmonised System for the Classification and Labelling of Chemicals (GHS)*, as adopted for industrial chemicals in Australia, or the *Approved Criteria for Classifying Hazardous Substances* (NOHSC, 2004).

### **6.3. Human Health Risk Characterisation**

#### **6.3.1. Occupational Health and Safety**

Based on the structure of the notified polymer, the potential for skin sensitisation and corrosion/irritation of the notified polymer cannot be ruled out.

Coating manufacture/reformulation/application operators and laboratory staff may come into contact with the solutions containing the notified polymer at up to up to 30%. The risk of corrosion/irritation or sensitisation effects resulting from contact with the notified polymer is expected to be low given that exposure is expected to be limited by the engineering controls and PPE used, and the enclosed and automated processes. After the coating has been applied and cured, the notified polymer will be bound into an inert matrix and will not be bioavailable for further exposure. Under the proposed occupational settings and control measures, the notified polymer is not considered to pose an unreasonable risk to workers.

#### **6.3.2. Public Health**

Members of the public may come into contact with surfaces coated with coating products containing the notified polymer. However, after the coatings are cured, the notified polymer will be bound into an inert matrix and will not be bioavailable for exposure. Based on very low exposure potential, the risk of the notified polymer to public health is not expected to be unreasonable.

## **7. ENVIRONMENTAL IMPLICATIONS**

### **7.1. Environmental Exposure & Fate Assessment**

#### **7.1.1. Environmental Exposure**

##### **RELEASE OF CHEMICAL AT SITE**

The notified polymer will be manufactured in Australia. The manufacturing process is expected to take place in a closed chamber, hence, accidental spillage from this process is expected to be limited. Accidental spills/leaks of the notified polymer and residues of the notified polymer on filters are expected to be collected using absorbent materials and disposed of to landfill.

During coating production, it is estimated by the notifier that up to 2% ( $200,000 \text{ kg} \times 2\% = 4,000 \text{ kg}$ ) of the total annual import volume of the notified polymer (due to sampling, maintenance and waste from the cleaning of equipment) may be released to the environment. Wastes from spills and leaks are expected to be disposed of through licensed waste disposal contractors. Wastewaters from coating production are expected to be contained in the internal interceptor pits before being released to the sewer.

##### **RELEASE OF CHEMICAL FROM USE**

The materials containing the notified polymer are currently only used in the automotive industry. The potential release scenarios of the notified polymer at the industrial coating plants include:

##### **a) Road tanker delivery to plants**

No significant release of the product containing the notified polymer is expected during transport. In the unlikely event of a spill, the product containing the notified polymer will either be contained and disposed to landfill or will be drained to the on-site interceptor pits.



#### b) Electrocoat (e-coat) immersion tank

Automotive bodies and parts are passed through the electrocoat tank by conveyor where the electrodeposition coating (e-coating) is deposited on the surface. The e-coat tank will be replenished with additional coating. Overflow and excess coating is expected to be recycled or directed to internal interceptor pits. Residues collected from filtration of the e-coat tank contents are also expected to be directed to internal interceptor pits. It is expected the filters will eventually be dried and disposed to landfill. No significant release of the notified polymer is expected at this stage.

#### c) E-Coat wash water tanks

Rinsing of the automotive metal surfaces after deposition will be conducted by a closed loop process, with successive rinses, each feeding back to the previous rinse. The final rinse drainings and filtration residues are expected to be directed to the on-site interceptor pits. Sludge from the on-site interceptor pits, containing residues of the notified polymer, is expected to be disposed of to landfill, and effluent is expected to be directed to local sewage treatment plants (STPs).

During a typical e-coating process, the application transfer efficiency of e-coating is generally near unity and a typical transfer rate is approximately 97%. The 3% losses include 0.5% lost in water via the ultrafiltrate and 2.5% lost as sludge during the cleaning and rinsing of the electrode tank. A release of up to 1,000 kg/year (200,000 kg  $\times$  0.5%) of the notified polymer is expected to be directed to the internal interceptor pits.

#### RELEASE OF CHEMICAL FROM DISPOSAL

The notified polymer is expected to share the fate of the coated automobile parts, and at the end of the car's useful life, the coated metal articles will be sent to metal reclamation facilities or be disposed of to landfill. Residual notified polymer in empty import containers (up to 1% of the total import volume) is expected to be disposed of to landfill during drum recycling.

#### 7.1.2. Environmental Fate

No environmental fate data were submitted for the notified polymer. The notified polymer will become irreversibly bound to form part of an inert coating matrix during the heat curing process. The notified polymer will share the fate of the coated automotive parts, which will involve eventual disposal to landfill or thermal decomposition during metal reclamation. In its cured form, the notified polymer is not expected to be bioavailable or mobile in the environment. Bioaccumulation of the uncured polymer is unlikely as it is not expected to cross biological membranes due to its high molecular weight.

Most of the residues of the notified polymer in waste streams generated from the electrodeposition coating process are expected to be captured by on-site interceptor pits. However, a small amount of the notified polymer may not be captured by these systems and could be released to the sewer. In sewage treatment plants, most of the notified polymer is expected to partition to sludge and sediment as it is a potentially cationic polymer and has high molecular weight. Sludge from treatment plants may be collected for disposal to landfill or used in soil remediation. The notified polymer will eventually degrade in landfill, or by thermal decomposition during metal reclamation processes, to form water and oxides of carbon and nitrogen.

#### 7.1.3. Predicted Environmental Concentration (PEC)

The notified polymer in waste waters from manufacturing and use is expected to be contained in internal interceptor pits (4,000 kg + 1,000 kg = 5,000 kg) and it is expected that 90% of the notified polymer will be removed within internal interceptor pits based on its potential cationicity and high molecular weight (Boethling and Nabholz, 1997). Therefore, release of the notified polymer to a local Sewage Treatment Plant (STP) is up to 500 kg/annum (5,000 kg/year  $\times$  10%). The Predicted Environmental Concentration (PEC) was calculated assuming that 10% of the total notified polymer contained in wastewater treated on site will be released to sewer annually. It was assumed that a further 90% of the notified polymer released to the local STP will partition to sludge. The release of the notified polymer will occur over 260 days per annum into an individual sewage treatment plant. This corresponds to release only on working days, based on a 5 day work week. The results of the calculation are shown in the table below.

Predicted Environmental Concentration (PEC) for the Aquatic Compartment		
Annual quantity of chemical released to internal interceptor pits	5,000	kg/year
Removal within internal interceptor pits	90%	
Annual quantity of chemical released to sewer	500	kg/year
Days per year where release occurs	260	days/year
Daily chemical release:	1.923	kg/day

Individual Sewage Treatment Plant Average Daily Flow:	329	ML/day
Removal within STP	90%	Mitigation
Dilution Factor - River	1.0	
Dilution Factor - Ocean	10.0	
PEC - River:	0.58	µg/L
PEC - Ocean:	0.06	µg/L

Partitioning to biosolids in STPs Australia-wide may result in an average biosolids concentration of 52.6 mg/kg (dry wt). Biosolids are applied to agricultural soils, with an assumed average rate of 10 t/ha/year. Assuming a soil bulk density of 1500 kg/m<sup>3</sup> and a soil-mixing zone of 10 cm, the concentration of the notified polymer may approximate 0.4 mg/kg in applied soil. This assumes that degradation of the notified polymer occurs in the soil within 1 year from application. Assuming accumulation of the notified polymer in soil for 5 and 10 years under repeated biosolids application, the concentration of notified polymer in the applied soil in 5 and 10 years may approximate 1.8 mg/kg and 3.5 mg/kg, respectively.

STP effluent re-use for irrigation occurs throughout Australia. The agricultural irrigation application rate is assumed to be 1000 L/m<sup>2</sup>/year (10 ML/ha/year). The notified polymer in this volume is assumed to infiltrate and accumulate in the top 10 cm of soil (density 1500 kg/m<sup>3</sup>). Using these assumptions, irrigation with a concentration of 0.6 µg/L may potentially result in a soil concentration of approximately 3.9 µg/kg. Assuming accumulation of the notified polymer in soil for 5 and 10 years under repeated irrigation, the concentration of notified polymer in the applied soil in 5 and 10 years may be approximately 19.5 µg/kg and 39.0 µg/kg, respectively.

## 7.2. Environmental Effects Assessment

No ecotoxicological data were submitted for the notified polymer. Cationic polymers are known to be toxic to aquatic life. Ecotoxicological endpoints for the notified polymer were calculated based on Structure Activity Relationships (SARs) equations assuming a worst case cationic charge density for the polymer (Boethling and Nabholz, 1997). The endpoints are summarised in the table below and have been modified by mitigation factors to account for the anticipated binding of the polymer with organic carbon in surface waters.

<i>Endpoint</i>	<i>Results</i>	<i>Assessment conclusion</i>
<i>Acute toxicity</i>		
Fish	LC50 (96 h) = 32.9 mg/L	Predicted to be harmful to fish
Daphnia	LC50 (48 h) = 12.8 mg/L	Predicted to be harmful to aquatic invertebrates
Algae	EC50 (96 h) = 2.9 mg/L	Predicted to be toxic to algae

The SARs estimation endpoints indicate that the notified polymer is potentially harmful to fish and aquatic invertebrates, but is potentially toxic to algae in environmental waters with typical levels of total organic carbon. The QSAR estimation procedure used here is a standard approach and is considered reliable to provide general indications of the likely environmental effects of the polymer. However, this method is not considered sufficient to formally classify the acute and long term hazard of the notified polymer to aquatic life under the Globally Harmonised System for the Classification and Labelling of Chemicals (United Nations, 2009).

### 7.2.1. Predicted No-Effect Concentration

The Predicted No-Effect Concentration (PNEC) was calculated using the most sensitive toxicity endpoint (algae) for the notified polymer and an assessment factor of 500. A conservative assessment factor is appropriate, in this case, as although the ecotoxicity endpoints for three trophic levels are available, these are SARs estimation endpoints.

Predicted No-Effect Concentration (PNEC) for the Aquatic Compartment		
EC50 (Algae)	2.90	mg/L
Assessment Factor	500	
PNEC:	5.80	µg/L

## 7.3. Environmental Risk Assessment

Risk Assessment	PEC µg/L	PNEC µg/L	Q
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Q - River:	0.58	5.8	0.101
Q - Ocean:	0.06	5.8	0.010

A Risk Quotient ( $RQ = PEC/PNEC$ ) for a reasonable case discharge scenario have been calculated to be  $< 1$  for the river and ocean compartments. Release of the notified polymer to the aquatic environment in ecotoxicologically significant quantities is not expected based on its assessed use pattern. The notified polymer is not expected to bioaccumulate in the environment. In its cured state the notified polymer will be irreversibly bound into an inert matrix and is unlikely to leach or be bioavailable. On the basis of the assessed use pattern and assumed low hazard, the notified polymer is not considered to pose an unreasonable risk to the environment.

**BIBLIOGRAPHY**

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