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

PUBLIC REPORT

Polymer in Arroshield EVO and EVO-X

This Assessment has been compiled in accordance with the provisions of the *Industrial Chemicals (Notification and Assessment) Act 1989* (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.

This Public Report is 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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**Director
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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/1880	The Trustee for Derwent Dyes Family Others	Polymer in Arroshield EVO and EVO-X	ND*	≤ 50 tonnes per annum	Component of carpet coatings

*ND = not determined

CONCLUSIONS AND REGULATORY OBLIGATIONS

Hazard classification

Based on the available information, the notified polymer is not recommended for classification according to the *Globally Harmonised System of 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

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

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 its low expected aquatic exposure and the reported 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:
 - Enclosed, automated systems where possible
- A person conducting a business or undertaking at a workplace should implement the following safe work practices to minimise occupational exposure during handling of the notified polymer:
 - Avoid skin and eye contact
- 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:
 - Impervious gloves
 - Safety goggles
 - Coveralls
 - Respiratory protection if inhalation exposure may occur

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 of 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

- Where reuse or recycling are not appropriate, dispose of the notified polymer in an environmentally sound manner in accordance with relevant Commonwealth, state, territory and local government legislation.

Emergency procedures

- Spills or accidental release of the notified polymer should be handled by containment, physical 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 chemical, 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;or
- (2) Under Section 64(2) of the Act; if
 - the function or use of the polymer has changed from component of carpet coatings or is likely to change significantly;
 - the amount of polymer being introduced has increased, or is likely to increase, significantly;
 - the polymer has begun to be manufactured in Australia;
 - 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.

(Material) Safety Data Sheet

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

ASSESSMENT DETAILS

1. APPLICANT AND NOTIFICATION DETAILS

APPLICANT

The Trustee for Derwent Dyes Family Others (ABN: 11 067 054 790)
196A Holt Parade
THOMASTOWN VIC 3074

NOTIFICATION CATEGORY

Limited: Synthetic polymer with $M_n \geq 1,000$ Da.

EXEMPT INFORMATION (SECTION 75 OF THE ACT)

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

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

None

NOTIFICATION IN OTHER COUNTRIES

USA (2013)

2. IDENTITY OF CHEMICAL

MARKETING NAMES

Arroshield EVO and EVO-X (products containing the notified polymer)

OTHER NAMES

56-0043

MOLECULAR WEIGHT

> 1,000 Da

ANALYTICAL DATA

Reference GPC data was provided.

3. COMPOSITION

DEGREE OF PURITY

> 80%

4. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE AT 20 °C AND 101.3 kPa:

Property	Value	Data Source/Justification
Melting Point/Freezing Point	Not determined	The notified polymer is introduced as an aqueous solution
Boiling Point	Not determined	The notified polymer is introduced as an aqueous solution
Density	Not determined	Imported at low concentration in aqueous solution
Vapour Pressure	Not determined	Expected to be low based on the high molecular weight of the polymer (> 1,000 Da)
Water Solubility	> 250 g/L at 20 °C	(M)SDS
Hydrolysis as a Function of pH	Not determined	Contains hydrolysable functionalities; however, not expected to rapidly hydrolyse under environmental conditions (pH 4-9)

Partition Coefficient (n-octanol/water)	Not determined	Expected to be low based on high water solubility and ionic properties
Adsorption/Desorption	Not determined	Expected to partition to soil and sediment based on molecular weight and ionic properties
Dissociation Constant	Not determined	Expected to be ionised under environmental conditions (pH 4-9)
Flash Point	> 100 °C	Estimated
Autoignition Temperature	Not determined	Introduced in aqueous solution
Explosive Properties	Not determined	Contains no functional groups that would imply explosive properties
Oxidising Properties	Not determined	Contains no functional groups that would imply oxidative properties

Reactivity

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

Physical hazard classification

Based on the submitted physico-chemical data depicted in the above table, the notified polymer is not recommended for hazard classification according to the *Globally Harmonised System of 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 notified polymer will not be manufactured in Australia. The notified polymer will be imported as part of a product in solution.

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

Year	1	2	3	4	5
Tonnes	30	35	40	45	50

PORT OF ENTRY

Melbourne

TRANSPORTATION AND PACKAGING

The notified polymer will be imported at $\leq 25\%$ concentration in 1,000 L intermediate bulk containers (IBCs) and transported to the site of use by road.

USE

The notified polymer will be used in formulations to impart soil resistance and liquid repellence to carpet.

OPERATION DESCRIPTION

At the site of use, the notified polymer at $\leq 25\%$ concentration in the formulated product will be pumped from the IBCs into application equipment and diluted in water to a final concentration of 2 to 3%. It will then be applied to the freshly dyed carpet via topical application in a booth with chambers. The carpet will then be dried to cure the notified polymer, before going to the secondary backing process, where an additional heating step is expected to further enhance the curing of the coating. The final concentration of the notified polymer in the carpet will be 1.75 to 5.25% w/w.

The notifier advised that the polymer is fully exhausted onto the carpet and will bond to it, and as such it is not expected to be released under normal conditions.

6. HUMAN HEALTH IMPLICATIONS

6.1. Exposure Assessment

6.1.1. Occupational Exposure

EXPOSURE DETAILS

Dermal and ocular exposure to the notified polymer at $\leq 25\%$ concentration by workers may occur during the transfer of the product containing the notified polymer into the application equipment and during the application

of the product onto the carpet. Workers may also be exposed to the notified polymer via the dermal and ocular routes during the cleaning and maintenance of application equipment. Exposure is expected to be minimised by the semi-closed nature of the application equipment and use of personal protective equipment (PPE) including coveralls, impervious gloves and goggles.

Dermal exposure to the carpet containing the notified polymer may also occur during the later stages of carpet manufacture and during the installation of carpet. However the notified polymer will be cured and bonded to the carpet and not expected to be bioavailable, and hence worker exposure at this stage is expected to be very low.

6.1.2. Public Exposure

Formulations containing the notified polymer will not be available to general public. However, the public will be exposed to carpets to which the polymer has been applied. In this form it is not expected to be bioavailable, and therefore the exposure of the public is expected to be very low.

6.2. Human Health Effects Assessment

The result from a toxicological investigation conducted on the notified polymer is summarised in the following table. For full details of the study, refer to Appendix A. No other toxicological data was submitted.

<i>Endpoint</i>	<i>Result and Assessment Conclusion</i>
Rat, acute oral toxicity	LD50 > 5,000 mg/kg bw; low toxicity

Toxicokinetics, metabolism and distribution.

No data on toxicokinetics, metabolism and distribution were submitted for the notified polymer. The notified polymer has high molecular weight (> 1,000 Da) and expected low partition coefficient, and thus dermal absorption is likely to be limited.

Acute toxicity.

The notified polymer was found to be of low toxicity via the oral route with LD50 > 5,000 mg/kg body weight.

Irritation and sensitisation.

No irritation or sensitisation studies were conducted on the notified polymer. The notified polymer contains a structural alert for irritation/corrosion. The potential of the notified chemical for causing skin and eye irritation cannot be ruled out based on physico-chemical properties and the presence of low molecular weight species < 1000 Da.

Health hazard classification

Based on the available information, the notified polymer is not recommended for classification according to the *Globally Harmonised System of 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

Workers may experience dermal and accidental ocular exposure to the notified polymer during the transfer of the product, application process and equipment cleaning and maintenance. The notified polymer has a structural alert for irritation. However the use of semi-closed application equipment along with the use of PPE such as impervious gloves, safety goggles and coveralls will reduce worker exposure to the notified polymer.

Therefore, given the use of PPE and engineering controls in place, the risk to workers from use of the notified polymer is not considered to be unreasonable.

6.3.2. Public Health

The public is expected to have dermal contact with the notified polymer during the use of carpet to which it has been applied. However, the notified polymer is designed to bind to the carpet fibres and hence have a low degree of bioavailability. Based on expected very low exposure, the risk to the public is not considered to be unacceptable.

7. ENVIRONMENTAL IMPLICATIONS

7.1. Environmental Exposure & Fate Assessment

7.1.1. Environmental Exposure

RELEASE OF CHEMICAL AT SITE

The notified polymer will be imported into Australia as a finished aqueous soil and liquid repellent treatment solution for carpets, and will not be reformulated in Australia. Therefore, no environmental release is expected from manufacturing or reformulation in Australia. Environmental release of the notified polymer during importation, transport and storage is likely to be limited to accidental spills and leaks. In the event of accidental spills or leaks, the notified polymer will be contained and collected with absorbents, and is expected to be disposed of to landfill in accordance with local government regulations.

RELEASE OF CHEMICAL FROM USE

The notified polymer will be applied to carpets during the dyeing process. After fibre dyeing, the notified polymer will be applied directly onto the carpet surface, then steam exhausted into the carpet fibres. The notified polymer will be adsorbed to the carpet fibres with a high degree of fixation, and once fixed, is not expected to be released to waste water. Following fixation, the carpet will be rinsed free of unfixed treatment solution, dried by vacuum extraction, then heat-cured during a secondary baking process.

Waste waters from the rinsing of treated carpets and application equipment will be released to an onsite waste water treatment plant. Empty import containers containing residues of the notified polymer are expected to be disposed of in accordance with local government regulations, most likely to landfill.

RELEASE OF CHEMICAL FROM DISPOSAL

The majority of the notified polymer will share the fate of the carpet to which it is applied, and is expected to be disposed of to landfill at the end of its useful life. Waste waters are expected to be discharged to sewer following onsite treatment, and solid wastes from treatment will be collected by a licensed trade waste disposal facility. A minor amount of the notified polymer as residue in import containers is expected to be disposed of to landfill.

7.1.2. Environmental Fate

The notified polymer is not readily biodegradable (15% in 35 days). Therefore, the notified polymer has the potential to be persistent in the environment. Summary results of an environmental fate study were submitted for the notified polymer; please refer to Appendix B for details of this study. As the full study report was not submitted, the data should be treated with caution. The potential for bioaccumulation of the notified polymer is low due to its very high water solubility, high molecular weight and ionic properties. Based on its high molecular weight and ionic properties, notified polymer released to sewer is expected to adsorb to sludge and sediment, and is therefore not expected to reach surface waters.

The majority of the notified polymer fixed to carpets is expected to share the fate of the carpet to which it is bound, and is expected to be ultimately disposed of to landfill. The notified polymer fixed onto carpet fibre is not expected to be mobile or bioavailable. In landfill and in surface waters, the notified polymer is expected to eventually degrade by biotic and abiotic processes to form water and oxides of carbon, nitrogen and silicone.

7.1.3. Predicted Environmental Concentration (PEC)

The predicted environmental concentration (PEC) has not been calculated, since no significant release of the notified polymer to the aquatic environment is expected from the reported use pattern.

7.2. Environmental Effects Assessment

A summary of results from an ecotoxicological investigation conducted in luminescent marine bacteria on the notified polymer was submitted (see table below). Details of this study can be found in Appendix B. However, the full study report was not submitted, and the data should therefore be treated with caution.

Ecotoxicological endpoints for aquatic organisms for the notified polymer were calculated based on structure-activity relationship (SAR) equations, assuming a worst case cationic charge density for the polymer (Boethling and Nabholz, 1997). The endpoints are summarised in the table below.

<i>Endpoint</i>	<i>Result</i>	<i>Assessment Conclusion</i>
<u>Acute Toxicity</u>		
Fish	96 h LC50 = 242.97 mg/L	Not predicted to be harmful to fish
Daphnia	48 h EC50 = 718.44 mg/L	Not predicted to be harmful to <i>Daphnia</i>

Algal Inhibition of Bacterial Respiration	96 h EC50 122.87 mg/L 0.25 h IC50 > 5,000 mg/L	Not predicted to be harmful to algae Not inhibitory to bacterial respiration
<u>Chronic Toxicity</u>		
Fish	ChV = 13.50 mg/L	Not predicted to be harmful to fish in the long term
Daphnia	ChV = 39.91 mg/L	Not predicted to be harmful to <i>Daphnia</i> in the long term
Algal	ChV = 48.80 mg/L	Not predicted to be harmful to algae in the long term

Based on the above calculated and measured ecotoxicological endpoints, the notified polymer is not expected to be acutely harmful to aquatic life. Although the notified polymer is not readily biodegradable, based on its above chronic ecotoxicological endpoints, the notified polymer is not expected to be harmful to aquatic life in the long term. Therefore, the notified polymer is not formally classified under the Globally Harmonised System of Classification and Labelling of Chemicals (GHS) (United Nations, 2009) for acute or chronic toxicities.

7.2.1. Predicted No-Effect Concentration

It is not considered necessary to calculate the predicted no-effect concentration (PNEC) since no significant release of the notified polymer to the aquatic environment is expected from the proposed use pattern.

7.3. Environmental Risk Assessment

The Risk Quotient ($Q = PEC/PNEC$) of the notified polymer has not been calculated due to its low potential for release to the aquatic compartment. The majority of the notified polymer will be irreversibly fixed onto carpet fibres, and after their useful lives, share the fate of the carpets. Whilst the notified polymer is not readily biodegradable, it is expected to have a low potential for bioaccumulation. Therefore, on the basis of its limited aquatic exposure, maximum annual importation volume, and assessed use pattern as a soil repellent in carpets, the notified polymer is not expected to pose an unreasonable risk to the environment.

APPENDIX A: TOXICOLOGICAL INVESTIGATIONS

A.1. Acute toxicity – oral

TEST SUBSTANCE	Notified polymer		
METHOD	OECD TG 425 Acute Oral Toxicity: Up-and-Down Procedure.		
Species/Strain	Rat/Sprague Dawley		
Vehicle	None		
Remarks - Method	No significant deviations from the OECD guideline. Initially, one female rat was dosed orally with the test substance. Since the animal survived, two additional animals were dosed at same level. All the animals were observed for mortality and signs of toxicity for 14 days.		
RESULTS			
	<i>Group</i>	<i>Number and Sex of Animals</i>	<i>Dose mg/kg bw</i>
	1	1 F	5000
	2	2 F	5000
LD50	> 5,000 mg/kg bw		
Signs of Toxicity	Abnormal physical signs including tremors, lethargy, sagging eyelids, wetness of the anogenital area, tachypnea and chromorhinorrhea were observed within four hours post exposure only.		
Effects in Organs	None		
Remarks - Results	All test animals survived and gross necropsy on all animals revealed no observable abnormalities. Body weight and weight gains were normal.		
CONCLUSION	The notified polymer is of low toxicity via the oral route.		
TEST FACILITY	MBRL (2013)		

APPENDIX B: ENVIRONMENTAL FATE AND ECOTOXICOLOGICAL INVESTIGATIONS

B.1. Environmental Fate

B.1.1. Ready biodegradability

TEST SUBSTANCE	Notified polymer
METHOD	OECD TG 301 D Ready Biodegradability: Closed Bottle Test.
Inoculum	Not specified
Exposure Period	35 days
Auxiliary Solvent	None reported
Analytical Monitoring	Chemical Oxygen Demand (COD)
Remarks - Method	At each time period, the dissolved oxygen concentration was measured in two test replicates, with endpoints calculated using the average reading of the two replicates.

RESULTS

<i>Test substance</i>		<i>Potassium hydrogen phthalate</i>	
<i>Day</i>	<i>% Degradation</i>	<i>Day</i>	<i>% Degradation</i>
7	5.0	7	83.7
14	3.8	14	90.0
21	12.5	21	88.7
35	15.0	35	91.2

Remarks - Results

The percentage degradation of the reference compound, potassium hydrogen phthalate, surpassed the threshold level of 60% by 7 days (83.7%), and attained 91.2% degradation by 35 days. Therefore, the test indicates the suitability of the inoculums. However, the validity criteria for the test were not specified.

As the 10-day window started on day 18 of the test (when 10% biodegradation was attained), the duration of the test was extended to 35 days. The notified polymer attained 15% degradation by 35 days. Therefore, the notified polymer cannot be classified as readily biodegradable according to the OECD (301 D) guideline.

CONCLUSION

The notified polymer is not readily biodegradable.

TEST FACILITY

AquaTox (2013b)

B.2. Ecotoxicological Investigations

B.2.1. Inhibition of microbial activity

TEST SUBSTANCE	Notified polymer
METHOD	Protocol EPS 1/RM/24, Environment Canada 1992
Inoculum	Not specified
Exposure Period	0.25 hours
Concentration Range	Nominal: 5,000 mg/L Actual: Not determined
Remarks – Method	The stock solution of 10,000 mg/L (w/v) was prepared by dissolving the test substance in reverse-osmosis water. The reference compound used was zinc sulphate.
RESULTS	
IC50	> 5,000 mg/L
NOEC	Not determined
Remarks – Results	No significant inhibition of respiration rates were observed at 5000 mg/L. However, the validity criteria for the test were not specified. The 0.25 h EC50 was determined to be > 5000 mg/L, based on nominal

concentrations.

CONCLUSION

The notified polymer is not inhibitory to microbial activity.

TEST FACILITY

AquaTox (2013a)

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