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NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME (NICNAS)

FULL PUBLIC REPORT

Polymer in Degalan 2S

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 Ageing, 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 and Water Resources.

For the purposes of subsection 78(1) of the Act, this Full Public Report may be inspected at our NICNAS office by appointment only at 334-336 Illawarra Road, Marrickville NSW 2204.

This Full 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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Director
NICNAS

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1. APPLICANT AND NOTIFICATION DETAILS

APPLICANT(S)
Evonik Degussa Australia Pty Ltd (ABN: 16 079 823 313)
30 Commercial Drive
Dandenong VIC 3175

NOTIFICATION CATEGORY
Limited: Synthetic polymer with NAMW ≥ 1000.

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, Polymer Constituents, Residual Monomers/Impurities, Use Details, and Import Volumes.

VARIATION OF DATA REQUIREMENTS (SECTION 24 OF THE ACT)
Variation to the schedule of data requirements is claimed as follows:

- Vapour pressure
- Water solubility
- Hydrolysis as function of pH
- Partition Coefficient
- Adsorption and Desorption
- Dissociation constant
- Particle size
- Flammability limits
- Autoignition temperature
- Explosive properties.

NOTIFICATION IN OTHER COUNTRIES
None

2. IDENTITY OF CHEMICAL

MARKETING NAME(S)
Polymer in Degalan 2S

ANALYTICAL DATA
Reference FTIR, GPC spectra were provided.

MOLECULAR WEIGHT (MW)
Number Average Molecular Weight (Mn) = 1,000 – 10,000 Da.

FUNCTIONAL GROUP EQUIVALENT WEIGHTS (FGEW)
The notified polymer contains a reactive functional group of high concern. The FGEW is 3,854 Da.

3. COMPOSITION

DEGREE OF PURITY >90%

4. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE AT 20°C AND 101.3 kPa: The notified polymer is imported in solution as a clear, yellowish liquid. The following properties are for the notified polymer in solution unless otherwise stated.

Property	Value	Data Source/Justification
Melting Point/Freezing Point	18°C	Measured for notified polymer
Boiling Point	~148°C at 101.3 kPa	MSDS*
Density	1040 kg/m^3	Measured for notified polymer
Vapour Pressure	< 1.3x10^{-8} kPa	Estimated
Water Solubility	6.6 - 10.7 mg/L at 20°C	Analogue data
Hydrolysis as a Function of pH	Expected to be stable	Analogue data
Partition Coefficient (n-octanol/water)	log P_{OW} > 4 at 20°C	Estimated
Adsorption/Desorption	Not determined	Expected to associate with soil and sediment based on water solubility and Partition Coefficient
Dissociation Constant	pKa >6.4	Estimated
Particle Size	Not Applicable	Introduced in solution
Flash Point	42°C	MSDS*
Flammability	Not determined	Based on the flash point and explosive properties, the product is expected to be highly flammable*
Autoignition Temperature	315°C	MSDS*
Explosive Properties	Upper: 10.8% Lower: 1.5%	MSDS*

* These properties are expected to be primarily due to the presence of solvent in the product.

DISCUSSION OF PROPERTIES

For full details of tests on physical and chemical properties, please refer to Appendix A.

Reactivity

No reaction is expected during use; dissolved in organic solvents. On contact with water however, the notifier states that the oxazolidinyl group may react (by ring opening) to form a secondary amine with the release of formaldehyde. The extent of the reaction is unknown. The notifier states that the notified polymer is not anticipated to come into contact with water throughout its lifecycle in Australia.

Dangerous Goods classification

The notifier states that the product containing the notified polymer is classified as a Class 3 Flammable liquid according to the Australian Dangerous Goods Code (FORS, 1998). The packing group for this class is III.

5. INTRODUCTION AND USE INFORMATION

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

The notified polymer will be introduced into Australia at 50-70% in solution in 208 L steel drums.

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

Year	*1*	*2*	*3*	*4*	*5*
Tonnes	10 – 100	10 – 100	100 – 200	100 – 200	100 – 200

PORT OF ENTRY: MELBOURNE

IDENTITY OF RECIPIENTS

Evonik Degussa Australia Pty Ltd
Dandenong VIC 3175

TRANSPORTATION AND PACKAGING

The notified polymer will be imported in 208 L steel drums and transported by road from the port of entry by road or rail.

The formulated colourant and protective coatings containing the notified polymer will be packaged and

transported by road in various cans, drums and containers.

USE
The notified polymer is a pigment dispersant used in solvent-based protective coatings and colourants for light industrial applications such as signs, buildings and boats.

OPERATION DESCRIPTION
The notified polymer will not be manufactured in Australia.

The notified polymer will be delivered from the manufacturer in Germany in solution in 208L steel drums to Evonik Degussa Australia warehouse in Dandenong, Victoria. At this site it will be used in the manufacture of solvent-based colourant. The notified polymer will be poured using a drum pourer from the drum into the mixing vessel and mixed. The notified polymer will then be moved to the milling areas by forklift where it will be pumped through the mill. The mixing vessel containing the notified polymer will be moved by forklift to the filling area. Filling lines will be connected to the vessel and it will be pumped through the lines into containers (1-litre or 4-litres) or 20 kg pails. The concentration of the notified polymer in the colourant will be between 5-25%.

The colourant containing the notified polymer is then transported by road to various companies around Australia where it will be incorporated in various coatings. Colourant containing the notified polymer will be manually filled into the reaction vessel. The notified polymer will then be blended in the reaction vessel by automated processes. The final product containing the notified polymer will be pumped into containers via automated filling lines. The concentration of the notified polymer in these coatings will be less than 5%. Most of the colourants will be used in 2 components epoxy and polyurethane finishes. A small amount of the notified polymer will be used in alkyd resin type coatings.

The coatings containing the notified polymer will be available to professional coating applicators only. The majority of the coating will be applied by spray with a small amount being applied by roller. The coating will be bound in an inert matrix and products will not be sold to the general public.

6. HUMAN HEALTH IMPLICATIONS

6.1 Exposure assessment

6.1.1 Occupational exposure

NUMBER AND CATEGORY OF WORKERS

Category of Worker	*Number*	*Exposure Duration*	*Exposure Frequency*
Transport and Storage	6	2-3	10-15
Colourant Manufacture			
Make up	3	8	100
Maintenance	2	8	100
Coating Manufacture			
Make up	3	8	100
QC Testing	1	8	100
Maintenance	2	8	100
Coating Application	> 100	8	300

Exposure Details

Transport and Storage
No exposure to the notified polymer is expected to occur during transport and warehousing unless the packaging is accidentally breached.

Colourant and Coating preparation
Workers are potentially exposed when opening the drums and weighing the notified polymer into the mixing vessel. During charging of the mixing vessel, exposure is not expected as this processes is fully enclosed and automated. Workers involved in cleaning of the mixing and filling lines and testing and adjusting batches may be exposed to the notified polymer at 5-25% in any residual colourant that remains in tanks or lines. The main

route of exposure by the dermal route but accidental ocular exposure may also occur. Inhalation exposure is not expected as the notified polymer has a low vapour pressure. Exposure will be prevented by the use of appropriate engineering controls and personal protective equipment. Personal protective equipment used when handling the imported solution containing the notified polymer will include as a minimum: gloves, safety glasses, hard-hat and overalls.

End use
The coatings containing the notified polymer at less than 5% will only be sold to industrial applicators. Inhalation, dermal and ocular exposure may occur during spray painting. Spray painting will occur in ventilated spray booths with workers using appropriate protective equipment to minimise exposure.

During application of the coating with a roller dermal and ocular exposure to the notified polymer may result from drips and splashes. In the industrial setting, workers applying the coating with rollers will wear gloves and safety glasses to minimise exposure.

Once cured, the coating containing the notified polymer is not expected to be released given the intermolecular linkages within the coating finish.

6.1.2. Public exposure
Exposure to the public during transport, storage, and colourant and coating manufacture is expected to be low, except in the event of an accidental spill.

Public exposure will occur as a result of dermal contact with coated surfaces. However the notified polymer will be bound in an inert matrix and hence not bioavailable.

6.2. Human health effects assessment
No toxicity data were submitted. The notified polymer contains a reactive oxazolidine group which has the potential to cause skin irritation and skin sensitisation. However, given the low percentage of low molecular weight species (0.1% <1000 Da.) and low amount of residual monomer (<1%), the oxazolidine group is unlikely to be present in significant quantities. There is no information on the inhalation toxicity, however, the notified polymer has a high molecular weight and is unlikely to cross biological membranes. However, the low water solubility and high molecular weight indicate that it may pose a risk of irreversible lung damage due to lung overloading.

The notified polymer contains an oxazolidine group which could react with water to generate formaldehyde: toxic by inhalation (≥25%), a skin sensitiser (≥0.2%), burning agent (≥25%) and cancer causing agent (≥1%).

The notified polymer also contains hazardous monomers at <1%, that have skin irritation and skin sensitisation potential.

6.3. Human health risk characterisation

6.3.1. Occupational health and safety
There is potential for high levels of inhalation, dermal and ocular exposure during spray application of products containing the notified polymer at 5%. There are no data available on inhalation toxicity of the notified polymer. However, during spray application, there is a risk of adverse effects if inhalation exposure to aerosols is significant. The notified polymer has low water solubility and high molecular weight which may pose a risk of irreversible lung damage due to lung overloading. Due to the hazards associated with the product containing the notified polymer, it is expected that suitable respiratory protection will be used, reducing potential exposure by the inhalation route.

The notified polymer contains an oxazolidine functional group that could react with water to generate formaldehyde. NICNAS has undertaken a priority existing chemical (PEC) assessment on formaldehyde which recommends that the occupational exposure standard be lowered to 0.3ppm 8h TWA and 0.6ppm STEL, due to concerns over the ability of formaldehyde to cause cancer by inhalation (NICNAS, 2006). Therefore engineering controls should be implemented to ensure the notified polymer does not come into contact with water causing the release of formaldehyde. However, if contact with water is unavoidable then formaldehyde levels should be monitored to ensure they remain below the recommended occupational exposure levels.

The potential for skin irritation and skin sensitisation cannot be excluded in the absence of data. Therefore,

suitable personal protective equipment should be used to limit dermal exposure.

The OHS risk presented by the notified polymer is expected to be low, provided that workers use engineering controls, good work practices and particularly respiratory protection during spray application. The notifier states that spray application of coatings containing the notified polymer will occur in spray booths.

6.3.2. Public health

Members of the public will only be exposed to end-use products (such as coatings) in which the notified polymer will be bound within a cured polymeric matrix. Therefore, the risk is considered to be acceptable, due to its expected low exposure and its expected low toxicity.

7. ENVIRONMENTAL IMPLICATIONS

7.1. Environmental Exposure & Fate Assessment

7.1.1 Environmental Exposure

RELEASE OF CHEMICAL AT SITE

The release of the notified polymer to the environment during importation, storage, transport is unlikely. The most likely reason for a release to the environment during these activities will be a transport accident. However, the container capacity and specifications are likely to reduce the extent of release.

Colourant preparation

The release of the notified polymer during colourant preparation is likely to be limited when the engineering controls and automated processes are considered. Any colourant residues that remain in the lines at the end of blending (3% of the total annual volume) will be either recycled or removed by the waste disposal company for incineration or disposal to landfill. Any spills that are likely (<1% of the total annual volume) to occur will be contained in the existing bunded areas and removed by waste disposal company to landfill or disposed of landfill. Leaking drums and any clean up material such as rags are likely to be stored on site in oversized containers or drums until they removed by a waste disposal company for incineration or landfill. Wash solvent from equipment cleaning are disposed of by incineration.

Residues in drums (1% of the total annual introduction volume) may either be removed by the waste disposal company for incineration and landfill.

Some of the waste from the process will be disposed of to landfill; at this stage the notified polymer would be immobile when bound in cured colourant matrix. The notified polymer when incinerated as part of production waste will emit oxides of nitrogen and carbon and possibly ammonia.

RELEASE OF CHEMICAL FROM USE
It is estimated that up to 90% of the coatings will be applied by spray application and the remainder by roller.

As the coatings containing the notified polymer is for industrial use exclusively, the spray application is expected to be performed in spray booths. A loss of 30% due to overspray is expected. The engineering controls for over spray are typically spray booth filters and water scrubbers, with filters generally renewed every 2-4 months. The filters and scrubber waters are disposed of in accordance with Local, State and Federal regulations. Up to approximately 30% of the total annual introduction volume during the application process. The overspray is expected to be captured, and after being allowed to dry will be collected by licensed waste disposal companies for disposal to landfill or by incineration.

The transfer efficiency of rollers is expected to high. It is estimated that less than 1% of the total annual introduction volume will be released through splashes and drips. It is expected that these releases will be collected with adsorbent material and disposed of through industrial waste to landfill or by incineration.

It is expected that residual notified polymer within the containers is expected to account for 2% of the total annual volume and is expected to be disposed to landfill or by incineration.

Approximately 2% of the total introduction volume will be expected to be lost from the cleaning of equipment. It is expected that the rinsate will be captured and disposed of to landfill or by incineration.

RELEASE OF CHEMICAL FROM DISPOSAL
Waste containing the notified polymer resulting from cleaning of equipment and filling lines during the coating manufacture and use incinerated or sent to landfill. The empty containers resulting from all the processes are crushed and sent to landfill. Waste from spill and drips will be collected with inert adsorbent material and disposed of in accordance with local, state and federal requirements, most likely to landfill or incineration.

7.1.2 Environmental fate

No environmental fate data were submitted. All of the notified polymer will eventually be disposed of to landfill, or will be thermally decomposed to oxides of carbon and nitrogen during metal reclamation processes. Once the coating is cured or dried, the notified polymer is expected to be bound in an inert matrix and not be bioavailable. Over time in the landfill environment, the notified polymer is expected to slowly degrade via a combination of biotic and abiotic pathways to form simple organic and nitrogen based compounds.

7.2. Environmental effects assessment

No ecotoxicity data were submitted. The notified polymer has both potentially cationic and anionic functionality, with the former predominating. Thus it could be toxic to the aquatic environment. However, there will be limited, if any, aquatic exposure.

7.3. Environmental risk assessment

Release to the aquatic environment is not expected at any stage during the lifecycle of the notified polymer within Australia. The majority of applied notified polymer is expected to be thermally decomposed during metal reclamation processes. The remaining proportion of notified polymer is expected to be disposed of to landfill in a cured stable coatings matrix which is not expected to be bioavailable. Alternatively, the notified polymer may be disposed of by incineration where possible. Therefore, based on the data provided and the proposed use pattern, the risk to the aquatic environment is expected to be acceptable.

8. CONCLUSIONS AND REGULATORY OBLIGATIONS

Hazard classification
No data is available on the toxicity of the notified polymer and hence it could not be classified as hazardous under the *Approved Criteria for Classifying Hazardous Substances* [NOHSC:1008(2004)]. The polymer has a high molecular weight and low amount of low molecular weight species. It contains an oxazolidine functional group that could react with water to form formaldehyde.

Human health risk assessment

Under the conditions of the occupational settings described, the risk to workers is considered to be acceptable considering that the polymer is used in industrial situations where spray booths are employed.

When used in the proposed manner the risk to the public is considered to be acceptable.

Environmental risk assessment
On the basis of the PEC/PNEC ratio:

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

Recommendations

REGULATORY CONTROLS

Material Safety Data Sheet

CONTROL MEASURES
Occupational Health and Safety

- Employers should implement the following safe work practices to minimise occupational exposure during handling of the notified polymer, as introduced:
  - *Avoid direct contact with material;*
  - *Avoid spills, and minimise direct handling;*
  - *Spray applications are performed only in spray booths where possible;*
  - *Avoid contact with water. If this is not possible, systems should be in place to monitor the release of formaldehyde.*

- Employers should ensure that the following personal protective equipment is used by workers to minimise occupational exposure to the notified polymer, as introduced:
  - *Coveralls, safety goggles/face shield, and gloves to avoid dermal and ocular exposure.*

  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 chemical are classified as hazardous to health in accordance with the *Approved Criteria for Classifying Hazardous Substances* [NOHSC:1008(2004)] workplace practices and control procedures consistent with provisions of State and Territory hazardous substances legislation must be in operation.

- Spray painting applications should be in accordance with the ASCC *National Guidance Material for Spray Painting*.

Disposal

- The notified polymer should be disposed of by incineration where possible. Otherwise, dispose of to landfill.

Emergency procedures

- Spills or accidental release of the notified chemical 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 chemical, have post-assessment regulatory obligations to notify NICNAS when any of these circumstances change. These obligations apply even when the notified chemical 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 importation volume exceeds one tonne per annum notified chemical; or
- the mode of import changes from a component of a solvent based coating; or
- the polymer has a number-average molecular weight of less than 1000; or
- there is an increase in the amount of low molecular weight species in the notified polymer; or
- the notified polymer is used in applications where there is potential for public exposure.

or

(2) Under Section 64(2) of the Act; if
- the function or use of the chemical has changed from a pigment dispersant used in solvent-based industrial coatings and colourants or is likely to change significantly;
- the amount of chemical being introduced has increased from 200 tonnes, or is likely to increase, significantly;
- if the chemical has begun to be manufactured in Australia;
- additional information has become available to the person as to an adverse effect of the chemical 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 notified chemical (and product containing the notified chemical) provided by the notifier was reviewed by NICNAS. The accuracy of the information on the MSDS remains the responsibility of the applicant.

APPENDIX A: PHYSICAL AND CHEMICAL PROPERTIES

Melting Point/Freezing Point 18ºC

Method ISO 11357-2:1999 (E)
Remarks Test reports not available
Test Facility Degussa (2007)

Density 1040 kg/m^3

Method ISO 1183-1"2003
Remarks Test reports not available
Test Facility Degussa (2007)

Vapour Pressure Not determined.

Remarks The molecular weight of notified polymer is greater than 1000 and hence the vapour pressure is expected to be $<10^{-8}$ mmHg ($< 1.3x10^{-8}$ kPa) (US EPA, 2006).
The Vapour Pressure for the imported product is 0.34 kPa at 20ºC according to the MSDS.

Water Solubility 6.6 - 10.7 mg/L at 20°C (based on analogue data)

Remarks Notified polymer is expected to be slightly soluble in water based on its mainly hydrophobic structure. The water solubility of similar polymers were found to be between 6.6 and 10.7 mg/L in tests conducted in accordance to Korean Polymer Test Guidelines (similar to OECD 120).

Analogue 1: 10.7 mg/L 20°C buffer and
Analogue 2: 6.6 mg/L 20°C no buffer.

Hydrolysis as a Function of pH Expected to be stable.

Remarks The water solubility as a function of pH was determined for similar polymers containing 2-3% amino-group methacrylate in tests conducted in accordance to Korean Polymer Test Guidelines (similar to OECD 120).

Analogue 1: 13.5 mg /L at pH 2 (20°C), 9.6 mg /L at pH 9 (20°C), 14.6 mg/L at pH 7 (37°C) and

Analogue 2: 13.1 mg /L at pH 2 (20°C), 9.3 mg /L at pH 9 (20°C), 13.0 mg/L at pH 7 (37°C).

These results indicate that over the range of environmental pH the notified polymer is expected to be only slightly soluble in water and hence hydrolysis is unlikely.

Partition Coefficient (n-octanol/water) log P_{OW} > 4 at 20ºC (Estimated)

Remarks Due to its low water solubility the polymer is expected to become associated with the octanol phase. The estimated log P_{OW} is expected to be > 4 (US EPA, 2006).

Adsorption/Desorption Not determined.

Remarks The notified polymer is expected to be immobile in soil due to its low water solubility and is expected to become associated with soil and sediment.

Dissociation Constant pKa > 6.4 (Estimated)

Remarks Estimated pKa > 6.4 based on the small number of carboxyl bearing monomers in the

notified polymer.

Particle Size Not applicable.

Flash Point Not determined.

Remarks According to the MSDS, 42°C for the imported product.

Flammability Not determined

Autoignition Temperature Not determined.

Remarks According to the MSDS, 315°C for the imported product.

Explosive Properties Not determined.

Remarks Upper limit: 10.8%
Lower limit: 1.5%
Limits given are for the imported product according to the MSDS.

Bibliography

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