

File No PLC/900

February 2010

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

FULL PUBLIC REPORT

Polymer in AQU D-3766

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, Water, Heritage and the Arts.

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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FULL PUBLIC REPORT**Polymer in AQU D-3766****1. APPLICANT AND NOTIFICATION DETAILS**

APPLICANT(S)

Nuplex Industries (Aust.) Pty Ltd (ABN 25 000 045 572)
49-61 Stephen Road
BOTANY NSW 2019

NOTIFICATION CATEGORY

Polymer of Low Concern

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

2. IDENTITY OF CHEMICAL

MARKETING NAME(S)

XXTRADURA FLA 3766 (100% notified polymer)
XXTRADURA FLA 3677 (100% notified polymer)
AQU D-3766 (25-30% notified polymer in aqueous dispersion)

MOLECULAR WEIGHT (MW)

Number Average Molecular Weight (Mn) > 10,000 Da

REACTIVE FUNCTIONAL GROUPS

The notified polymer contains only low concern functional groups.

3. PLC CRITERIA JUSTIFICATION*Criterion**Criterion met*

Molecular Weight Requirements	Yes
Functional Group Equivalent Weight (FGEW) Requirements	Yes
Low Charge Density	Yes
Approved Elements Only	Yes
Stable Under Normal Conditions of Use	Yes
Not Water Absorbing	Yes
Not a Hazard Substance or Dangerous Good	Yes

The notified polymer meets the PLC criteria.

4. PHYSICAL AND CHEMICAL PROPERTIES

Appearance at 20°C and 101.3 kPa:	Tan powder
Softening Point	98-110°C
Bulk Density	350 kg/m ³
Water Solubility	The notified polymer is fully miscible in water, but does not dissolve despite significant solubilising ionic functionality due to its high molecular weight and degree of cross-linking
Dissociation Constant	The notified polymer is a salt and will be fully dissociated in water over the environmental pH range of 4-9

Particle Size	67.5-82.5 μm
Reactivity	Stable under normal environmental conditions
Degradation Products	None under normal conditions of use

5. INTRODUCTION AND USE INFORMATION

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

Year	1	2	3	4	5
Tonnes	< 30	< 30	< 30	< 30	< 30

Use

The notified polymer will be used as a cement additive at $\leq 1\%$. At the end use sites it will be added manually to a mixing vessel with other cement components and mixed. The finished cement containing the notified polymer will be pumped directly into oil and gas wells.

Mode of Introduction and Disposal

The notified polymer will be imported either at 100% as a dry powder or at 25-30% in an aqueous dispersion.

6. HUMAN HEALTH IMPLICATIONS

Hazard Characterisation

No toxicological data were submitted. The notified polymer meets the PLC criteria and is therefore assumed to be of low hazard.

The notified polymer has a molecular weight in the range of 1,000-10,000 Da., and contains a portion (5.7%) of particles in the respirable range ($< 10\mu\text{m}$). The notified polymer is unlikely to be absorbed from the lung due to its low water solubility and molecular weight, so deposition in the lung is possible. However, it is assumed that any particulates of the notified polymer within this molecular weight range will be cleared by normal lung clearance mechanisms.

Occupational Health and Safety Risk Assessment

Dermal and ocular exposure to the notified polymer (at 100% in powder form or at 25-30% in a dispersion) may occur during formulation of cement mixture, sampling the mixture for quality control, cleaning of mixing equipment and from spills and splashes during mixing and transfer of the mixture to drilling wells. Exposure is expected to be minimised by the use of personal protective equipment (PPE) such as overalls, gloves, boots, respiratory protection and/or safety glasses.

The greatest potential for inhalation exposure is expected during the manual transfer of the notified polymer (100%) in powder form into mixing vessels. The risk posed by the notified polymer upon inhalation is unknown. However, due to its molecular weight being $< 10,000$ Da., it is assumed that normal lung clearance mechanisms would not be overloaded following repeated inhalation of a small amount of respirable particles.

The Australian recommended exposure standard for dust is 10 mg/m^3 [NOHSC 3008:(1995)], but a recommended exposure limit of 3 mg/m^3 has been suggested by the American Conference of Governmental Industrial Hygienists (ACGIH) for "respirable (insoluble) particulates (not otherwise regulated)". Dust levels should be minimised as much as possible during manual transfer of the notified polymer into the mixing vessels onsite. Correctly fitted respiratory protection should be worn by workers involved in manual transfer of the notified polymer.

The risk to workers is not expected to be unacceptable given the low percentage of respirable particles ($< 10\mu\text{m}$) and the assumed low hazard of the notified polymer.

Public Health Risk Assessment

The public are not expected to be exposed to the notified polymer as it is intended for use in cement mixtures in industrial settings only. Based on the absence of exposure and the assumed low hazard, the risk to public health posed by the notified polymer is not considered to be unacceptable.

7. ENVIRONMENTAL IMPLICATIONS

The notified polymer meets the PLC criteria and can therefore be considered to be of low hazard. This is supported by environmental endpoints observed in testing conducted on analogues of the notified polymer.

<i>Endpoint</i>	<i>Result</i>	<i>Effects Observed?</i>	<i>Test Guideline</i>
Fish Toxicity	LC50 >5000 mg/L for Formulation A LC50 >5000 mg/L for Formulation B	No	EPA/600/4-90/027F
Daphnia Toxicity	LC50 >1000 mg/L for Formulation A LC50 >5000 mg/L for Formulation B	Yes – mortality	EPA/600/4-90/027F

All results were indicative of low ecotoxicological hazard. This conclusion is supported by additional ecotoxicology information reported in the MSDS for the powdered form of the notified polymer which indicates that similar products are not harmful to representative species from each of the three marine trophic levels.

The fish study was conducted under static conditions on two separate formulated products which each contained a different analogue polymer present as a 30% dispersion in water. The two polymers are understood to differ primarily based on the proportions of a particular acid functionality present in the structure (Formulation A: 10% acid functionality; Formulation B: 20% acid functionality). The tests were conducted on a whole product basis and the nominal concentrations were reported as milligrams of whole product per litre. The samples dispersed well during solution preparation remaining clear, with no observable precipitates or surface slicks. At the end of the 96-hour exposure, no mortality occurred at 5000 mg/L, the highest concentration tested for either formulation.

Similarly, the aquatic invertebrate study was conducted on a whole product basis using the same formulations of analogue polymers as used in the fish toxicity test. The nominal concentrations were again reported as milligrams of whole product per litre. At the end of the 48-hour exposure, 40% mortality occurred at 5000 mg/L of Formulation A. No mortality occurred at 1000 mg/L dose rate. At the end of the 48-hour exposure, 5% mortality occurred at 5000 mg/L, the highest concentration tested, of Formulation B. Following EPA protocols, mortality of less than 10% is considered statistically insignificant. Reportable data is, therefore, 0% mortality at 5000 mg/L of Formulation B, containing up to 30% of an analogue polymer.

Environmental Risk Assessment

The notified polymer will be reformulated at the oil and gas drilling site to produce a cement mixture that will be pumped directly from the onsite mixing vessel into the well where it will cure to form a solid concrete structure that acts to seal the well. Residual notified polymer within packaging (empty bags or drums) is expected to be disposed of to landfill. Washings of equipment used to prepare and dispense the formulated cement mixture may contain up to 1% of the annual introduction volume of notified polymer. It is anticipated by the notifier that the cement washings will be collected and where possible reused in further cementing applications or be disposed to landfill. However, it is reasonable to assume that the liquid phase of the washings, in an offshore drilling situation, may be disposed directly to the marine environment.

Given the use pattern, some limited aquatic exposure can be expected as a result of cleaning operations at offshore oil and gas drilling sites. While the notified polymer is miscible with water and mobile in aqueous conditions, the use pattern and results of aquatic ecotoxicity testing indicate that the risk to aquatic species is low. Notified polymer incorporated into hardened cement is expected to resist degradation, and environmental exposure is not expected whilst the notified polymer is entrapped within the cement matrix.

Notified polymer that is disposed to landfill is expected to partition to surfaces where it will undergo gradual degradation. While not readily biodegradable (< 60% degradation over 28 days in seawater by OECD TG 306), its large molecular weight indicates that it will not be volatile nor be able to cross biological membranes and is therefore not considered to be bioavailable or bioaccumulative.

Therefore, based on the proposed use pattern, the notified polymer is not expected to pose a risk to the environment.

8. CONCLUSIONS AND RECOMMENDATIONS

Human health risk assessment

Under the conditions of the occupational settings described, the notified polymer is not considered to pose an unacceptable risk to the health of workers.

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

Environmental risk assessment

Based on the reported use pattern, the notified polymer is not considered to pose a risk to the environment.

Recommendations

CONTROL MEASURES

Occupational Health and Safety

- Employers should implement the following engineering controls to minimise occupational exposure to the notified polymer as introduced in powder form:
 - Local Exhaust ventilation is in place to minimise dust levels where weighing and mixing occurs.
- Employers should implement the following safe work practices to minimise occupational exposure to the notified polymer as introduced in powder form:
 - Avoid the formation of airborne dusts.
- Employers should ensure that the following personal protective equipment is used by workers where dust may be generated:
 - Correctly fitted respiratory protection (adequate for respirable particle sizes)

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.
- In the interest of occupational health and safety, the following guidelines and precautions should be observed for use of the notified polymer as introduced in powder form:
 - The level of atmospheric dust should be maintained as low as possible. The Australian recommended exposure standard for dust is 10 mg/m³ [NOHSC 3008:(1995)], but a recommended exposure limit of 3 mg/m³ has been suggested by the American Conference of Governmental Industrial Hygienists (ACGIH) for “respirable (insoluble) particulates (not otherwise regulated)”.
- If products and mixtures containing the notified polymer 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.

Disposal

- The notified polymer should be disposed of to landfill.

Emergency procedures

- Spills and/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 polymer 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:

- (2) Under Section 64(2) of the Act; if
- the function or use of the notified polymer has changed from [a component of cement](#), or is likely to change significantly;
 - the amount of notified polymer being introduced has increased, or is likely to increase, significantly;
 - [the notified polymer 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.

Material Safety Data Sheet

The MSDS of 2 [products containing the notified polymer](#) provided by the notifier were reviewed by NICNAS. The accuracy of the information on the MSDS remains the responsibility of the applicant.