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NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME (NICNAS)

FULL PUBLIC REPORT

Synthacryl 700

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)
Cytec Australia Holdings Pty Ltd (ABN 45 081 148 629)
Suite 1, Level 1 Norwest Quay
21 Solent Circuit
Norwest Business Park
Baulkham Hills NSW 2153

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

EXEMPT INFORMATION (SECTION 75 OF THE ACT)
Data items and details claimed exempt from publication:
Chemical name; Other names; CAS Number; Molecular formula; Structural formula; Molecular weight; Purity; Identity of toxic or hazardous impurities; % Weight of toxic of hazardous impurities; Non-hazardous impurities; Identity of additives/adjuvants; % Weight of additives/adjuvants; Manufacture/import volume; Concentration of the notified polymer in end-use products; Use details.

VARIATION OF DATA REQUIREMENTS (SECTION 24 OF THE ACT)
Variation to the schedule of data requirements is claimed as follows:
Melting Point/Boiling Point; Density; Vapour Pressure; Hydrolysis as a Function of pH; Partition Co-efficient; Absorption/Desorption; Dissociation Constant; Flash Point; Flammability Limits; Autoignition Temperature; Explosive Properties; Reactivity

PREVIOUS NOTIFICATION IN AUSTRALIA BY APPLICANT(S)
None

NOTIFICATION IN OTHER COUNTRIES
Korea (2004)

2. IDENTITY OF CHEMICAL

MARKETING NAME(S)
Synthacryl 700

3. COMPOSITION

DEGREE OF PURITY
>97%

DEGRADATION PRODUCTS
Some degradation of the product and a decrease in epoxy content is expected after 12 months.

LOSS OF MONOMERS, OTHER REACTANTS, ADDITIVES, IMPURITIES
The residual monomers may be lost to the environment when the polymer or product containing it is in the powder form. Once the powder coated products are cured, the monomers will be trapped in the solid matrix.

4. INTRODUCTION AND USE INFORMATION

MODE OF INTRODUCTION OF NOTIFIED CHEMICAL (100%) OVER NEXT 5 YEARS
The notified polymer will be imported neat into Australia as a powder at a purity of >97%. It will not be manufactured in Australia.

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

Year	*1*	*2*	*3*	*4*	*5*
Tonnes	<15	<15	10-20	10-20	10-30

USE
The notified polymer will be used in powder coating preparations. It will be used industrially, for example, in the automotive industry and on consumer articles such as outdoor furniture, doors and windows.

5. PROCESS AND RELEASE INFORMATION

5.1. Distribution, transport and storage

PORT OF ENTRY
The notified polymer will be imported through Sydney by wharf.

IDENTITY OF MANUFACTURER/RECIPIENTS
Industrial paint formulators of powder coating products.

TRANSPORTATION AND PACKAGING
The notified polymer will be imported in 25 kg polyethylene bags within fibreboard cartons and transported from dockside on shrink-wrapped pallets. It will be transported from the wharf to powder coating formulators around Australia by road for warehousing and formulation into powder coating products.

5.2. Operation description

Reformulation
At the formulation site, bags containing the notified polymer as a powder (>97% purity) are removed from boxes and manually transferred to a weighing station. Following weighing, the notified polymer is manually poured into enclosed tanks with other ingredients. Powder coatings containing the notified polymer are typically produced by blending and extruding using enclosed and automated systems. The resulting matrix is ground into a fine powder. The powder is stored in automatically sealed bags for use as required. The formulated powder coating contains the notified polymer at <25 % concentration.

Quality control personnel collect samples of the flakes or finely milled powder. Flakes are milled into fine powder and sprayed onto test panels for curing and evaluation. Maintenance workers are required to service the machinery periodically.

End use
The finished product containing the notified polymer will be transported by road from the formulation site to the powder coating facilities. At the powder coating facility, bags are opened and either emptied into a hopper with an automatic feeder to the production line, or a spray gun is connected directly from the bag. The majority of the powder coatings are applied by automated systems (>97%), with the remainder being applied manually. When using automated systems, the item is placed within an enclosed application unit and transported through a spray zone containing a number of electrostatic spray guns and into an oven via an overhead conveyor for curing. The operator inspects the final coating and ensures that the powder is continuously supplied to the sealed automatic applicator unit. Manual application of the powder coating may be required to touch up the items or to ensure complete coating of the article. Manual spraying is undertaken in a separate manual spray booth.

5.3. Occupational exposure

Number and Category of Workers

Category of Worker	*Number*	*Exposure Duration*	*Exposure Frequency*
Transport and Storage			
Transporting from dock to customer's site for warehousing (loading/unloading trucks)	2	2-3 hours/day	10-15 days/year
Powder coating formulation			
Workers involved in weighing, mixing and bead milling operations	6	30 min to 6 hours/day	30 days/year
Workers involved in filling bags of coating	2	3 hours/day	30 days/year
Quality control/chemists and technical service	2	1 hour/day	30 days/year
Cleaning and maintenance operations	2	30 min/day	30 days/year
End use			
Powder coating industry	> 1000	8 hours/day	220 days/year

Exposure Details
Transport and storage
Warehousing and distribution of the notified polymer involves loading, moving and storing of packaged products containing the notified polymer. No exposure is expected except in the case of an accident.

Reformulation
During reformulation of powder coatings, dermal, ocular and inhalation exposure to the notified polymer may occur during manual operations, such as opening the bags containing the notified polymer, weighing and loading into a mixing tank. Other processes are fully automated and enclosed. Exposure should be minimised by the local exhaust ventilation in place during each step in the reformulation process, and by workers wearing personal protective equipment such as anti-static overalls, non-insulating gloves, anti-static footwear, and respirators or air fed respiratory equipment.

Quality control personnel may be exposed to the notified polymer during sampling of coatings and during electrostatic application to test metal panels, which takes place in a dedicated spray booth. Exposure should be minimised by QC personnel wearing laboratory coats, gloves and eye goggles, and by the fact that only small quantities will be handled.

End use
Dermal, ocular and inhalation exposure to the notified polymer may occur during transfer of the powder coating to the hopper. Exposure is likely to be minimised by the use of local exhaust ventilation and the wearing of personal protective equipment.

Over 97% of the powder coating is applied automatically in enclosed application units and the remainder is applied manually. No worker exposure to the notified polymer during automatic spraying is expected to occur, given that such operations will be performed in a sealed and enclosed application unit. During manual spray operations, dermal, ocular and inhalation exposure to the notified polymer at concentrations <25% may occur. Exposure should be minimised by performing manual operations in spray booths that extract airborne powder, with the direction of airflow coming from behind the operator. In addition, personal protective equipment will be worn to further reduce exposure, including anti-static overalls, non-insulating gloves, anti-static footwear, and respirators or air fed respiratory equipment.

Dermal exposure to the notified polymer may occur when handling uncured coated articles. Exposure should be reduced by workers wearing personal protective equipment similar to that outlined above.

Upon curing, the polymer becomes an integral part of the article and exposure is not expected.

5.4. Release

RELEASE OF CHEMICAL AT SITE

The notified polymer will not be manufactured in Australia. Release of the notified polymer at the customer site is expected to be minimal.

RELEASE OF CHEMICAL FROM USE

During formulation

During formulation activities, approximately 1% of the notified polymer is expected to be left as residue in the 20 kg lined paper bags (~ 300 kg based on import volumes of 30 tonne per year). A further 1% may be lost as a result of spills and equipment leaks, which also equates to 300 kg per year based on 30 tonne import volume. Material lost due to spills and leaks will be collected, placed in label containers and collected by waste disposal contractors. Residues left in bags will be disposed of to landfill along with the imported bags.

During End-Use Application

In industrial applications, spraying systems are closed systems designed to minimise the amount of overspray. The application of the powder coatings to substrates is generally carried out in spray booths with exhaust extraction systems designed to trap excess dust and coating powder in collector systems. In most industrial coating operations, all excess powder is recovered and re-used. Equipment cleaning is done with dust-tight vacuum cleaners and this material is also collected for re-use or disposal.

It is estimated that 1-5% of powder may be collected during application and equipment cleaning. Consequently, at the maximum import volume of 30 tonnes, up to 1500 kg of the notified polymer could be generated each year for disposal or re-use. It is estimated that up to 150 kg of the notified polymer will be left as residues in bags. These bags will be disposed of to landfill.

No release of the notified polymer is expected once the coatings are applied and cured. Upon curing the polymer is incorporated into the polymer matrix where it will become inert.

Under normal usage the notified polymer is not expected to enter soil or aquatic compartments. As such, it is expected that environmental exposure to the notified polymer will be limited. Most of the polymer will be incorporated into the polymer matrix of coatings, which upon curing become inert. Once incorporated into the coating formulation, the notified polymer is expected to be immobile in the environment. At the end of their useful life, the substrates coated with the polymer are likely to be recycled or placed into landfill.

The water solubility of the polymer is 50 mg/L and it is not volatile, hence, if the notified polymer is placed in landfill, it may have some degree of mobility. However, in the cured and cross-linked form it is expected to be immobile and would degrade along with the substrates onto which it is deposited.

5.5. Disposal

All wastes generated during application, which are not reused, are expected to be disposed of to landfill. Container residues will be disposed to landfill along with the import bags.

The notified polymer will form part of a surface coating on substrates and be fixed strongly to the coated articles, thus sharing their fate. At the end of their useful lives these would be disposed of to landfill. Released material resulting from the surface coating process would also be placed into landfill. When disposed of to landfill, the highly cross linked nature of the material will preclude significant leaching, and the polymer would be subject to the slow biodegradation processes operative in landfill situations.

5.6. Public exposure

The coating product containing the notified polymer will not be available to the public. The general public may come into contact with coated articles. However, the notified polymer will be encapsulated within the cured coating and will not be available for exposure.

6. PHYSICAL AND CHEMICAL PROPERTIES

Appearance at 20°C and 101.3 kPa	Pale odourless granules

Melting Point/Freezing Point Not determined

Boiling Point Not determined

Glass Transition Temperature 82°C

METHOD Differential Scanning Calorimetry
TEST FACILITY Cytec (2007)

Density 1200 kg/m^3

Remarks Quoted in MSDS

Vapour Pressure Not determined

Remarks The notified polymer is of high molecular weight and is not expected to be volatile.

Water Solubility 0.05 g/L at 20°C

METHOD
1. Weigh 5.0 g of resin into 200 ml of distilled water.
2. Stir for 24 h at 25 °C.
3. Filter the dispersed mixture through filter paper.
4. Evaporate the water from the filtrate in an oven at 60 °C. Cool it down in a dessicator and weigh the dried beaker.
5. Calculate the weight of the dissolved solid.

TEST FACILITY Cytec (2006)

Hydrolysis as a Function of pH Not determined

Remarks The notified polymer has only limited solubility in water, thus the hydrolysis as a function of pH cannot be determined. The polymer contains groups that are amenable to hydrolysis, but it is not very soluble in water and should not hydrolyse significantly in the environmental pH range (4-9).

Partition Coefficient (n-octanol/water) Not determined

Remarks The notified polymer is relatively insoluble in water and is expected to have high solubility in n-octanol.

Adsorption/Desorption Not determined

Remarks The polymer is relatively insoluble in water and is expected to largely adsorb or associate with the organic matter of soils and sediments.

Dissociation Constant Not determined

Remarks The polymer does not contain any groups able to dissociate.

Particle Size Average particle size 4mm

METHOD In-house test method, details not provided. Only a result table was provided.

Range	*%*
≤150 µm	0.1
150 µm – 1 mm	2.7
1 – 5 mm	66.7
5 – 10 mm	30.1
≥10 mm	0.4

Remarks <0.1% of the notified polymer is of inhalable size (<100 μm).
A negligible fraction of the notified polymer would be of respirable size (<10 μm).

The notifier has stated that grinding of the product following reformulation involves sieving and classification of the powder to ensure an even particle size distribution. The particle size generally falls within the range of 10 – 120 μm, with an average of approximately 50 μm.

TEST FACILITY Not indicated

Flash Point Not determined

Remarks The notifier has estimated the flash point to be >200ºC.

Flammability Limits Not determined

Remarks The notifier has stated that the notified polymer is not expected to be flammable.

Autoignition Temperature Not determined

Remarks The notified polymer is not expected to auto-ignite under normal conditions of use. The autoignition temperature will be >200 ºC, based on its estimated flash point.

Explosive Properties Not explosive

METHOD Differential scanning calorimetry (DSC)

Remarks The notified polymer contains a chemical group that could infer explosive properties (Brethericks, 1999). The notifier provided the results of DSC performed on the notified polymer up to temperatures of 250 ºC. The DSC trace did not display any sharp peaks (sharp peaks would have been consistent with explosive properties). The notifier states that they have not had any reported explosions with this product.

TEST FACILITY Cytec (2007)

Reactivity Not determined

Remarks The notified polymer is stable under normal conditions of use. It is unreactive up to temperatures of 140 ºC.

7. TOXICOLOGICAL INVESTIGATIONS

No toxicity data were submitted.

8. ENVIRONMENT

8.1. Environmental fate

No environmental fate data were submitted.

8.2. Ecotoxicological investigations

No ecotoxicity data were submitted.

9. RISK ASSESSMENT

9.1. Environment

9.1.1. Environment – exposure assessment

The majority of the notified polymer will be thermally cured on the surface of the articles to which it has been applied, forming a very high molecular weight and stable film. As the coating degrades over time, any fragments, chips and flakes of the coating will be of little concern as they are expected to be inert. The surfaces coated with the polymer are likely to be either recycled for metal reclamation or be placed into landfill at the end of their useful life (5-20 years). When recycled the polymer would be destroyed in furnaces and converted to water vapour and oxides of carbon and sulfur.

Waste from cleaning of application equipment may be disposed of to landfill where it is expected to degrade via biotic and abiotic process over time to form simple organic compounds.

The polymer is not expected to cross biological membranes, due to its high molecular weight and as such should not bioaccumulate

9.1.2. Environment – effects assessment

No data were provided. Non-ionic polymers of MW > 1,000 are generally of low concern to the aquatic environment.

9.1.3. Environment – risk characterisation

No environmental exposure of the notified polymer is expected under normal usage as the polymer is not expected to enter soil or aquatic compartments. Most of the polymer will be incorporated into the polymer matrix of coatings, which upon curing become inert. Once incorporated into the coating formulation, the notified polymer is expected to be immobile in the environment. At the end of their useful life, the substrates coated with the polymer are likely to be recycled or placed into landfill. The notified polymer is not expected to pose an unacceptable risk to the environment.

9.2. Human health

9.2.1. Occupational health and safety – exposure assessment

Dermal, ocular and inhalation exposure to the notified polymer may occur during reformulation, particularly when handling the neat notified polymer such as when opening bags, and when manually weighing and transferring the notified polymer into the mixing tank. However, worker exposure should be reduced by local exhaust ventilation, the granular nature of notified polymer and the use of personal protective equipment.

Following reformulation, the notified polymer will be present at concentrations <25%. No worker exposure is expected during automatic spraying processes, however, dermal, ocular and inhalation exposure to the notified polymer may occur during manual spray operations, including quality control spraying and during transfer of the powder coating to the hopper. The notifier has indicated that the final powder product will have only a small proportion of particles of size <10μm (respirable). However, a significant proportion of particles are expected to be of inhalable size (10 – 100 μm).

Exposure during manual spray operations is expected to be minimised by performing manual spray operations in spray booths that extract airborne powder, with the direction of airflow coming from behind the operator, and the wearing of personal protective equipment including respiratory equipment.

9.2.2. Public health – exposure assessment

The notified polymer is present in a number of products that the public are likely to come into contact with occasionally, such as outdoor furniture, doors, windows, etc. However, the notified polymer is unlikely to be bioavailable as it becomes encapsulated within a polymer matrix during curing. Therefore the level of public exposure is expected to be minimal.

9.2.3. Human health – effects assessment

No toxicological data have been provided for the notified polymer and therefore the substance cannot be classified in accordance with the NOHSC *Approved Criteria for Classifying Hazardous Substances* (NOHSC, 2004).

The notified polymer contains an epoxy functional group that has a structural alert for irritation/corrosion (Hulzebos 2005), sensitisation (Barratt 1994), cancer, reproductive effects, and perhaps genotoxicity (USEPA). The USEPA specifies that structures with epoxy equivalent weights of >1,000 are presumed not to pose a hazard under any conditions. In addition, concerns are confined to species with molecular weights <1,000 or <500 if exposure is limited to the dermal route. Species of low molecular weight (<1000) have a higher sensitising potential compared with oligomers of higher molecular weight (HSE, 2003).

The functional group equivalent weight of the notified polymer is <1000, however, its high molecular weight (>1,000) and low percentage of low molecular weight species (<1% <1000, 0% <500) should mitigate the health concerns of the notified polymer associated with this functional group.

9.2.4. Occupational health and safety – risk characterisation

The notified polymer has not been tested for any toxicological properties, however, it is expected to be of low hazard, given its high molecular weight and low percentage of low molecular weight species.

The risk for workers is considered to be greatest where inhalation exposure to the notified polymer could occur, however, considering that exposure of workers to the notified polymer during reformulation and end use is expected to be mitigated through the use of engineering controls and personal protective equipment, the occupational health and safety risk of the notified polymer is considered to be low.

9.2.5. Public health – risk characterisation

The exposure of the public to the notified polymer is expected to be negligible; therefore the risk to public health is negligible.

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

10.1. Hazard classification

Based on the available data the notified polymer cannot be classified as hazardous under the NOHSC *Approved Criteria for Classifying Hazardous Substances.*

10.2. Environmental risk assessment

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

10.3. Human health risk assessment

10.3.1. Occupational health and safety

There is Low Concern to occupational health and safety under the conditions of the occupational settings described.

10.3.2. Public health

There is Negligible Concern to public health when used in the proposed manner.

11. MATERIAL SAFETY DATA SHEET

11.1. Material Safety Data Sheet

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

11.2. Label

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

12. RECOMMENDATIONS

CONTROL MEASURES
Occupational Health and Safety

- Employers should implement the following engineering controls to minimise occupational exposure to the notified polymer:
  - Local exhaust ventilation during reformulation processes where exposure to dust may occur, and during transfer of the powder coating.
  - Spray booths during manual spray operations.

- Employers should implement the following safe work practices to minimise occupational exposure during handling of the notified polymer:
  - Avoid inhalation exposure to powder.
  - Avoid generating and breathing dust.

- Employers should ensure that the following personal protective equipment is used by workers to minimise occupational exposure to the notified polymer:
  - Respiratory protection during manual spraying operations and transfer of the powder coating.

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

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

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

Environment
Disposal

- The notified polymer should be disposed of by controlled incineration or landfill in accordance with local jurisdiction waste management regulations

Emergency procedures

- Spills/accidental release of the notified polymer should be contained and placed in suitable containers for disposal.

12.1. Secondary notification

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

(1) Under Section 64(1) of the Act; if
  - the polymer has a number-average molecular weight of less than 1000;
  - there is a significant increase in the % of low molecular weight species (<1000).

or

(2) Under Section 64(2) of the Act:
  - if any of the circumstances listed in the subsection arise.

The Director will then decide whether secondary notification is required.

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