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NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

Polymer in Halar 800/8000 Series

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 National Occupational Health and Safety Commission which also conducts the occupational health & safety assessment. The assessment of environmental hazard is conducted by the Department of the Environment and the assessment of public health is conducted by the Department of Health and Family Services.

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Director
Chemicals Notification and Assessment

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1. APPLICANT

Swift and Company Ltd of 64 Trenerry Crescent Abbotsford VIC 3067 has submitted a Polymer of Low Concern notification statement in support of their application for an assessment certificate for Polymer in Halar 800/8000 Series.

2. IDENTITY OF THE CHEMICAL

The chemical name, CAS number, molecular and structural formulae, molecular weight, spectral data and details of the polymer composition have been exempted from publication in the Full Public Report.

Marketing Name:	Halar 801, Halar 812, Halar 840, Halar 8013, Halar 8014, Halar 8514, Halar 8614, Halar XPH 427

Characterisation as a Synthetic Polymer of Low Concern

Number-Average Molecular Weight (NAMW):	> 1000
Maximum Percentage of Low Molecular Weight Species	
Molecular Weight < 500:	< 10 %
Molecular Weight < 1 000:	< 25 %
Polymer Stability	the notified polymer is stable under normal environmental conditions; thermally stable to 300°C
Reactivity	no reactive functional groups are present
Charge Density	the notified polymer has no charged functional groups

The polymer meets the criteria for assessment as a synthetic polymer of low concern under Regulation 4A of the *Industrial Chemicals (Notification and Assessment) Act 1989*.

Method of Detection and Determination:	infrared spectroscopy

3 PHYSICAL AND CHEMICAL PROPERTIES

The physical and chemical properties given below are for the pure notified polymer. The water solubility measurements were performed using Halar 8014.

Appearance at 20°C and 101.3 kPa: White odourless powder, pellets or micro-pellets

Melting Point: 222 - 232°C

Specific Gravity: 1.68

Water Solubility: 5 mg/L at 25°C (see comments below)

Particle Size:

Size Range (μm)	Weight percentage
> 180	1.5
125 – 180	17.2
75 – 125	34.3
53 – 75	13.6
45 – 53	3.8
10 – 45	29.6
< 10	0

Partition Co-efficient (n-octanol/water): not determined (see comments below)

Hydrolysis as a Function of pH: not determined (see comments below)

Dissociation Constant: no dissociable groups are present

Flammability Limits: not flammable

Autoignition Temperature: cannot be autoignited

Explosive Properties: not explosive

Reactivity/Stability: the notified polymer is stable under normal environmental conditions; thermally stable to 300°C; no reactive functional groups are present

Comments on Physico-Chemical Properties

The water solubility of the polymer was determined using a gravimetric method. A weighed sample of the polymer was added to water, stirred for 2 hours at 25°C, filtered. The filter was

dried and weighed with a precision of 10^{-4} g.

The polymer is reported to be stable under normal conditions of use. Decomposition will start to occur at temperatures in excess of 300°C.

Partition co-efficient and adsorption/desorption were not determined for the polymer, but its low water solubility indicates that it would not be likely to be mobile in the aquatic environment but would be associated with the soil and sediments.

There are no groups generally accepted as being hydrolysable present in the polymer structure.

4. PURITY OF THE CHEMICAL

Degree of Purity:	> 95 %
Maximum Content of Residual Monomers:	residual monomer identities and concentrations have been exempted from publication; concentrations of residual monomers are all below the relevant cutoffs for the notified polymer to be classified as hazardous

5. USE, VOLUME AND FORMULATION

The notified polymer is a thermoplastic resin with high chemical resistance and good thermal and electrical properties. It will be processed in a number of ways, including extrusion, injection moulding, transfer moulding, blow moulding, rotomoulding, rotolining and electrostatic powder coating. The articles so produced will be used where fire safety and chemical resistance are required, such as in cable insulation, chemical process industry components, semiconductor processing equipment and tubing, rod and coatings for the oil and gas industries.

The notified polymer will be imported in effectively pure form, as pellets or powder, in 25 kg polyethylene bags in cardboard drums. The polymer will then be formed into articles (using between 90 % and 100 % notified polymer) by a variety of the above methods. The notifier estimates that between 1 and 10 tonnes of notified polymer will be imported per annum in the first five years.

6. OCCUPATIONAL EXPOSURE

Transport and Storage
The notified polymer will be unloaded from shipping containers at the docks, and transported by road to the notifier's warehouse, then distributed by road to the customer sites. The notifier estimates that the notified polymer will be handled by 6 – 10 dock and transport workers, on 10 days per year, and 6 – 8 storage workers at the notifier's site and 20 – 30 storage workers at customer sites, both on approximately 50 days per year. These workers will handle only sealed containers, and are not expected to be exposed to the notified polymer except in the case of an accident involving damage to the packaging.

Article Production
The notifier expects that the notified polymer will be used by 12 customers, 6 each in the powder coating and plastics processing industries. Approximately 20 – 30 process workers will be involved in producing articles using the notified polymer, for up to 8 hours per day, on a daily basis.

In powder coating applications, the powder is conveyed through a gun containing electrodes to impart a charge on the powder by a low pressure air stream. The particles are directed onto an earthed metal object and held in place electrostatically. The powder coating is then melted in an oven. Any powder that is not deposited on the article is recovered for reuse by an extraction system, with recovery rates typically better than 99 %. The overall loss rate for unprocessed polymer is estimated to be less than 0.5 %.

Examples of plastics processing by extrusion and injection moulding have been provided. The polymer powder is melted and forced under pressure through a die or into a steel mould. In the moulding process, the mould is opened after the article has cooled. During extrusion, the article cools in air after passing through the die, with exhaust ventilation to remove any volatile compounds formed by polymer decomposition.

The processing equipment is highly automated, and exposure will normally only occur during loading of the polymer pellets or powder into the equipment, and cleaning up spills. Due to the fine powder size of the notified polymer, with greater than 90 % of the particles being in the inspirable range (no respirable particles), exposure to dust by dermal, ocular and inhalation routes is possible.

During thermal processing, particularly if the normal temperatures are exceeded, toxic and corrosive decomposition products including hydrogen fluoride, hydrogen chloride and carbonyl fluoride may be formed. The notifier has indicated that local exhaust ventilation will be used where these products may be present.

The notifier states that workers are recommended to wear overalls, gloves and safety glasses, and that dust respirators should be used where existing ventilation is insufficient.

Once the articles have been formed, the notified polymer is expected to be inert and contact with the finished articles will not lead to any significant exposure.

7. PUBLIC EXPOSURE

The notified polymer will not be sold to the public, with manufacturing of articles occurring only at industrial sites. Much of the use of articles incorporating the notified polymer is also industrial. The public will come into contact with the notified polymer only as finished articles or as coatings on articles. In this form, the polymer will be inert and not available for absorption.

8. ENVIRONMENTAL EXPOSURE

Release

Release to the environment of the notified polymer as a result of manufacturing is expected to be minimal. In plastics applications the polymer will be fed automatically into moulding and extruding machinery under high pressure and any reject product will be ground up and reprocessed. In the powder coating application an electrostatic spray gun is used in a booth to apply the powder resin to the metal objects which are then cured in an oven; any reject articles will be recoated. Overall the notifier estimates that < 100 kg/annum of polymer would be disposed of to landfill through product rejection and indicates that any spills will be swept up and not released to the environment.

The polymer will be used on dedicated equipment so the waste generated from equipment cleaning will be minimal, with the notifier estimating waste at < 10 kg/annum.

The notifier estimates that < 0.5 % (< 50 kg/annum) of the polymer may remain in the 'empty' import containers after use. This volume of polymer will be disposed of to landfill along with the packaging.

The maximum predicted amount of waste polymer that will be disposed to landfill as a result of the processing of the polymer granules into finished products will be approximately 160 kg/annum at the maximum proposed import volume.

Used articles incorporating the cured polymer will also eventually be deposited in landfills at the end of their useful life.

Fate

In the case of accidental spillage, pellets of the polymer are expected to remain where they are deposited. Should a spill occur to water, the pellets or granules should settle onto the bottom sediments, where they could be collected. Due to the negligible solubility of the polymer, leaching from landfill is highly unlikely, and no movement from the landfill site is expected.

The majority of the polymer is not expected to be released to the environment until it has been moulded into components. Due to the high content of fluorine, biodegradation is unlikely, as this class of compounds are known to be very persistent in the environment. The high molecular weight of the substance means that bioaccumulation is not likely to occur (Connell, 1990).

If the polymer was to be incinerated or accidentally burnt there is some chance of formation of dioxins, but the chlorine content is relatively low and little is known about fluorinated dioxins. However, incineration would likely produce toxic decomposition products such as HF, HCl and COF_2.

9. EVALUATION OF TOXICOLOGICAL DATA

No toxicology data were submitted. Polymers of low reactivity and high molecular weight do not readily cross skin or other biological membranes, and the toxicity of the notified polymer

is therefore expected to be low.

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

No ecotoxicological data were submitted.

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

The maximum predicted amount of waste polymer that will be disposed to landfill as a result of the processing of the polymer granules into finished products will be approximately 160 kg/annum. Eventually all the articles coated with or manufactured from this polymer will be disposed of at the end of their useful lives, probably to landfill.

Disposal of the notified polymer to landfill is unlikely to present a hazard to the environment as it will be in a pellet form or as a finished product. Bioconcentration and leaching are both considered unlikely to occur, due to the high molecular weight of the product and its insoluble nature. Biodegradation of the product is also considered unlikely.

If the polymer was to be incinerated or accidentally burnt there is some chance of formation of dioxins, but the chlorine content is relatively low and little is known about fluorinated dioxins. However, incineration would likely produce toxic decomposition products such as HF, HCl and COF_2. Therefore disposal of the polymer products by incineration at the end of their useful lives should be strongly discouraged and all polymer waste created in the manufacturing process should be disposed of to landfill or preferably recycled back into production.

The low environmental exposure of the polymer as a result of the proposed use, together with its expected low environmental toxicity, indicate that the overall environmental hazard should be negligible.

The notified polymer is not likely to present a hazard to the environment when it is stored, transported and used in the proposed manner.

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

No toxicological information has been provided for the notified polymer and therefore the substance cannot be assessed against the NOHSC *Approved Criteria for Classifying Hazardous Substances* (NOHSC, 1999). Due to the high molecular weight and low reactivity of the polymer, the toxicological hazard of the notified polymer is expected to be low. The polymer is not expected to be hazardous by dermal exposure as the high molecular weight will preclude absorption through the skin. As there is unreactive particulate material within the inspirable size range, the notifier has indicated that the NOHSC dust exposure standard of 10 mg/m^3 (inspirable dust) (NOHSC, 1995) should apply to this material.

The Material Safety Data Sheet (MSDS) for the notified polymer lists health effects due to thermal decomposition products such as hydrogen halides and carbonyl halides. These include redness, irritation and possible burns to the eyes and skin. Symptoms following exposure include headache, short breathing, coughs, chills, fever and tachycardia on inhalation. These may not occur until several hours after exposure.

Occupational Health and Safety
There is little potential for significant occupational exposure to the notified polymer during transport and storage. There may be exposure during the manufacture of plastic articles. Dust exposure is expected to be the main hazard, and this is most probable during addition of polymer powder to the processing equipment, and cleaning up of resultant spills.

Precautions should be taken to prevent inhalation exposure to the notified polymer or to its thermal decomposition products. Ventilation, including local exhaust ventilation, should be used where thermal decomposition products may result, and anywhere where the powdered notified polymer is transferred. The exposure standard of 10 mg/m^3 for inspirable dust should be observed in the workplace, and dust respirators used if the atmospheric dust level exceeds this value. The recommendation that exposure to thermal decomposition products of plastics be kept as low as possible should also be observed, particularly in view of the hazardous nature of the decomposition products of the notified polymer. Individual exposure standards for the decomposition products (which range from 2 ppm TWA to 5 ppm peak limitation for the major products) should also be observed.

Once formed into articles, the polymer will not be available for exposure or absorption.

Public Health
The notified polymer in powder form will only be used by industry. Although members of the public may make dermal contact with articles comprised of or coated with the notified polymer, exposure will be negligible because of the high molecular weight and the inert state of the notified polymer in the articles.

The notified polymer is not expected to pose a significant hazard to public health when used in the proposed manner.

13. RECOMMENDATIONS

To minimise occupational exposure to Polymer in Halar 800/8000 Series the following guidelines and precautions should be observed:

- Employers should ensure that NOHSC exposure standards for inspirable dust and for any decomposition products of the notified polymer are not exceeded in the workplace;

- Safety goggles should be selected and fitted in accordance with Australian Standard (AS) 1336 (Standards Australia, 1994) to comply with Australian/New Zealand Standard (AS/NZS) 1337 (Standards Australia/Standards New Zealand, 1992); industrial clothing should conform to the specifications detailed in AS 2919

(Standards Australia, 1987); impermeable gloves or mittens should conform to AS 2161 (Standards Australia/ Standards New Zealand, 1998); all occupational footwear should conform to AS/NZS 2210 (Standards Australia/ Standards New Zealand, 1994);

- Spillage of the notified chemical should be avoided. Spillages should be swept up promptly and then be put into containers for disposal;
- Good personal hygiene should be practised to minimise the potential for ingestion;
- A copy of the MSDS should be easily accessible to employees;
- The notified polymer should not be disposed of by incineration.

14. MATERIAL SAFETY DATA SHEET

The MSDS for the notified polymer was provided in accordance with the *National Code of Practice for the Preparation of Material Safety Data Sheets* (NOHSC, 1994).

This MSDS was provided by the applicant as part of the notification statement. It is reproduced here as a matter of public record. The accuracy of this information remains the responsibility of the applicant.

15. REQUIREMENTS FOR SECONDARY NOTIFICATION

Under subsection 64(1) of the Act, secondary notification will be required if the polymer characteristics cease to satisfy the criteria under which it has been accepted as a Synthetic Polymer of Low Concern. Secondary notification of the notified polymer shall be required if any of the circumstances stipulated under subsection 64(2) of the Act arise. No other specific conditions are prescribed.

16. REFERENCES

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