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**NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION
AND ASSESSMENT SCHEME**

FULL PUBLIC REPORT

Zenite 7000 (co-polyester)

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Director
Chemicals Notification and Assessment

FULL PUBLIC REPORT**Zenite 7000 (co-polyester)****1. APPLICANT**

DuPont (Australia) Ltd of 49-59 Newton Road Wetherill Park NSW 2164 has submitted a Polymer of Low Concern notification statement in support of their application for an assessment certificate for Zenite 7000 (co-polyester).

2. IDENTITY OF THE CHEMICAL

The chemical name, CAS number, molecular and structural formulae, molecular weight, mean of identification, polymer composition, and import volumes have been exempted from publication in the Full Public Report.

Other Names: Zenite 7000 (co-polyester)

Marketing Name: Zenite LCP,
Zenite 7130 WT010,
Zenite 7130 WT020,
Zenite 7130A WT020,
Zenite 7130L BK010,
Zenite 7130L WT010.

Characterisation as a Synthetic Polymer of Low Concern

Polymer Stability Highly stable, decomposition will start to slowly occur at temperature in excess of 335°C.

Reactivity The notified polymer contains carboxyl, ester and hydroxyl groups, but it is not considered reactive under normal conditions.

Particle Size 1 - 3 mm pellets

Charge Density Not determined, but expected <2 acid groups per molecule.

Water Solubility Not determined, but expected negligible water solubility.

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)*.

3. PHYSICAL AND CHEMICAL PROPERTIES

Appearance at 20°C and 101.3 kPa:	A light white-opalescent-gray pellet
Melting Point:	335°C
Density:	1.05±0.05 g/cm ³
Vapour Pressure:	Not determined.
Water Solubility:	Not determined (see comments below)
Stability:	Expected to be stable under normal conditions of use (decomposition above 335°C)
Flammability Limits:	Not determined.
Autoignition Temperature:	>335°C
Explosive Properties:	Unlikely unless manufacturing causes dusts via removal of injection point.

Comments on Physico-Chemical Properties

The water solubility of the polymer is expected to be negligible given its high molecular weight, predominantly aromatic nature and the claimed tight intermolecular bonding of the crystalline structure.

The polymer may contain residual carboxyl and hydroxyl groups which should not be reactive under normal environmental conditions, but will give the polymer a slight acidity. The notifier claims the ester groups contained within the polymer structure should be protected from hydrolysis by the tight crystalline structure.

4. PURITY OF THE CHEMICAL

Degree of Purity: High

Hazardous Impurities: Exempt information;
Impurities are present at 1% each and below their respective concentration cut off levels for classification as Type I ingredients under the NOHSC *List of Designated Hazardous Substances* (NOHSC 1999a)

Non-hazardous Impurities (> 1% by weight): None

Additives/Adjuvants: The import polymer product contains 25-30% fiberglass, 0-1% carbon black.

Chemical name: Fibreglass
Weight percentage: 25-30%
Toxic properties: National Exposure Standard ():
0.5 fibre/mL TWA (respirable)

Chemical name: Titanium dioxide
Weight percentage: 5-10%
CAS No.: 13463-67-7
Toxic properties: National Exposure Standard ():
10 mg/m³ TWA (inspirable)

Chemical name: Carbon black
Weight percentage: 0 – 1%
CAS No.: 1333-86-4
Toxic properties: National Exposure Standard ():
3 mg/m³ TWA (inspirable)

5. USE, VOLUME AND FORMULATION

Use

The notified polymer is an ingredient (up to 60%) in a product to be used for moulding precision parts for automotive, electrical and communications application.

The polymer product is formulated as pellets with a diameter of approximately 3 mm, packed in 25 kg bags. It will be used in injection moulding process to form various appliance parts.

Volume

The import volumes in the first two years are expected to be less than 10 tonnes annually, and less than 20 tonnes per annum for the following three years.

Formulation

The notified polymer will be injection moulded into components for use in the automotive, electrical and the electronics industry as a Liquid Crystal Polymer resin. It can be used to manufacture components that must withstand soldering and high temperatures and is resistant to solvents. When melted it can be used to mould thin sections and small parts that are difficult to mould with other materials.

The polymer will be stored in a licensed warehouse in the original packaging. From here it will be transported by road to the thermoplastic injection moulding facilities for processing into the final products. The notifier indicates that the polymer will only be melted and extruded at these plants and will not be blended with any other raw materials. The notifier has given no information on the number or location of the moulding facilities within Australia.

6. OCCUPATIONAL EXPOSURE

Routes of Exposure

The notified polymer is imported at up to 60% as a formulated resin in pellet form and considered to be immobilised at room temperature. Since injection molding processes are unlikely to produce aerosols, the most probable route of occupational exposure to this polymer will be dermal exposure to the solid pellets and moulded appliance parts. At very high temperature (over 300°C), some hot fume or hot gases from degraded polymer may be generated. Inhalation exposure will become possible under these circumstances.

Transport and storage

The notified polymer product will be imported in 25 kg bags. Waterside, transport and storage workers would only be exposed to the notified polymer in the event of an accident involving spillage of the notified polymer.

Injection Moulding

The pellets will form into a variety of articles via injection moulding. Generally, the injection moulding process can be divided into 3 stages:

Resin drying and hopper loading \Rightarrow Injection moulding \Rightarrow Cleaning equipment using inert resin

To remove any traces of moisture, bags of resin are first placed into a drying room with the top of the bag open for 24 hours. Subsequently, dried resin pellets are poured into a hopper above the extruder and gravity fed down into the pre-heater where final drying occurs. Dermal contact with the resin pellets may occur during the dry stage, however, the exposure is expected to be low as the notified polymer will be transferred into the feed hopper from bags.

Resin moulding is carried out using an injection moulding equipment to produce finished articles containing the notified polymer. Temperatures of the polymer in the moulding machine are in the range of 300-350°C. Skin contact with molten resin can inflict severe burns. This could happen when gases generate pressure in the machine cylinder and violently eject molten polymer through the nozzle or hopper.

The injection operator will regularly take samples of the moulded products for quality control. Dermal contact for samples taking will be limited to a few minutes. The testing operator will then analyse the samples. Each test takes 20 minutes. The notifier did not indicate the number of tests to be carried out for each batch. An establishment with one moulding machine running 3 shifts a day would have 3 operators and one analyst.

Cleaning of extrusion equipment is usually carried out by a purge using polyethylene or polypropylene resin to mechanically force residual Zenite from the extruder barrel and nip. Waste may be reground and reused within the extruder. Respiratory protection (with dust/mist cartridge) would be required to prevent exposure to fines in the process.

A guidance document on moulding was provided by the notifier and including precautions to be taken during the operation of moulding equipment. The injection equipment is fitted with guards and exhaust ducts near the injection nozzle to remove any volatile materials from the melt. Operators will wear protective glasses and gloves.

When servicing a hot moulding machine, workers will use air fed or self-contained respirator, faceshield, gloves and protective suit to protect them from potential exposure to hot polymer and fumes.

End use

End users in the automotive, electrical and communication workers, will manually handle the moulded articles containing the notified polymer. It is expected, though not stated by the notifier, that the polymer will be incorporated in the plastic matrix and not separately available for exposure or dermal absorption.

7. PUBLIC EXPOSURE

Both public contact with, and exposure to, the notified polymer is likely to be negligible because they mostly will have no need to access the end use components or equipment. Electrical hobbyists using manufactured items will come into contact with the polymer but it will be in the form of solid injection moulded components and exposure will be negligible.

The high value of the polymer will encourage recovery following accidental spillage. In the event of a transport accident, spilt polymer beads would be readily recoverable by sweeping. The lack of water solubility will prevent dispersion into drinking or ground water. Hence, public exposure from this source is likely to be negligible.

8. ENVIRONMENTAL EXPOSURE

Release

Release to the environment of the notified polymer as a result of manufacturing is expected to be minimal. The polymer will be fed automatically into moulding machinery from a hopper. Sprue will be reground and reused. Contaminated polymer scraps will be deposited into municipal landfills. Overall, such waste streams would account for between 1% (large production runs) and 5% (small production runs) of the annual throughput.

Residues produced by start-up injector feed at the beginning of each run (less than 1%) will be disposed of to landfill if not recycled.

The notifier estimates that less than 0.002% of the polymer may remain in the 25 kg import containers after emptying. This volume of polymer will be disposed of to landfill 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 6% of the import volume. At an import volume of less than 20 tonnes per annum this equates to a maximum annual release of 1 200 kg of the notified polymer.

Used articles containing the polymer will also eventually be deposited of in landfills at the end of their useful life. No recycling of the end use articles is currently envisaged in Australia.

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/granules should settle onto the bottom sediments, where they could be collected. Due to the anticipated 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. Biodegradation is unlikely. The high molecular weight of the substance also means that bioaccumulation is not likely to occur (Connell 1989).

Surface photodegradation of the finished components is expected with sunlight, but this should affect products that have been disposed of to landfill, or discarded inappropriately.

9. EVALUATION OF TOXICOLOGICAL DATA

No toxicology data were submitted.

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 6% of the import volume or up to 1 200 kg annually of the notified polymer. Eventually all the electronic components manufactured from this polymer will be disposed of at the end of their useful lives, probably to landfill as no recycling currently occurs in Australia.

Disposal of the notified polymer to landfill is unlikely to present a hazard to the environment as the polymer will be in pellet form or a finished product. Bioconcentration and leaching are both considered to be unlikely due to the high molecular weight and negligible water solubility of the polymer. Biodegradation of the product is also considered unlikely.

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.

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

No toxicology studies have been submitted with this application. The high molecular weight of the polymer will restrict passage across biological membranes. There is a low percentage of low molecular species and the concentration of residual monomers and by products is low. Ingestion or skin contact with components manufactured with the notified polymer is not expected to lead to any systemic exposure as the polymer will be bound within the matrix and therefore not bioavailable. Hence no toxicological hazard is anticipated. The notified

polymer is unlikely to be classified as a hazardous substance according to NOHSC *Approved Criteria for Classifying Hazardous Substances* (NOHSC, 1999b).

The MSDS indicates that exposure to the pellets may cause irritation by mechanical effects.

Occupational Health and Safety

Occupational exposure to the notified polymer at 60% may occur by skin contact during handling of the formulated resin pellets prior to final moulding into the finished articles. However, little exposure would be expected as the polymer resin is transferred directly into the feed hopper from the bags after drying. There is little opportunity for exposure during drying as the bags of formulated resin are cut open without transfer to another vessel. Limited skin contact may be experienced by the moulding machine operator during routine checking of the moulded parts during the moulding operation and cleaning of the moulding equipment. The potential for inhalation exposure is low as the polymer is imported in pellet form and polymer fines are unlikely to be generated during the drying or moulding operations.

The hazards for moulding operators are high temperature and high pressure of the polymer during injection process. Local exhaust ventilation should be provided over all extruders, and elsewhere where natural ventilation is considered inadequate, and workers need to wear eye protection and gloves. When servicing equipment with hot polymer, the service personnel should use respirator, faceshield, gloves and protective overalls to protect them from potential exposure to hot polymer and fumes. Workers should wear respiratory protection if they are regrounding waste extruded product for recycling to protect against exposure to fines.

Therefore, taking into account the physicochemical properties and low toxicity of the polymer and the low potential for exposure, the occupational health and safety risk arising from handling of the polymer during the drying and moulding processes is very low.

The health risk arising from handling the finished moulded articles is negligible as the polymer is bound with the polymer matrix and is not available for absorption.

There is negligible health risk for transport and storage workers, and end users as exposure is unlikely unless accidental spillage occurs.

NOHSC has established national exposure standards for titanium dioxide (TWA 10 mg/m³) and carbon black (TWA 3 mg/m³). Employers are responsible for maintaining concentrations of titanium dioxide and carbon black at workplaces below the exposure standards.

Public Health

Public contact with, and exposure to, the notified polymer is likely to be negligible. Any contact which does occur is unlikely to lead to systemic exposure because of the high molecular weight of the polymer. Based on the physico-chemical characteristics and the proposed use pattern, ZENITE 7000 (co-polyester) is not considered to pose a significant hazard to public health.

13. RECOMMENDATIONS

To minimise occupational exposure to Zenite 7000 (co-polyester) the following guidelines and precautions should be observed:

- 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);
- Respiratory protection is required during grinding, sanding or sawing operations and should conform to AS/NZS 1715 and 1716 (Standards Australia/Standards New Zealand, 1994a; Standards Australia/Standards New Zealand, 1994b);
- Industrial clothing should conform to the specifications detailed in AS 2919 (Standards Australia, 1987) and AS 3765.2 (Standards Australia, 1990);
- 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, 1994c);
- Spillage of the notified chemical should be avoided. Spillages should be cleaned up promptly with absorbents which should 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.

14. MATERIAL SAFETY DATA SHEET

The MSDS for the notified chemical was provided in accordance with the *National Code of Practice for the Preparation of Material Safety Data Sheets* (National Occupational Health and Safety Commission, 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

National Occupational Health and Safety Commission (1994) National Code of Practice for the Preparation of Material Safety Data Sheets [NOHSC:2011(1994)]. Canberra, Australian Government Publishing Service.

National Occupational Health and Safety Commission (1999a) List of Designated Hazardous Substances [NOHSC:10005(1999)]. Canberra, AusInfo.

National Occupational Health and Safety Commission (1999) Approved Criteria for Classifying Hazardous Substances [NOHSC:1008(1999b)]. Canberra, AusInfo.

Standards Australia (1987) Australian Standard 2919-1987, Industrial Clothing. Sydney, Standards Association of Australia.

Standards Australia (1990) Australian Standard 3765.2-1990, Clothing for Protection against Hazardous Chemicals Part 2 Limited protection against specific chemicals. Sydney, Standards Association of Australia.

Standards Australia/Standards New Zealand (1994a) Australian/New Zealand Standard 1715-1994, Selection, Use and Maintenance of Respiratory Protective Devices. Standards Association of Australia/Standards Association of New Zealand, Sydney/Wellington.

Standards Australia/Standards New Zealand (1994b) Australian/New Zealand Standard 1716-1994, Respiratory Protective Devices. Standards Association of Australia/Standards Association of New Zealand, Sydney/Wellington.

Standards Australia (1994c) Australian Standard 1336-1994, Eye protection in the Industrial Environment. Sydney, Standards Association of Australia.

Standards Australia/Standards New Zealand (1992) Australian/New Zealand Standard 1337-1992, Eye Protectors for Industrial Applications. Sydney/Wellington, Standards Association of Australia/Standards Association of New Zealand.

Standards Australia/Standards New Zealand (1994) Australian/New Zealand Standard 2210-1994, Occupational Protective Footwear. Sydney/Wellington, Standards Association of Australia/Standards Association of New Zealand.

Standards Australia/Standards New Zealand (1998) Australian/New Zealand Standard 2161.2-1998, Occupational protective gloves, Part 2: General requirements. Sydney, Standards Association of Australia.