

August 2000

**NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION  
AND ASSESSMENT SCHEME**

**FULL PUBLIC REPORT**

**Thermoplastic Polyurethane**

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## **FULL PUBLIC REPORT**

### **Thermoplastic Polyurethane**

#### **1. APPLICANT**

Australian Vinyls Corporation Ltd of 599 Kororoit Creek Road, ALTONA, VIC 3018 has submitted a notification statement in support of their application for an assessment certificate for the synthetic polymer of low concern (PLC) Thermoplastic Polyurethane.

#### **2. IDENTITY OF POLYMER**

**Marketing name:** Thermoplastic Polyurethane, Polyester thermoplastic polyurethane, Polymer in Estane 5719

The chemical name, CAS number, molecular and structural formula, details of polymer composition, import volume and manufacture/formulation site, have been exempted from publication in the Full Public Report.

**Reactive functional groups:**

The polymer does not contain any positively or negatively charged groups.

**Functional group equivalent weight (FGEW):**

Not applicable.

**Molecular weight (MW):**

<b>Number-average MW</b>	<b>Weight-average MW</b>	<b>% MW &lt; 1000</b>	<b>% MW &lt; 500</b>	<b>Method</b>
31,785 Mn	106,627 Mw	0.52%	0.07%	Gel permeation chromatography (GPC)

**Structural identification method:**

The polymer is characterised by GPC and identified by Infra-red (IR) spectrum. A reference spectrum has been provided. The peaks are 513, 769, 831, 928, 1 017, 1 066, 1 184, 1 222, 1 312, 1 361, 1 414, 1 459, 1 534, 1 599, 1 731, 2 959, and 3 334 cm<sup>-1</sup>.

### 3. POLYMER COMPOSITION AND PURITY

#### Polymer constituents

Polymer constituents are exempt from publication in the Full Public Report.

#### Purity (%):

>99% [the information is from the Material Safety Data Sheet (MSDS) for Estane 5719]

#### Hazardous impurities (other than residual monomers and reactants):

None

#### Non-hazardous impurities at 1% by weight or more:

None

#### Additives/adjuvants:

Chemical name	Synonym	CAS No.	% weight
Talc	Talcum	14807-96-6	< 0.5%

### 4. PLC JUSTIFICATION

The notified polymer meets the PLC criteria.

### 5. PHYSICAL AND CHEMICAL PROPERTIES

Property	Result	Comments
Appearance	natural to light yellow solid pellets	
Melting point	177-232 °C	The general melting point range for thermoplastic polymers (from Estane 5719 MSDS)

Specific Gravity/Density	1.19 kg/m <sup>3</sup> at 20 °C	
Water solubility	Insoluble	See comments below
Particle size	Pellet size: 3-6mm	
Flammability	Not applicable	
Autoignition temperature	>393 °C	
Explosive properties	Not explosive	
Stability/reactivity	Stable/Not reactive	
Hydrolysis as function of pH	Not determined	See comments below
Partition coefficient	Not determined	See comments below
Adsorption/desorption	Not determined	See comments below
Dissociation constant	Not determined	See comments below
Flash point	400 °C	From Estane 5719 MSDS

### **Comments on physical and chemical properties**

Tests were not performed according to EEC/OECD test guidelines at facilities complying with OECD Principles of Good Laboratory Practice.

Water solubility was not determined. However, the notifier has estimated the water solubility to be < 1 mg/L (at 25 °C) based on knowledge of similar polymers. Noting the absence of hydrophilic groups, this estimate is acceptable.

The ester and urethane linkages of the polymer have the potential to hydrolyse. However, it is anticipated that the low solubility of the polymer will prevent hydrolysis under environmental conditions.

The determination of partition coefficient and adsorption/desorption were not undertaken as the notified polymer is expected to be insufficiently soluble in water. The polymer is expected to partition into n-octanol rather than water, and may be expected to become associated with the organic component of soil and sediments.

In the absence of dissociable groups, the notified polymer is unlikely to be acidic or basic.

## **6. USE, VOLUME AND FORMULATION**

### **Use:**

The notified polymer is used as a binder in the manufacture of magnetic media strips used in audio and videotapes, floppy discs and credit cards.

### **Import volume:**

The notified polymer is not manufactured in Australia. The exact import volume is exempt from publication in the Full Public Report, but is in the range 10-50 tonnes per year for the first five years. It is imported in pellet form (3-6 mm) in shrink wrapped 25 kg paper bags.

### **Formulation details:**

There is one reformulation site using the notified polymer within Australia. The manufacture of magnetic media is a batch process. The reformulation process involves the manual loading of the notified polymer into a hopper followed by dissolution of the resin in solvent. Millroom operators transfer pellets from bags into mixing tanks and make the oxide lacquer using horizontal mills and pellet dissolvers. The polymer mixture is then mixed with metal pigment and additives to produce the magnetic media. No information was provided on whether or not the formulation process is enclosed. The formulation and dispersion process does not involve heating. Finally, the lacquer is coated onto a polyester film, dried and heat cured at 60°C to produce magnetic strips.

## 7. OCCUPATIONAL EXPOSURE

Scenario	Exposure route	Exposure details	Controls indicated by notifier
<b>Formulation and coating</b> Weighing, manually adding to hopper; up to 10 millroom and coater operators	Inhalation Dermal	Possible skin and inhalation exposure during manual loading of hopper, blending (if is open process) and cleaning of equipment	Protective overalls, rubber gloves and face/nose masks; adequate ventilation
<b>End use</b> Magnetic stripe applications such as audio tapes, video tapes, floppy disks	Dermal	Negligible as the notified polymer binds irreversibly to the polyester film	No information provided
<b>Transport and storage</b> Transported to formulation site by road/rail and stored.	-	No exposure anticipated during transport and storage	None, MSDS contains information on cleanup of spills
<b>Disposal</b> Spilled material, spent magnetic strips, cleaning of equipment	Dermal		Spilled materials, empty bags and magnetic tapes disposed of to landfill; all cleaning solvent/fluid sent to trade waste sewer

## 8. PUBLIC EXPOSURE

In the event of a transport or storage accident, the public may be exposed to the notified polymer.

Dermal contact with the notified polymer is possible as a result of handling items containing magnetic tape, e.g. credit cards, audio and video tapes, floppy disks. Public exposure to the notified polymer as a result of environmental release is considered to be unlikely.

## **9. ENVIRONMENTAL EXPOSURE**

### **Release**

There is potential for accidental release during transport but environmental risk is considered to be low because spills will be easily contained and cleaned up.

Release may occur during storage and the notifier has indicated that up to 25 kg per year may be released in this way. This is equivalent to approximately 0.1% of total import volume.

Additional release is expected at the reformulation plant during manual transfer from the import bags to the hopper. The notifier has indicated that release via this means would be expected to be less than 200 kg per year. The notifier has stated that waste generated as a result of spillage will be disposed of to landfill.

Residues in bags are unlikely due to the large granular nature of the notified polymer. Import bags will be disposed of to landfill.

Release may also be expected during cleaning of processing equipment. The notifier has not quantified this release but it is anticipated to be up to 0.5 % of the total import volume. The notifier has indicated that this waste will be minimal and will be discarded to the trade waste sewer. This assumption is acceptable.

Release is also expected when magnetic media (audio and video tapes) are discarded at the end of their useful lives. The notifier has indicated that discarded products are predominantly disposed of to landfill.

### **Fate**

It is expected that waste polymer and discarded magnetic media containing the polymer will be disposed of to landfill. In this environment the polymer is not expected to leach and will slowly degrade via biotic and abiotic processes. Bioconcentration and leaching are considered to be unlikely, due to the high molecular weight and insolubility of the polymer.

The ester and urethane linkages of the polymer have the potential to hydrolyse. However, it is anticipated that the insolubility of the polymer will prevent hydrolysis under environmental conditions.



## 10. EVALUATION OF HEALTH EFFECTS DATA

No toxicological data were submitted.

Chemical	Health hazards	Regulatory controls
<b>Additives/adjuvants</b>		
Talc	On NOHSC List of Designated Hazardous Substances (NOHSC 1999a)	TWA = 2.5 mg/m <sup>3</sup> (NOSHC 1995)

## 11. EVALUATION OF ENVIRONMENTAL EFFECTS

No ecotoxicological data were provided.

## 12. ENVIRONMENTAL HAZARD AND RISK ASSESSMENT

Although some release of the notified polymer is expected during manufacture of the end products, the majority is expected to occur as a result of disposal of damaged or worn out magnetic media. This waste will be disposed of either in pellet form or as finished product and is unlikely to present a hazard to the environment. The notified polymer is insoluble and therefore is expected to be immobile within landfill sites. Bioconcentration and leaching are considered to be unlikely, due to the high molecular weight and insolubility of the polymer. Although no polymer degradation information is available, it is expected that the polymer and finished products will degrade very slowly via biotic and abiotic processes.

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

## 13. HEALTH AND SAFETY RISK ASSESSMENT

### Hazard assessment

No toxicological data have been submitted for the notified polymer, therefore the substance can not be assessed against the NOHSC *Approved Criteria for Classifying Hazardous Substances* (NOSHC 1999b). Given high molecular weight (NAMW 31,785) and the low concentrations of low molecular weight species, it is not expected to traverse biological membranes.

The MSDS for Estane 5719 lists health hazards such as skin, eye and respiratory irritation. These relate mainly to exposure to dust. Although Estane 5719 is in solid form, no information was provided on the degree of friability or dustiness of the product.

### **Occupational health and safety**

There will be little potential for occupational exposure to the notified polymer in transport and storage of the polymer resin or magnetic strips. There may be exposure during the reformulation of the polymer, for example, manual addition of pellets to hopper, during mixing up of the lacquer and blending with other ingredients if the processes are not enclosed. Occupational exposure may also occur during application of the lacquer to polyester film, use and disposal of end products.

During curing of prepared strips the temperature is raised to a maximum of 60°C. This can be considered “normal processing” and will result in evolution of carbon dioxide and water vapour. The MSDS for Estane 5719 indicates that over heating can result in the release of toxic fumes such as hydrogen cyanide, carbon oxide, nitrogen oxides, isocyanates and hydrocarbons and that large masses of polymer held at elevated temperatures for extended periods of time may auto-ignite. The product will not be subject to high temperatures during formulation and coating. The MSDS for Estane 5719 includes procedures and exposure control measures to be followed in the event of a fire.

The pellet or powder form of the notified polymer may result in dust explosions and electrostatic charges may build up during transfer of the dissolved form of the notified polymer. Therefore, handling of the notified polymer should be carried out under humid conditions and all equipment used must be earthed.

Considering the particle size of the product containing the notified polymer (3-6 mm) it is unlikely that workers would experience any adverse health effects upon physical contact. However, it is recommended that workers wear overalls, gloves and masks and wear a dust respirator if exposure to dust cannot be avoided. Well ventilated conditions are necessary to control exposure.

Exposure of workers to coated tapes is negligible as the notified polymer binds irreversibly to the polyester film and is unavailable for uptake.

### **Public health**

Although dermal contact with the notified polymer is possible as a result of handling items containing magnetic tape, exposure to the notified polymer is unlikely since it is irreversibly bound to the magnetic tape, has a high NAMW and is unlikely to cross biological membranes. Public exposure via environmental routes is also considered to be unlikely.

Therefore, the risk to the public health induced by the notified polymer is considered to be low.

## **14. MSDS AND LABEL ASSESSMENT**

### **MSDS**

The MSDS for Estane 5719 was provided in accordance with the *National Code of Practice for the Preparation of Material Safety Data Sheets* (NOSHC 1994). It is published here as part of the assessment report. The accuracy of the information on the MSDS remains the responsibility of the applicant.

### **Label**

A draft label for Estane 5719 was provided as part of the notification package. The accuracy of the information on the label remains the responsibility of the applicant.

## **15. RECOMMENDATIONS**

To minimise occupational exposure to the notified polymer, the following precautions should be observed:

- During formulation, handling of the notified chemical should be carried out under humid conditions and all equipment used must be earthed;
- Ensure that personal protective equipment worn conforms to the relevant Australian standard: Safety goggles - Australian Standard (AS) 1336 (Standards Australia, 1994) and Australian/New Zealand Standard (AS/NZS) 1337 (Standards Australia/Standards New Zealand, 1992); Industrial clothing - AS 2919 (Standards Australia, 1987) and AS 3765.2 (Standards Australia, 1990); Impermeable gloves or mittens - AS 2161 (Standards Australia/Standards New Zealand, 1998); Occupational footwear - AS/NZS 2210 (Standards Australia/Standards New Zealand, 1994);
- Spillage of the notified polymer should be avoided. Spillages should be swept up promptly and 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.

## 16. REQUIREMENTS FOR SECONDARY NOTIFICATION

Secondary notification may be required if:

- (i) any of the circumstances stipulated under subsection 64(2) of the Act arise. If any importer or manufacturer becomes aware of any of these circumstances, they must notify the Director within 28 days; or
- (ii) the notified polymer is introduced in a chemical form that does not meet the PLC criteria.

## 17. REFERENCES

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

NOHSC (1995). Adopted National Exposure Standards for Atmospheric Contaminants in the Occupational Environment, [NOHSC:1003(1995)]. Exposure Standards for Atmospheric Contaminants in the Occupational Environment: Guidance Note and National Exposure Standards. Canberra, Australian Government Publishing Service.

NOHSC (1999a). List of Designated Hazardous Substances [NOHSC:10005(1999)]. Canberra, AusInfo.

NOHSC (1999b). Approved Criteria for Classifying Hazardous Substances [NOHSC:1008(1999)]. Canberra, AusInfo.

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

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

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.

## **MSDS**