File No: PLC/37

Date: August 1996

NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

XUS 72301.00L Developmental Engineering Thermoplastic Polyurethane Resin

This Assessment has been compiled in accordance with the provisions of *the Industrial Chemicals (Notification and Assessment) Act* 1989*,* and Regulations. This legislation is an Act of the Commonwealth of Australia. The National Industrial Chemicals Notification and Assessment Scheme (NICNAS) is administered by Worksafe Australia which also conducts the occupational health & safety assessment. The assessment of environmental hazard is conducted by the Commonwealth Environment Protection Agency and the assessment of public health is conducted by the Department of Health and Family Services.

For the purposes of subsection 78(1) of the Act, copies of this full public report may be inspected by the public at the Library, Worksafe Australia, 92-94 Parramatta Road, Camperdown NSW 2050, between the hours of 10.00 a.m. and 12.00 noon and 2.00 p.m. and 4.00 p.m. each week day except on public holidays.

Under subsection 34(2) of the Act the Director of Chemicals Notification and Assessment is to publish this Report in the Chemical Gazette on .

Enquiries contact Chemical Assessment on (02) 9577 9464:

Street Address: 92 Parramatta Rd Camperdown, NSW 2050, AUSTRALIA
Postal Address: GPO Box 58, Sydney 2001, AUSTRALIA
Telephone: (61) (02) 9577-9466 **FAX (61) (02) 9577-9465**

Director
Chemicals Notification and Assessment

FULL PUBLIC REPORT

XUS 72301.00L Developmental Engineering Thermoplastic Polyurethane Resin

1. APPLICANT

Dow Chemical (Australia) Ltd of Kororoit Creek Rd ALTONA VIC 3018 has submitted a notification statement accompanying their application for assessment of a synthetic polymer of low concern, XUS 72301.00L Developmental Engineering Thermoplastic Polyurethane Resin.

2. IDENTITY OF THE POLYMER

Trade name: XUS 72301.00L Developmental Engineering Thermoplastic Polyurethane Resin

Number-average molecular weight: > 1000

Maximum percentage of low molecular weight species
molecular weight < 1000: 0.9%
molecular weight < 500: 0.5%

Means of identification (List of spectral data available):

Infrared spectrum

3. PHYSICAL AND CHEMICAL PROPERTIES

Appearance at 20°C and 101.3 kPa: clear to pale yellow pellets (approximately 3-5mm, octahedral)

Melting point: 180°C

Density: 1200 - 1300 kg/m^3

Water Solubility: not determined

Hydrolysis as a function of pH: not provided

Autoignition Temperature: not determined but anticipated to be > 260°C

Explosive Properties: none

Comments on Physico-Chemical Properties

The notifier has provided a result for water solubility testing of a related polymer. In this test (details provided) pellets of the polymer are agitated at 40°C for 24 hours. This test method is similar to the guidelines being developed by the OECD for polymer solubility testing. Total extractable solubility was 140 ppm, but as the

polymer itself is non-polar in nature, it is anticipated that this figure represents low molecular weight species solubilities. At 20°C the solubility is expected to be less than 140 ppm. Although this figure is higher than allowed for polymers of low concern, due to the structure of the notified polymer, the data presented is considered sufficient to demonstrate the low expected solubility of the notified substance.

The polymer is reported to be stable under the conditions of use, contains no charged groups, will not be cationic or anionic in the typical pH range of use and does not contain functional groups that will readily hydrolyse or further react.

While the polymer contains urethane linkages, these are not likely to hydrolyse under environmental conditions due to low water solubility.

4. PURITY OF THE CHEMICAL

The notified polymer is approximately 99.7% pure. Each residual monomer is stated to be present at < 0.1%. Additives are present to inhibit oxidation and promote thermal stability.

5. USE VOLUME AND FORMULATION

The notified polymer is to be used to manufacture plastic articles, including equipment parts, tool and toothbrush handles. The estimated quantity to be imported is less than 1000 tonnes per year in the first five years.

6. OCCUPATIONAL EXPOSURE

The notified polymer will be imported in bulk containers and transported by road to the customer's warehouse.

The contents of the containers are unloaded to storage bins by an enclosed conveyor system. The polymer is then contained in a closed system. After drying the polymer pellets flow to feed hoppers of injection moulding machines. The moulding system is computer controlled and moulded parts ejection is robotics assisted. Sub-runners are removed and granulated for reprocessing back through the system.

Ejected parts are air-cooled whilst on a transfer conveyor into a plastic crate for transfer to subsequent stages of manufacture. Off-specification handles are recycled to the feed system.

7. PUBLIC EXPOSURE

There is negligible potential for public exposure to the notified polymer. The particle size and water insolubility suggest that the polymer will not be air or water dispersed. Widespread, daily, short term (1-5 minutes) contact with the notified polymer as toothbrush handles is expected but the solid form of the handle and its physico-chemical properties will be sufficient to preclude absorption.

8. ENVIRONMENTAL EXPOSURE

. Release

During toothbrush manufacture, the polymer is fed automatically into injection moulding machinery from drying hoppers. Any spills at this time are placed into hoppers for re-use. Wastes produced as a result of the moulding process, such as connecting portions between handles or reject handles, are also granulated and recycled to the feed systems. Completed handles then pass into further stages of manufacture.

Any polymer scrap that is soiled, items rejected after granulation and off-specification polymer are buried as landfill in municipal tips. This amount is expected to be approximately 2% of the annual throughput.

Losses of the polymer to air are also expected. Filters scour air from vacuum pumps in the air lift system prior to discharge. During the start up of equipment, or purging of the moulding machinery feed system, it is also expected that fumes will be generated. The notifier estimates a loss of less than 1% of predicted annual use during these procedures. As the material undergoes thermal degradation during these procedures, it cannot be recycled.

Under normal operating conditions, no fumes are generated from the moulding processes, with none therefore released.

Finally, used toothbrush handles will disposed of as general household garbage, and most likely will be placed in landfill. The toothbrush heads cannot be recycled, due to the inclusion of a metal plate in the head. Only slight breakdown of the material is expected in landfill, and no leaching of material is anticipated.

Environmental release is expected to be similar if the polymer is used for manufacturing of equipment parts and tools handles.

Overall, it is anticipated that a maximum of 20 tonnes of the polymer will be disposed of to landfill each year.

. 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 should settle onto the bottom sediments, where they could be collected. Due to the anticipated low solubility of the polymer, leaching from landfill is highly unlikely, and no movement away from the landfill site is expected.

Any incineration of the polymer may produce aliphatic and aromatic compounds, carbon dioxide and hydrogen cyanide. Therefore, incineration should be avoided, and wastes should be deposited in tips that do not burn refuse.

The majority of the polymer is not expected to be released to the environment until it has been formulated into a solid product. Biodegradation is unlikely. The high molecular weight of the substance also means that bioaccumulation is not likely to occur.

Surface photodegradation of the finished product is expected with sunlight, but this is only likely to occur after the product has been disposed of to landfill, or discarded inappropriately.

9. ASSESSMENT OF ENVIRONMENTAL EFFECTS

No ecotoxicological data were supplied, which is acceptable for polymers of low concern. Due to its high number-average molecular weight (NAMW) the polymer is not expected to cross biological membranes. However, due to the pelletised form of the polymer, the notifier states that 'mechanically cause(d) adverse effects' may occur should wildlife ingest the pellets. Spill procedures should reduce this possibility.

10. ASSESSMENT OF ENVIRONMENTAL HAZARD

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, and is unlikely to biodegrade or leach.

The main environmental hazard would arise through spillage in transport accidents that may release quantities of the polymer to drains and waterways. However, the polymer is expected to sink to the sediments and remain immobile pending collection on the soil/sediment layer. The Material Safety Data Sheet (MSDS) contains adequate directions for dealing with a spill of the polymer.

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.

11. ASSESSMENT OF OCCUPATIONAL AND PUBLIC HEALTH AND SAFETY EFFECTS

The notified chemical has been notified as a synthetic polymer of low concern under section 23 for the purposes of section 24A of the Act. The polymer meets the criteria for a synthetic polymer of low concern specified in regulation 4A of the Act and can, therefore, be considered to be of low hazard to human health.

Exposure during transport and handling is only expected to occur in the event of an accident.

Exposure of workers to the notified polymer during manufacture of plastic articles is expected to be minimal through the use of closed systems and because manual handling of either the polymer pellets or moulded articles is not necessary.

The occupational and public health risk arising from transport, storage, use and disposal of the notified polymer is likely to be minimal.

12. RECOMMENDATIONS

To minimise occupational exposure to the notified chemical the following guidelines and precautions should be observed:

- Spillage of the notified chemical should be avoided, spillages should be cleaned up promptly which should then be put into containers for disposal or recycling;
- Good personal hygiene should be practised to minimise the potential for ingestion;

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

13. 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* (1).

This MSDS was provided by the applicant as part of the notification statement. The accuracy of this information remains the responsibility of the applicant.

14. REQUIREMENTS FOR SECONDARY NOTIFICATION

Under the Act, secondary notification of the notified chemical shall be required if any of the circumstances stipulated under subsection 64(2) of the Act arise. No other specific conditions are prescribed.

15. REFERENCES

1. National Occupational Health and Safety Commission 1994, *National Code of Practice for the Preparation of Material Safety Data Sheets [NOHSC:2011(1994)]*, AGPS, Canberra.