

File No: NA/546

October 1997

**NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION
AND ASSESSMENT SCHEME**

FULL PUBLIC REPORT

Epoxy Acrylate Oligomer in ENPLATE DSR-3241A-G

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 Worksafe Australia which also conducts the occupational health & safety assessment. The assessment of environmental hazard is conducted by the Department of the Environment, Sport, and Territories 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

FULL PUBLIC REPORT

Epoxy Acrylate Oligomer in ENPLATE DSR-3241A-G

1. APPLICANT

Enthone OMI (Aust) Pty Ltd of 60 Heaths Court MILL PARK VIC 3082 has submitted a limited notification statement in support of an application for an assessment certificate for 'Epoxy Acrylate Oligomer in ENPLATE DSR-3241A-G'.

2. IDENTITY OF THE CHEMICAL

Epoxy Acrylate Oligomer in ENPLATE DSR-3241A-G is not considered to be hazardous based on the nature of the polymer and the data provided. Therefore the chemical name, CAS number, molecular and structural formulae, molecular weight, spectral data, details of the polymer composition and details of exact import volume and customers have been exempted from publication in the Full Public Report and the Summary Report.

Trade Names:	ENPLATE [®] DSR -3241 A-G ENPLATE [®] DSR -3241 A-PG ENPLATE [®] DSR -3241 A-B ENPLATE [®] DSR -3241 A-U.
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Number-Average Molecular Weight (NAMW):	> 1 000
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Maximum Percentage of Low Molecular Weight Species	
Molecular Weight < 500:	< 0.5%
Molecular Weight < 1 000:	< 1%

Method of Detection and Determination:	gel permeation chromatography (GPC) and infrared (IR) spectroscopy
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3. PHYSICAL AND CHEMICAL PROPERTIES

Appearance at 20°C and 101.3 kPa:	the product containing the notified polymer is a green, pale green, blue or clear viscous liquid
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Boiling Point:	> 175°C (product containing the notified polymer)
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Specific Gravity:	1.26 (product containing the notified polymer)
Vapour Pressure:	0.133 kPa at 20°C (product containing the notified polymer)
Water Solubility:	negligible (product containing the notified polymer-see comments below)
Partition Co-efficient (n-octanol/water):	not determined (see comments below)
Hydrolysis as a Function of pH:	not determined (see comments below)
Adsorption/Desorption:	not determined (see comments below)
Dissociation Constant:	not determined (see comments below)
Flash Point:	87°C (product containing the notified polymer)
Flammability Limits:	not determined
Autoignition Temperature:	not determined
Explosive Properties:	not determined
Reactivity/Stability:	notifier states that the notified polymer is stable, but contact with strong oxidants should be avoided

Comments on Physico-Chemical Properties

The boiling point, specific gravity and vapour pressure reported are for the product containing the polymer and not for the polymer itself.

The notifier has applied for variation of schedule requirements on the physico-chemical properties solubility, hydrolysis, partition coefficient, adsorption/desorption and dissociation constant. This is acceptable for the following reasons:

- Considering the high molecular weight and low amounts of polar functionality, low molecular weight species, and residual monomers, the polymer's solubility in water is likely to be low;
- The polymer contains some ester functionalities but hydrolysis in the environmental pH range (4-9) is unlikely due to the expected low solubility;
- The polymer is likely to have a high octanol/water partition coefficient and bind

strongly to or be associated with the organic matter in the soil;

- The polymer contains carboxylic acid functionality that may become anionic at high pH and increase the water solubility.

4. PURITY OF THE CHEMICAL

Degree of Purity: high

**Maximum Content
of Residual Monomers:** < 1.5%

5. USE, VOLUME AND FORMULATION

The notified polymer will not be manufactured in Australia. It will be imported into Australia at a concentration of 30-60% in a non-aqueous solution in the product ENDPLANE DSR 3241 formulations A-G (green), A-PG (pale green), A-B (blue) and A-U (clear). These products will be used as one part of a solder mask protective coating for printed wiring boards used by the electronics industry. Import volumes for the next five years will be less than five tonnes of the polymer per annum.

6. OCCUPATIONAL EXPOSURE

The product containing the notified polymer will be imported by air freight in 4 kg plastic tubs, contained within a cardboard box together with the 'B' component of the product. It will be transported by road to the notifier's warehouse, where it will be stored prior to distribution to customers. There will be no repacking of products containing the notified polymer. Airport, transport and warehouse workers are not expected to be exposed to the notified polymer under normal circumstances.

Dermal exposure to the notified polymer may occur at customer sites. Workers will combine the product containing the notified polymer using the 'B' component of the formulation with a spatula, prior to application to circuit boards using screen printers. Further dermal exposure may occur during the manual screen printing process, where a squeegee is used to force the product through the screen onto the circuit board. Eye contact would be limited to accidental contact, and inhalation exposure should not be a major route of exposure, due to the expected low vapour pressure of the notified polymer.

It should be noted that exposure to other potentially hazardous components of the end-use formulation may occur during the screen printing and curing of circuit boards (see notifier's Material Safety Data Sheet (MSDS)). The notifier states that application of the products to circuit boards will take place in self-contained areas with good general ventilation, and that fumes will be extracted from the curing ovens prior to opening.

The circuit boards are cured in an oven prior to inclusion in products (eg

calculators, computers and mobile phones). There may be significant dermal contact with the notified polymer in cured form.

7. PUBLIC EXPOSURE

No public exposure to the notified polymer is expected to occur during its storage, distribution or industrial use. There is also minimal potential for public exposure to the notified polymer during disposal. If the public were to have dermal contact with circuit boards treated with the notified polymer, dermal adsorption would be unlikely, as the notified polymer will be bound within the polymer matrix, and therefore migration from the coating to the skin is unlikely to occur. In addition, the high NAMW of the notified polymer suggests that if contact were to occur, dermal absorption is unlikely.

8. ENVIRONMENTAL EXPOSURE

Release

The company estimates up to 3% of the product to be lost from accidental spills and leaks and up to 2% to be lost in the application process. Up to 5% may be left on the screen printing apparatus but most of this would be recycled. The company estimates the worst case maximum waste of the product through application and handling to be 10% per annum. This equates to 300 kg of the polymer per annum. This waste would be disposed of to either landfill or incinerated.

Old circuit boards containing the cured polymer and even old electronic equipment containing such circuit boards are likely to be disposed of to landfill. Some used circuit boards may be recycled outside Australia.

The polymer will be widely distributed as the circuit boards coated with the cured polymer and equipment such as calculators, mobile phones and computers containing coated circuit boards will be sold nation wide.

Fate

The fate of bulk of the polymer (90%) will be tied to the fate of circuit boards on to which it will be applied and cured. Such circuit boards are likely to remain inside the electronic equipment into which they are installed for long periods. After the useable life, the circuit boards and electronic equipment are likely to end up in landfill as industrial waste. Waste from application and handling will also be disposed of to landfill or incinerated.

Waste polymer disposed of to landfill will remain bound to or associated with soil and organic matter. Due to the low solubility and the expected high partition coefficient, the potential for aquatic contamination through leaching would be very low. Incineration will destroy the polymer converting it to water vapour and oxides of carbon.

9. EVALUATION OF TOXICOLOGICAL DATA

No toxicological data were provided, which is acceptable for polymers with NAMW greater than 1 000 according to the Act.

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

No ecotoxicology data were provided, which is acceptable for polymers of NAMW greater than 1 000 according to the Act.

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

The polymer is unlikely to present a hazard to the environment when handled, used and disposed of as proposed. Disposal of waste polymer and the circuit boards containing the cured polymer to landfill will not pose a hazard to the aquatic organisms due to the high molecular weight and negligible solubility.

In addition, the US Environmental Protection Agency considers polynonionic polymers with NAMW greater than 1 000 and low solubility to be of low concern (3).

Given these considerations, the environmental hazard from the notified polymer can be rated as low.

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

The occupational health risk posed to airport, warehouse and transport workers is negligible, as they are not expected to come into contact with the notified polymer under normal circumstances.

There is a low occupational health risk to workers who may be exposed to the notified polymer during production of circuit boards. While the screen printing process is conducted manually, and there is considerable potential for dermal exposure to the notified polymer, the polymer is not expected to pose a toxicological hazard. Given that the polymer has a NAMW of greater than 1 000, it is not expected to traverse biological membranes. Although the notified polymer contains a number of residual monomers, they will be at low levels in the product (which will contain 30-60% of the notified polymer) and are unlikely to constitute a toxicological hazard, even when potential additive effects are taken into account. There are also low levels of low molecular weight species which are unlikely to be of toxicological concern.

The notifier has classified the product containing the notified polymer as hazardous and appropriate precautions should be taken to avoid dermal and inhalation exposure to potentially hazardous components (see the notifier's MSDS and the recommendations section). Workers should note that exposure standards

have been established for quartz and silica (4), however, inhalation exposure to these components is unlikely, given the end use product is supplied in liquid form.

The proposed use of the notified polymer is not expected to result in significant public exposure. If dermal contact were to occur, the high NAMW of the polymer suggests that dermal adsorption is unlikely. Based on the above information, the notified polymer is not expected to pose a significant risk to public health.

13. RECOMMENDATIONS

To minimise occupational exposure to Epoxy Acrylate Oligomer in ENPLATE DSR-3241A-G the following guidelines and precautions should be observed:

- It is good work practice to wear industrial clothing which conforms to the specifications detailed in Australian Standard (AS) 2919 (5) and occupational footwear which conforms to Australian and New Zealand Standard (AS/NZS) 2210 (6) to minimise exposure when handling any industrial chemical;
- Spillage of products containing the notified polymer should be avoided, spillages should be cleaned 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.

Workers should also be aware that a number of other components in the end-use products are hazardous, and appropriate engineering controls and personal protective equipment should be utilised by workers to prevent exposure (see notifier's MSDS).

14. MATERIAL SAFETY DATA SHEET

The MSDS for a product containing the notified polymer was provided in accordance with the *National Code of Practice for the Preparation of Material Safety Data Sheets* (7).

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 the Act, 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

1. National Occupational Health and Safety Commission 1994, *Approved Criteria for Classifying Hazardous Substances [NOHSC:1008(1994)]*, Australian Government Publishing Service, Canberra.
2. National Occupational Health and Safety Commission 1994, *List of Designated Hazardous Substances [NOHSC:10005(1994)]*, Australian Government Publishing Service, Canberra.
3. Nabholz, J.V., Miller, P. & Zeeman, M. 1993, 'Environmental Risk Assessment of New Substances under the Toxic Substances Control Act Section Five', in *Environmental Toxicology and Risk Assessment, American Society for Testing and Materials*, ASTM STP 1179, Philadelphia, pp. 40-55.
4. National Occupational Health and Safety Commission 1995, 'Adopted National Exposure Standards for Atmospheric Contaminants in the Occupational Environment, [NOHSC:1003(1995)]', in *Exposure Standards for Atmospheric Contaminants in the Occupational Environment: Guidance Note and National Exposure Standards*, Australian Government Publishing Service, Canberra.
5. Standards Australia 1987, *Australian Standard 2919-1987, Industrial Clothing*, Standards Association of Australia, Sydney.
6. Standards Australia/Standards New Zealand 1994, *Australian/New Zealand Standard 2210-1994, Occupational Protective Footwear*, Standards Association of Australia/Standards Association of New Zealand, Sydney/Wellington.
7. National Occupational Health and Safety Commission 1994, *National Code of Practice for the Preparation of Material Safety Data Sheets [NOHSC:2011(1994)]*, Australian Government Publishing Service, Canberra.