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NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

Urethane Acrylate Oligomer

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Director
Chemicals Notification and Assessment

FULL PUBLIC REPORT

Urethane Acrylate Oligomer

1. APPLICANT

3M Australia Pty Limited of 2-74 Dunheved Circuit ST MARYS NSW 2760 has submitted a limited notification statement in support of their application for an assessment certificate for Urethane Acrylate Oligomer.

2. IDENTITY OF THE CHEMICAL

Urethane Acrylate is not considered to be hazardous, based on the nature of the chemical and the data provided. Therefore 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 and the Summary Report.

Other names:	Urethane Acrylate Oligomer R-22587
Trade name:	component of Scotchcal™ Screen Printing Ink

3. PHYSICAL AND CHEMICAL PROPERTIES

The notified chemical is made in solution and is never isolated. The provided physico-chemical properties relate to the formulation containing 30-60% of the notified chemical unless indicated otherwise.

Appearance at 20°C and 101.3 kPa:	clear to light yellow liquid
Boiling Point:	not determined
Specific Gravity:	1.05-1.1 (formulation)
Vapour Pressure:	< 2.7 kPa at 32.2°C (formulation)
Water Solubility:	insoluble

Partition Co-efficient (n-octanol/water):	not determined
Hydrolysis as a Function of pH:	not determined
Adsorption/Desorption:	not determined
Dissociation Constant:	not determined
Flash Point:	> 93°C (formulation)
Flammability Limits:	not determined
Autoignition Temperature:	not determined
Explosive Properties:	unknown
Reactivity/Stability:	stable; the notifier states that temperatures above 89°C, UV light, peroxides and/or other acrylate initiators may cause hazardous polymerisation

Comments on Physico-Chemical Properties

The content of reported physico-chemical properties was limited as the notified polymer is made in solution and never isolated. The difficulty is acknowledged, in these circumstances, in obtaining data regarding partition coefficient and adsorption/desorption characteristics of the notified substance. It is also noted that there are no proposed releases of notified polymer to terrestrial or water environments.

The notifier claims that the notified polymer is insoluble and contact with water would cause it to become a gelatinous mass. An experimentally determined water solubility was not determined as test methodologies require the substance tested to be a "pure" system. The notified polymer is composed of acrylates diluting the Urethane Acrylate Oligomer. As a result, the water solubility value would reflect the value for the mixture and not the oligomer.

4. PURITY OF THE CHEMICAL

Degree of purity: > 50%

5. USE, VOLUME AND FORMULATION

Urethane Acrylate Oligomer is manufactured by the parent company in the United States. The substance will be used as a minor component of multi-component, solvent-free, ultraviolet-radiation-curable screen printing inks based on acrylate and/or vinyl monomers (Scotchcal™ Screen Printing Ink). Less than 500 kg per annum of the notified chemical are expected to be imported over the next five years.

6. OCCUPATIONAL EXPOSURE

The notified chemical formulated within the ink will be imported in 3.7 L plastic containers. There is not expected to be any exposure to transport workers, except in the event of a major spillage of the formulated inks containing the notified chemical.

The number of printing establishments that would utilise the screen printing ink cannot be determined. Up to two workers per screen printing establishment will manually mix and apply the formulated product to silk screens by squeegee for commercial productions. There is expected to be potential for exposure to the notified chemical at between 30 and 60% within the inks for up to 8 hours a day. The silk screening is conducted at room temperature with local exhaust ventilation. The silk screened films are subsequently placed onto a conveyor and fed into a UV-light exposure chamber (equipped with local exhaust ventilation) and exposed to ultraviolet light for a fraction of a second which allows the ink to cure. No further occupational exposure to the notified chemical on printed articles is expected after the ink cures. There may be further exposure to residual ink on the silk screen during cleaning with a lacquer thinner.

7. PUBLIC EXPOSURE

All the other ink constituents can react under the curing conditions to become part of the solidified ink matrix. The potential for public exposure to Urethane Acrylate Oligomer, via the inhalation route is considered low due to the low volatility of the chemical and the use of UV exposure chambers equipped with local exhaust ventilation.

These inks are generally used only in commercial screen printing. The public will come into limited contact with silk screened items, and in these cases the urethane acrylate oligomer will be irreversibly bound into the UV cured ink matrix. Minor public exposure may result from accidental spillage during transport and storage of the inks.

8. ENVIRONMENTAL EXPOSURE

Release

The price of these inks is high, so the company expects screen printers will maximise utilisation of any ink purchased. Silk screen printing involves controlled application of inks via ink-filled squeegees, which avoid ink waste. Following application, the printed substance is cured immediately and then stored for use. Subsequently, the quantity of the notified polymer contained in the waste from the silk screening process will be negligible. The reuse of screens, templates and application-squeegees ensures that this method of printing has minimal losses, compared to losses incurred by other forms of printing. A commercial lacquer thinner, rather than water, is used as a cleaning solution. The notifier estimates the total amount of waste to be < 1% of the total ink, ie < 0.5% of the notified polymer. The recommended disposal method of this waste is by incineration.

The UV Ink is described as "solventless". In this context it means that there is no liquid (organic solvent or water) which must be removed from the mixture to take on its solidified form. All the constituents in the liquid ink are reacted under the UV conditions to take on the solidified form of the printed product. An advantage of UV curing is a reduction in air pollution (1). Therefore there is no release of ink constituents during the UV curing process.

Articles coated with the cured ink containing the notified polymer will be disposed of as solid waste in landfill

Fate

The fate of most of the notified polymer is identical to that of the articles to which it is bound. These articles would eventually be disposed of to landfill. Here they would very slowly break down. It is unlikely that the cured ink would leach, but stay within the landfill.

For screen washup, commercial thinners are used. These wastes are then collected and sent for incineration. Complete incineration of the notified polymer will result in water, and oxides of carbon and nitrogen.

9. EVALUATION OF TOXICOLOGICAL DATA

Toxicological data are not required for polymers of NAMW > 1000 according to the Act.

The notified chemical is not expected show significant toxicological effects as it should not cross biological membranes. The addition of the isooctyl acrylate diluent, however, would make the resulting formulation a potential eye, skin and

respiratory irritant and the formulation would be classified as hazardous according to Worksafe Australia's *Approved Criteria for Classifying Hazardous Substances [NOHSC:1008(1994)]* (2). The notified polymer is not classified as hazardous, however.

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

No ecotoxicological data were provided, which is acceptable for polymers of NAMW > 1000 and with an annual import rate of < 1 tonne according to the Act.

The notified polymer is not expected to show ecotoxicity effects as it should not cross membranes and belongs to a class of polymers recognised as being of low concern (3).

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

The very low environmental exposure of the polymer as a result of normal use indicates that the overall environmental hazard should be negligible.

The cured ink will be inert and bound to the article which it coats. Articles coated with printing inks containing the notified polymer are expected to be disposed of to landfill. The environmental hazard from the disposal of the product containing the polymer is rated as negligible.

Complete incineration of the notified polymer will generate oxides of carbon and nitrogen, and water. The environmental hazard can be rated as low.

The only sources of environmental contamination during normal usage are from accidental spills, etc. The information provided on the Material Safety Data Sheet (MSDS) is adequate to limit the environmental exposure from such events and therefore should limit the environmental effects.

The overall environmental hazard can be rated as low.

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

The notified chemical is a polymer with a NAMW > 1000 and is not classified as hazardous according to Worksafe Australia's *Approved Criteria for Classifying Hazardous Substances* (2). However, the additional of acrylate diluents makes a formulation which is likely to be an eye, skin and respiratory irritant.

There is likely to be the risk of dermal exposure to the notified chemical from splashing or spillage through the work practices of mixing and applying the ink to silk screens prior to curing through UV exposure. To prevent exposure to the notified chemical within the ink formulation safety goggles, protective clothing and impervious gloves should be utilised but cannot be guaranteed in commercial

application. Use of the final formulated ink may require the use of an organic vapour respirator, which will also serve to reduce exposure to the notified chemical.

There is no significant occupational health risk from the notified polymer, however screen printing inks containing the notified polymer are likely to be occupational health risks due to their potential eye, skin and respiratory irritation properties.

Direct public exposure to the bulk liquid inks is unlikely. However the health effects of such exposure would be severe as the final product includes reactive acrylates, which may cause severe eye and skin irritation, skin sensitisation, respiratory irritation and gastrointestinal irritation, if swallowed.

13. RECOMMENDATIONS

To minimise occupational exposure to Urethane Acrylate Oligomer the following guidelines and precautions should be observed:

- If engineering controls and work practices are insufficient to reduce exposure to Urethane Acrylate Oligomer to a safe level, then the following personal protective equipment which conforms to Australian Standards (AS) or Australian/New Zealand Standards (AS/NZS) should be worn;

  safety goggles should be selected and fitted in accordance with AS 1336 (4) to comply with AS/NZS 1337 (5),

  industrial clothing should conform to the specifications detailed in AS 2919 (6),

  impermeable gloves or mittens conforming to AS 2161 (7).

- Usage of formulations containing the notified chemical should take into account the presence of diethylene glycol ethyl ether acrylate and the appropriate personal protective equipment to minimise exposure should be worn,

- 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 by incineration,

- 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* (8).

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 chemical shall be required if any of the circumstances stipulated under subsection 64(2) of the Act arise.

Should the notifier increase the amount to be imported to > 1 tonne or propose uses resulting in releases to the aquatic compartment, the environmental hazard will have to be reassessed.

No other specific conditions are prescribed.

16. REFERENCES

1. Oil and Colour Chemists' Association, Australia 1984, *Surface Coatings. Volume 2 - Paints and Their Applications*, TAFE Educational Books, Kensington NSW, p 611.

2. National Occupational Health and Safety Commission 1994, *Approved Criteria for Classifying Hazardous Substances* [NOHSC:1008(1994)], Australian Government Publishing Service, Canberra.

3. Nabholz JV, Miller P and Zeeman M, "Environmental Risk Assessment of New Chemicals Under the Toxic Substances Control Act TSCA Section Five", in Landis WG, Hughes JS and Lewis MA (Eds), *Environmental Toxicology and Risk Assessment*, pp 40 - 55.

4. Standards Australia 1994, *Australian Standard 1336-1994*, *Eye protection in the Industrial Environment*, Standards Association of Australia Publ., Sydney.

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

6. Standards Australia 1987, *Australian Standard 2919-1987, Industrial Clothing,* Standards Association of Australian Publ., Sydney.

7. Standards Australia 1978, *Australian Standard 2161-1978, Industrial Safety Gloves and Mittens (excluding electrical and medical gloves),* Standards Association of Australia Publ., Sydney.

8. 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.