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NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION
AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

Polyether Copolymer Polyol, XUS 13454.00.

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Director
Chemicals Notification and Assessment

FULL PUBLIC REPORT

Polyether Copolymer Polyol, XUS 13454.00

1. APPLICANT

Dow Chemical (Australia) Ltd of Kororoit Creek Road ALTONA VIC 3018 has submitted a limited notification statement with their application for an assessment certificate for Polyether Copolymer Polyol, XUS 13454.00.

2. IDENTITY OF THE CHEMICAL

Based on the nature of the chemical and the data provided, Polyether Copolymer Polyol, XUS 13454.00, is not considered to be hazardous. Therefore at the notifier's request the chemical identity has been exempted from publication in the Full Public Report and the Summary Report as commercial interests may be prejudiced if disclosed.

Other name:	Polyether Copolymer Polyol
Trade name:	XUS 13454.00 Polyol

3. PHYSICAL AND CHEMICAL PROPERTIES

The following data refers to the notified polymer and not to the product containing it.

Appearance at 20°C and 101.3 kPa:	Clear amber liquid
Odour:	Polyether-like
Melting Point:	Decomposes into lower molecular weight species at temperatures greater than ~200°C
Specific Gravity:	1.015 at 60°C
Vapour Pressure:	< 3 mmHg at 75°C (based on 'similar products')
Water Solubility:	< 2g/100g water at 20°C
Fat Solubility:	Not provided
Partition Co-efficient (n-octanol/water) log P_{OW}:	Not provided
Hydrolysis as a function of pH:	Does not hydrolyse (no readily identifiable hydrolysable groups)
Adsorption/Desorption:	Not provided

Dissociation Constant pKa**:**	Not determined, the chemical is non-ionic
Flash Point:	> 260°C (Pensky Martin Closed Cup Method)
Flammability Limits:	Not determined
Combustion Products:	Not provided
Pyrolysis Products:	Not provided
Decomposition Temperature:	Not provided
Decomposition Products:	Not provided
Autoignition Temperature:	Not provided
Reactivity/Stability:	XUS 13454.00 Polyol is stable at room temperatures and degrades rapidly at temperatures approaching the flash point. Contact with strong acids or oxidisers should be avoided.

Comment on physico-chemical properties

The vapour pressure and solubility have not been determined, but have been approximated by comparison with other polyols of similar composition

Solubilities of such polyether polyols have been found by the company to decrease with increasing NAMW. The estimate provided is based on a scale of such compounds developed by the company. Based purely on structure, the EPA expects the solubility to be much lower than the figure quoted above.

Since the compound is surface active, the partition coefficient was not required, according to part B of the Schedule. Surface activity and low water solubility indicate that the substance is likely to partition in soil/sediment.

4. PURITY OF THE CHEMICAL

Degree of purity : >99%

Additives/Adjuvants: None

5. INDUSTRIAL USE

The notified polymer is not manufactured in Australia. The notified polymer is used in the formulation of polyurethane foam systems. This process will be carried out at the Dow Chemical Altona manufacturing site, Victoria.

The estimated volumes of the notified chemical to be imported are:

Year	For Use in Australian Sales (tonnes)	Total Imports (tonnes)
1	<1	< 7.5
2	1-5	10-20
3	5-15	20-50
4	10-25	20-50
5	10-25	20-50

The formulated product will be exported overseas and sold on the Australian market. Potentially, 2-3 major polyurethane manufacturers in each state of Australia will use the product, leading to quantities at each plant. The estimated use of polyol in Australian manufacturing plants is tabulated below:

Year	Maximum Amount at an Australian Plant per annum
1	70 kg
2	360 kg
3	1.8 tonnes
4	1.8 tonnes
5	1.8 tonnes

6. OCCUPATIONAL EXPOSURE

XUS 13454.00 Polyol will be used only at the Dow Chemical, Australian manufacturing plant at Altona, Victoria. The product is blended with other substances to form one part of a formulated system.

Two day workers and one blending coordinator are directly involved in the blending operation and the maintenance of the plant and equipment.

The new polymer is just one of many products used in the blending plant and will not be required for production on a continuous basis. The hazards associated with the new polymer, as described in the material safety data sheet (MSDS), strictly only apply to the drum handling and charging activities. The concentration of the new polymer in the blended product is 1-5% and the hazards are accordingly low.

The Polyol Blending Plant is located in a well-ventilated, open area. The blending process is essentially closed except for raw materials charging, sampling and drum filling.

The blending of XUS 13454.00 with bulk polyol is a batch process performed by the day workers. Activities associated with the process have varying degrees of potential exposure to the new polymer. There is potential for low exposure when drum handling (raw materials) and drumming off of finished products. There is potential for moderate exposure when charging of raw materials into blender and sampling of blender.

Drums of XUS 13454.00 Polyol are moved into the work area on a pallet using a forklift. The product is pumped from 200 litre drums to the blender via a short pipe that is inserted directly into the bung hole of the drum.

Blended product containing a small proportion of the new polymer is periodically sampled by running small quantity into a drum, turning off the sample valve and collecting the residual product in the pipeline in sample jars.

Finished product is pumped into 200 litre drums at a filling station adjacent to the blending tank.

7. PUBLIC EXPOSURE

The notified chemical Polyether Copolymer Polyol, XUS 13454.00, will be imported into Australia in quantities less than 7.5 tonne in the first year, increasing to 10-20 tonne in the second year, and 20-50 tonnes per year thereafter. The polymer is intended as a component (concentration is less than 5%) in the formulation of rigid polyurethane foam. The rigid polyurethane foam will be used for internal insulation of white goods, and as a core for insulated building panels. As such, the public should not normally come into contact with the notified chemical. However, damaged white goods or building panels may expose the polyurethane foam containing the notified chemical resulting in possible dermal contact, although absorption will be negligible as the polymer has a number average molecular weight of 6500. In addition, minor dermal contact may result from accidental spillage of the notified chemical during transport, although adequate measures are detailed to contain such a spillage.

8. ENVIRONMENTAL EXPOSURE

Release

The notified substance is itself an ingredient for polyurethane manufacture. The shipping, handling (prior to and during formulation) and polyurethane manufacture itself all provide potential for environmental exposure.

The notifier has provided detailed information about the layout of the formulation site, which provides procedures for all possible routes of release of the compound into the environment.

In normal use excess polyol (e.g. in pipes leading to the blending apparatus) is drained into waste drums, and either re-blended with other polyols, or, if contaminated, collected in drums and removed by a waste disposal company for incineration. This loss is estimated to be 1.5 kg per 400 L batch, which is either recycled or incinerated.

The Materials Safety Data Sheet (MSDS) gives details of procedures for spills. At the manufacturing site, the spills are likely to occur in a sealed and bunded area where a cleanup is likely to be contained. Sand is kept on-site for the cleanup of accidental spills. Oversize drums are kept on-site to contain any leaking drums. Materials used for clean-ups (eg rags etc) would also be incinerated.

Potentially contaminated wash water from spills, scrubbers and cleaning would be discharged into the Altona site waste water treatment plant, estimated at 16.5 kg per batch (from data from American plants included with the submission). After treatment, water is discharged to the Dow tree plantation adjacent to the plant, so that no water is discharged to waterways or the sewer system.

Since the compound is not particularly volatile, potential release to the air is by formation of an aerosol. As all blending operations are contained, release of this nature is only likely to occur during the batching or drumming procedures. Smoke tests and air velocity measurements reveal the adjustable fume hoods at the manufacturing site to be quite efficient. Scrubbers would remove some of this material, left-over airborne material would be exhausted to the atmosphere, where it

is expected to either become substantially diluted or fall to ground in low concentrations around the plant.

The formulated polyol solution will be reacted with diphenylmethane diisocyanate to form polyurethane, for use in applications such as internal insulation (of refrigerators, walls etc.) which have reduced exposure to physical processes such as fraying. Information provided by the notifier indicates the polyol will completely react with the isocyanate by crosslinking, leaving no residual material. Substantial losses to the environment from the reaction or end product are not anticipated. Table 2 indicates the quantities of the notified substance used at individual plants. Small unanticipated losses in manufacturing polyurethane could result in further environmental exposure. This issue is further discussed in the "Environmental Hazard" section below.

Fate

Spilled polyol at the Altona site is likely to be degraded by incineration, or treated at the on-site sewage treatment works. Products of incineration are expected to be oxides of carbon (CO_2, CO) and water. As noted above, waste polyol is expected to be partitioned to sludge in the sewage treatment plant. In this form the polyol will most likely to be disposed of as landfill or by incineration. The polyol released in post waste treatment water will most likely be found at the Dow tree plantation, where it is likely to bind to soil/sediment, resulting in specific local exposure.

A Materials Safety Data Sheet was not provided for the formulated product, however, incineration of spilled material would presumably be the recommended outcome. In Australia, landfill is the more common method of disposal. A limited amount of landfilling may occur for the formulated product, where it is likely to partition to soil.

Biochemical oxygen demand tests were performed using samples of polyether copolymer polyol of the same constituent monomers of NAMW 2200. The five day BOD for these was 4 - 8 mg/L. The COD range was 230 - 310 mg/L, indicating very little biodegradation.

A graph was provided on the BOD/COD of five butylene oxide-ethylene oxide copolymers. There appeared to be a correlation between the percentage of the low molecular weight monomer contained in the polymer, and biodegradability as measured by BOD/COD. In general these polymers degrade slowly with <10% biodegradation after 28 days.

9. EVALUATION OF TOXICOLOGICAL DATA

No toxicological data were supplied and this is acceptable according to the *Industrial Chemicals Notification and Assessment Act, 1989* for the polymers of number-average molecular weight (NAMW) > 1000.

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

No tests have been carried out on the notified polymer, in accordance with the limited notification of a high NAMW polymer. Data from tests of similar polyether copolymers, however, has been provided, which are summarised in the table below.

Species	Test	Results
Daphnia Pulex	48 h acute immobilisation test	LC_{50} = 22[a]; >200[b] ppm
Fathead Minnow (*Pimephales promelas*)	48 h acute toxicity test	LC_{50} = 15.6[a];155[b] ppm

a: Polyether copolymer polyol NAMW 2200 and of the same constituent monomers as XUS 13454.00.

b: Polyether copolymer polyol NAMW 1800 and of the same constituent monomers as XUS 13454.00.

The results show that, if similar to the above as may be expected, the notified substance would be classified as slightly toxic by US EPA standards. The toxicity is possibly lower due to the much higher NAMW of the notified substance than XUR-1049-D-14-16-2.

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

The principal area of handling of the notified polyol in its most concentrated form is at the Dow chemical site, where the polyol is blended. Small quantities are expected to be vented to the air (as an aerosol) via fume hoods, and possibly in water to the on-site sewage treatment plant. Any remaining polyol in wastewater from the treatment plant is expected to be used for irrigation of the nearby Dow tree plantation. Exposure is thus likely to be quite local in nature.

Ecotoxicological data was not supplied for the notified substance, however consideration of the data supplied for similar but lower NAMW compounds indicates the notified substance as in the range practically non toxic to slightly toxic to fish and daphnia. It is highly unlikely that the notified substance would be able to reach an aquatic environment whilst being processed at the plant.

Once leaving the plant as a formulated product in 200L steel drums for sales in Australia or overseas (via road transport), the possibility of chemical spills exist. A materials safety data sheet should be provided for the formulated product, to safeguard workers and the environment in Australia. Due to the volumes (Table 2) of material handled at the polyurethane manufacturing plants, the materials safety data sheet would provide pertinent information for appropriate disposal techniques, which would reduce environmental exposure and impact through correct handling. The eventual fate of the polyol is by chemical reaction to form polyurethane, which is relatively inert and of low environmental hazard.

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

No toxicology data was supplied as the notified chemical is a polymer with a number average molecular weight of greater than 1000.

The notified polymer is not expected to be a health hazard as the high number-average molecular weight (> 1000) should preclude transmission of molecules across biological membranes. Levels of residual monomers are very low and should not render the polymer a health hazard. There is one notable hazardous impurity, ethylene oxide. However, the level is not sufficient to render the polymer hazardous (2). The level of low molecular weight(<1000) species (0.05%) is also unlikely to render the polymer hazardous.

Occupational exposure to the notified chemical is minimal due to the closed nature of the blending operations, provision of an effective exhaust ventilation system and the use of protective equipment.

All employees wear safety glasses with side shields to protect the eyes against accidental splashes. Gloves (PVC material) are used by employees for activities where there is potential contact with the polymer. Gloves are used specifically during drumming process. Potential for inhalation of vapours is very low because of the low vapour pressure of all ingredients and the largely enclosed nature of all operations. Any vapour or mists formed during the blending process are contained within the equipment. Vapours or mists associated with the batching or drumming processes are captured and extracted by an effective vacuum exhaust system. An exhaust hood is positioned over the top of the drums of Polyether Copolymer Polyol, XUS 13454.00 when pumping product to the blender to remove any vapours present and vapours or mist issuing from drums during the filling process are captured by an exhaust shroud surrounding the filling pipe. Therefore, workers are unlikely to be exposed to vapours residing in the headspace of drums or vapours/mists produced during the drum filling process.

Given the low intrinsic health hazard of the notified polymer together with expected low exposure, the occupational health risk arising from use is expected to be minimal. On the basis of the available data the notified chemical, Polyether Copolymer Polymer, XUS 13454.00 would not be classified as hazardous according to the criteria of Worksafe Australia (3).

The notified chemical Polyether Copolymer Polyol, XUS 13454.00, will be used as a component in the manufacture of polyurethane used in white goods and insulated building panels. As the polyurethane is contained, public contact with the substance should be negligible. In the unlikely event of accidental dermal contact, resulting from damage to goods containing the polyurethane, or spillage of the notified chemical itself during transport, negligible absorption would occur as the polymer has a number average molecular weight greater than 1000. It is unlikely that the notified chemical will pose a significant hazard to public health when used in the proposed manner.

13. RECOMMENDATIONS

To minimise occupational exposure to Polyether Copolymer Polyol, XUS 13454.00 Polyol the following guidelines and precautions should be observed.

. When using the notified chemical the following protective equipment should be worn:

- impervious gloves conforming to Australian Standards (AS) AS 2161 (4),

- protective eye goggles conforming to AS 1336 (5),and AS/NZS 1337 (6),

- protective clothing conforming to AS 3765.2 (7), and

- protective footwear conforming to AS/NZS 2210 (8).

- If mist, vapour or aerosols are generated, and engineering controls are not sufficient to control exposure, the following protective equipment should also be worn:

  - respiratory protection conforming to AS/NZS 1715 (9) and AS/NZS 1716 (10).

- When entering poorly ventilated enclosed spaces, tanks or vessels the following protective equipment should be worn:

  - self-contained breathing apparatus conforming to AS/NZS 1715 (9).

- Safe work practices should be implemented to prevent splashing and spillages.

- Good personal hygiene practices should be observed.

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

14. MATERIAL SAFETY DATA SHEET

The attached Material Safety Data Sheet (MSDS) for Polyether Copolymer Polyol, XUS-13454.00 Polyol was provided in a suitable format.

This MSDS was provided by Dow Chemical (Australia) Limited as part of their notification statement. It is reproduced here as a matter of public record. The accuracy of this information remains the responsibility of Dow Chemical (Australia) Limited.

15. REQUIREMENTS FOR SECONDARY NOTIFICATION

Under the *Industrial Chemicals (Notification and Assessment) Act 1989*, secondary notification of Polyether Copolymer Polyol, XUS-13454.00 Polyol 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. N.I. Sax and R.J. Lewis, 1989. Dangerous Properties of Industrial Materials, Van Nostrand Reinhold, New York.

2. National Occupational Health and Safety Commission, 1994. *List of Designated Hazardous Substances*, [NOHSC:10005(1994)], AGPS, Canberra.

3. National Occupational Health and Safety Commission, 1994. *Approved Criteria for Classifying Hazardous Substances*, [NOHSC:1008(1994)], AGPS, Canberra.

4. Standards Australia, 1978. *Australian Standard 2161-1978, Industrial Safety Gloves and Mittens (excluding Electrical and Medical Gloves*), Standards Association of Australia Publ., Sydney, Australia.

5. Standards Australia, 1994. *Australian Standard 1336-1994, Recommended Practices for Eye Protection in the Industrial Environment*, Standards Association of Australia Publ., Sydney, Australia

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

7. Standards Australia, 1990 Australian Standard 3765 - 1990. *Clothing for Protection Against Chemical Hazards*, Part 1, *Protection against General or Specific Chemicals*; Part 2, *Limited Protection Against Specific Chemicals*, Standards Australia Publ., Sydney, Australia.

8. Standards Australia, Standards New Zealand 1994. *Australian/ New Zealand Standard 2210 - 1994 Occupational Protective Footwear, Part 1: Guide to Selection, Care and Use. Part 2: Specifications,* Standards Association of Australia Publ., Sydney, Australia, Standards Association of New Zealand Publ. Wellington, New Zealand.

9. Standards Australia, Standards New Zealand, 1994. *Australian/New Zealand Standard 1715 - 1994 Selection, Use and Maintenance of Respiratory Protective Devices*, Standards Association of Australia Publ., Sydney, Australia, Standards Association of New Zealand Publ., Wellington, New Zealand.

10. Standards Australia, Standards New Zealand, 1991. *Australian/ New Zealand Standard 1716 - 1991 Respiratory Protective Devices,* Standards Association of Australia Publ., Sydney, Australia, Standards Association of New Zealand Publ., Wellington, New Zealand.