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NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

DIUREA

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Director
Chemicals Notification and Assessment

FULL PUBLIC REPORT

DIUREA

1. APPLICANT

Dulux Australia of McNaughton Road, Clayton, VIC 3168 has submitted a standard notification statement accompanying their application for an assessment certificate for Diurea.

2. IDENTITY OF THE CHEMICAL

The hazardous nature of the notified chemical is unknown except for the fact that it is unlikely to be a skin irritant. Variation of schedule requirements for the remainder of the toxicological data was sought and granted on the basis that the resin solution to be imported is at a relatively low concentration of the notified chemical in sturdy steel drums, is formulated into a paint at a single site and the paint contains the notified chemical at a concentration which would not lead to its classification as a hazardous substance according to Worksafe Australia's *Approved Criteria for Classifying Hazardous Substances* (1) even if it were positive in one or more of the toxicological tests normally required as part of a standard notification under the Act. However, in view of the unknown nature of the hazard it is deemed prudent to treat the chemical as potentially hazardous. Therefore certain conditions are placed on the granting of exempt status for the chemical identity. These are:

- A descriptive generic name, Aromatic aliphatic urea derivative, be used to identify the substance in public reports and the MSDS,
- The relevant employee unions shall be informed of the conditions of use of Diurea,
- The full chemical name shall be provided to any health professionals in the case of a legitimate need where exposure to the chemical may involve a health risk,
- The full chemical name shall be provided to those on site who are using the chemical and to those who are involved in planning for safe use, etc. in the case of a legitimate need,
- The Director of NICNAS will release the full chemical name etc in the case of a request from a medical practitioner,
- Confidentiality will expire after a 3 year period,
- Reference to assessment of Diurea by NICNAS be made on the MSDS,
- These conditions shall be published in the Chemical Gazette.

Trade names: Diurea, 4422/148 Rheology Control Agent

Molecular weight: 382

Method of detection and determination:

FTIR spectroscopy

3. PHYSICAL AND CHEMICAL PROPERTIES

As the notified chemical is difficult to isolate and only available in limited quantities as a pure substance only the melting point and water solubility have been measured. Other properties are estimates, mostly obtained from the US EPA's Assessment Tools for the Assessment of Risk (ASTER) database.

Melting Point: 218°C

Specific Gravity: 1.1 (estimated)

Vapour Pressure: 3.2×10^{-13} kPa at 25°C (estimated) (ASTER)

Water Solubility: 0.05 mg/L at 24°C (turbidimetric method). Estimated value 41.9 mg/L (ASTER)

Partition Co-efficient (n-octanol/water) log P_{ow}: log P = 3.86 (ASTER). An estimate of 3.2 (Hansch and Leo's method) has been provided by the CSIRO Division of Chemicals and Polymers, on behalf of the notifier.

Hydrolytic stability: Not available. Diurea would not be expected to hydrolyse at significant rates under environmental conditions because of low solubility.

Adsorption/Desorption: Expected to be immobile in soils by virtue of its low solubility. The estimated soil organic carbon partition cofficient is 2800 (ASTER), indicative of strong binding to soils.

Dissociation Constant: The substance contains no readily dissociable groups.

4. PURITY OF THE CHEMICAL

Degree of purity : > 98%

Toxic or hazardous impurities: None identified

Non-hazardous impurities: None identified

Additives/Adjuvants: Nil

5. INDUSTRIAL USE

Diurea will be imported as a component (5-10%) of a resin solution for use as a flow control agent in paints. The annual import volume is expected to be 1 - 10 tonnes per year for the first five years.

6. OCCUPATIONAL EXPOSURE

A resin solution containing the notified chemical at 5-10% is transported by road in 200 L steel drums to the notifier's premises and transferred from the drum to a paint mixer by pumping. Four to five drums of solution are added to the mixer per batch and exposure is possible when removing drum bungs or when transferring a drum lance from one drum to another. Spills of resin solution may occur as drips from the drum lance and are expected with perhaps 1 in 20 drums handled. The volume involved is expected to be small - 100-200 mL of resin solution which is cleaned up using a mop and bucket of solvent.

Mixing is carried out in an enclosed mixer fitted with local exhaust ventilation to capture volatiles at source. Drumming off of the paint, containing 0.25% of the notified chemical is accomplished by gravity feed from the base of the paint mixer into 200 L open head steel drums. The flow of paint is controlled through a tap system which is switched off as the drums fill. Exposure to the paint may occur by skin contact when closing drums and cleaning up minor spills - at worst involving 20-30 kg of paint containing 100 g Diurea.

Small amounts of paint will be handled during laboratory development and quality control.

Three workers will be involved on 10 days per year, 8 hours per day in laboratory development, quality control testing and drum filling operations and 3 hours per day in paint make-up.

The finished automotive paint is to be used at a single site and applied automatically to vehicles in a spray booth with fume extraction.

7. PUBLIC EXPOSURE

The public is unlikely to come in contact with the notified chemical during importation, formulation, use or disposal of the notified chemical. The only possible circumstances would be in the event of an accident during transport of the notified chemical or the paint into which it is formulated and contact with the notified chemical or paint disposed to landfill.

8. ENVIRONMENTAL EXPOSURE

. Release

The notifier estimates that up to 100 kg waste diurea from formulation may require disposal. This is most likely to occur to landfill, after treatment through the 'Dusol" process to reclaim solvents and immobilise the residue as an inert solid. Incineration is another disposal option.

Drums will be sent to a drum reconditioner for incineration, washing and recycling.

Additional wastes (up to 60% of imports, or a maximum of 6 tonnes per annum) will be generated as overspray during use. Solid wastes from spray painting will be disposed of to landfill.

. Fate

Diurea will mainly be disposed of to landfill as residues from spray painting operations. Diurea has low intrinsic mobility, and will be effectively immobilised in these solid residues.

A Mackay level 1 calculation indicates that 47% of diurea released to the environment would partition to water at equilibrium, with 27% to soil and 25% to sediment (ASTER). Note that this may be an overestimate of the aqueous fraction as measured solubility is much less than that calculated.

There is no evidence to suggest that diurea will biodegrade. The ASTER database cites a biodegradation half-life in excess of 20 days, noting that the degradation rate can not be estimated.

Diurea has the potential to bioaccumulate, based on its octanol-water partition coefficient and apparent hydrolytic stability. The estimated bioconcentration factor in fathead minnow is 448 (ASTER).

9. EVALUATION OF TOXICOLOGICAL DATA

The only toxicological data available was for dermal irritation. Variation of schedule requirements for the remainder of the toxicological data was sought and granted on the basis that the resin solution to be imported is at a relatively low concentration of the notified chemical in sturdy steel drums, is formulated into a paint at a single site and the paint contains the notified chemical at a concentration which would not lead to its classification as a hazardous substance according to Worksafe Australia's *Approved Criteria for Classifying Hazardous Substances* (1) even if it were positive in one or more of the toxicological tests normally required as part of a standard notification under the Act.

9.1 Skin Irritation (2)

Result: non-irritant to rabbit skin **Species/strain:** New Zealand White rabbits

Number/sex of animals: 3 M

Method of administration: sample as fine powder moistened with de-ionised water and applied under semi-occlusive gauze dressing for four hours.

Clinical observations: No clinical signs were observed

Test Method: OECD Guidelines for the Testing of Chemicals (3) no. 404

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

No measured data are available. LC_{50}s for fish and water fleas estimated using QSAR techniques and assuming nonpolar narcosis to be the mode of acutely toxic action are in the range of 2-8 mg/L, indicative of moderate toxicity (ASTER).

Data have been estimated for *Daphnia magna* (48 h LC_{50} = 4.5 mg/L), bluegill sunfish (96 h LC_{50} = 6.0 mg/L), fathead minnow (96 h LC_{50} = 7.4 mg/L), channel catfish (96 h LC_{50} = 3.2 mg/L) and rainbow trout (96 h LC_{50} = 2.8 mg/L).

The estimated maximum acceptable toxicant concentration under conditions of chronic exposure to fathead minnows is 1.0 mg/L, based on growth effects (ASTER).

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

The predicted hazard is low because environmental exposure to diurea is expected to be low.

It is important that diurea be excluded from water in view of its potential for bioaccumulation and the Mackay calculations indicating a significant fraction would partition to the aquatic compartment. Current handling and disposal practices, as outlined above, are expected to be effective in excluding diurea from waterways. The material safety data sheets for the resin solution and the topcoat instruct that spills should be prevented from contaminating drains and waterways.

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

Little is known about the toxicity of diurea although it is not likely to be a skin irritant based on a study in rabbits. The concentration of diurea in the imported resin solution - 10% maximum - is expected reduce the likelihood that the imported formulation would be hazardous as a result of its diurea content.

The resin solution in which diurea is imported is expected to be hazardous as a result of the content of xylene (up to 30%) and aromatic hydrocarbon solvent (up to 30%). At the

single site of reformulation of the resin solution engineering controls are in place to minimise exposure to solvents from both inhalation and dermal contact during paint makeup. The efficiency of these controls - enclosed mixers and the use of pumps for addition to the mix tank - would be indicated by solvent vapour levels, which are stated to be routinely monitored, and should ensure low exposure to the notified chemical. Dermal exposure to the resin solution is possible during removal of bungs from drums and during pumping operations when the drum lance is transferred from one drum to another although the notifier estimates that spills occur infrequently - one spill in 20 drums processed.

The risk of adverse health effects occurring during paint makeup is not possible to quantify but may be expected to be low as a result of the low concentration of the notified chemical in the resin solution coupled with limited opportunities for dermal contact. The risks of adverse health effects from conducting laboratory tests and quality control operations are expected to be correspondingly lower given the limited quanitities used.

As the resin solution is flammable, there is a potential for combustion in the workplace if it comes in contact with an ignition source.

The final concentration of diurea in the automotive paint of which it is a component is 0.25% so that the paint is unlikely to be hazardous according to Worksafe Australia's *Approved Criteria for Classifying Hazardous Substances* (1). As the paint is applied automatically to vehicles in a spray booth with fume extraction, the risk of adverse health effects from this source is expected to be minimal.

The is expected to be little opportunity for public contact with the notified chemical so that there is a low risk of adverse public health effects.

13. RECOMMENDATIONS

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

. during removal of diurea from the drums in which it is imported, paint formulation and drum cleaning personal protective equipment as described in Australian (AS) or Australian/New Zealand (AS/NZS) Standards as follows should be worn:

  - eye protection should be selected and fitted in accordance to AS 1336 (4) and meet the requirements of AS/NZS 1337 (5);

  - impermeable gloves should conform to AS 2161 (6);

  - protective clothing should conform to AS 2919 (7) and the fabric should provide at least limited protection against certain hazardous chemicals in accordance with AS 3765.2 (8);

  - protective footwear should conform to AS/NZS 2210 (9).

. good work practices should be implemented to avoid spillages and splashing;

. good housekeeping and maintenance should be practised. Spillages should be cleaned up promptly with absorbents which should then be put into containers for disposal in accordance with Local or State government regulations;

. storage should be in robust sealed containers away from sources of ignition or high temperatures;

. the workplace should be well ventilated;

. good personal hygiene should be observed; and

. a copy of the relevant Material Safety Data Sheet(s) (MSDS) should be easily accessible to employees.

14. MATERIAL SAFETY DATA SHEET

The attached MSDS for the resin solution and paint containing Diurea were provided in accordance with Worksafe Australia's *National Code of Practice for the Preparation of Material Safety Data Sheets* (10).

These MSDS were provided by Dulux Australia as part of their notification statement. They are reproduced here as a matter of public record. The accuracy of this information remains the responsibility of Dulux Australia.

15. REQUIREMENTS FOR SECONDARY NOTIFICATION

Under the *Industrial Chemicals (Notification and Assessment) Act 1989*, secondary notification of Diurea shall be required if any of the circumstances stipulated under subsection 64(2) of the Act arise. Secondary notification under subsection 64(1) of the Act shall be required if the site of manufacture of paints containing Diurea changes and if exposure of workers or the environment to Diurea may potentially increase for any reason.

16. REFERENCES

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

2. Techlink Australasia Pty Ltd, 1994 *Skin irritation/Corrosion Test on 4422/148 Rheology Control Agent*, data on file, ICI Australia Operations Pty Ltd, Melbourne, Australia.

3. Organisation for Economic Co-operation and Development, *OECD Guidelines for Testing of Chemicals*, OECD, Paris, France[1].

[1] The Guidelines relevant to the current notification are as follows:

. No. 404 Acute Dermal Irritation/Corrosion

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

5. 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.

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

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

8. Standards Australia 1990, *Australian Standard 3765.2-1990 Clothing for Protection against Hazardous Chemicals Part 2 Limited protection against specific chemicals*. Standards Association of Australia Publ., Sydney, Australia.

9. 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.

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