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**NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION  
AND ASSESSMENT SCHEME**

**FULL PUBLIC REPORT**

**Polymer in Densodrin CD**

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 Department of the Environment, Sport, and Territories and the assessment of public health is conducted by the Department of Human Services and Health.

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Director  
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**FULL PUBLIC REPORT****Polymer in Densodrin CD****1. APPLICANT**

BASF Australia Ltd of 500 Princes Highway, Noble Park, Vic 3174 has submitted a limited notification in support of their application for an assessment certificate for the new synthetic polymer in Densodrin CD.

**2. IDENTITY OF THE CHEMICAL**

Based on the nature of the chemical and the data provided, the notified chemical is considered to be non-hazardous. Therefore, the chemical name, CAS number, molecular formula and structural formula data have been exempted from publication in the Full Public Report and the Summary Report.

**Trade name:** Densodrin CD

**Number-average molecular weight:** 2373

**Maximum percentage of low molecular weight species (molecular weight < 1000):**  
5.84 (maximum 7%) < 500  
9.6 (maximum 12%) < 1000

**3. PHYSICAL AND CHEMICAL PROPERTIES**

Physical-chemical data were provided for Densodrin CD, a water based dispersion containing less than 10% of the notified polymer. The following data are for the product unless otherwise stipulated.

**Appearance at 20°C and 101.3 kPa:** Yellowish liquid

**Boiling Point:**  $\geq 100^{\circ}\text{C}$

**Solidification Temperature:**  $< 0^{\circ}\text{C}$

**Density:**  $0.97 \text{ g/cm}^3 @ 20^{\circ}\text{C}$

**Vapour Pressure:** Expected to be negligible for this class of polymer

**Water Solubility:** Highly insoluble

**Partition Co-efficient**

<b>(n-octanol/water) log P<sub>ow</sub>:</b>	Not determined due to low water solubility of the polymer
<b>Hydrolysis as a function of pH:</b>	Not determined due to low water solubility of the polymer
<b>Adsorption/Desorption:</b>	Not determined
<b>Dissociation Constant</b>	Not determined
<b>Flash Point:</b>	None determined below 100°C
<b>Autoignition Temperature:</b>	None determined below 200°C
<b>Combustion Products:</b>	If the water is evaporated from the polymer dispersion, the polymer is expected to burn with a smoky flame and produce carbon dioxide, carbon monoxide, water vapour, incompletely burned hydrocarbons and possibly trace amounts of silicon oxides
<b>Explosive Properties:</b>	None expected
<b>Reactivity/Stability:</b>	Stable

#### **Comments on physico-chemical properties:**

Siloxanes are highly insoluble in water (1). The company estimates the solubility of the present compound to be in the ppb range and confirms that the presence of carboxylic acid groups even as the sodium salt does not improve the solubility.

The polymer contains no functional groups that are likely to hydrolyse.

Partition coefficient would be difficult to measure but is expected to be high due to the low solubility in water.

The polymer contains some free carboxylic acid groups expected to have typical acidity. The Densodrin CD formulated from it however is slightly alkaline as the acid polymer is neutralised with sodium hydroxide.

On the basis of the low solubility of the polymer it is likely to adsorb to soil/sediment and be immobile in soil. Siloxanes are tightly sorbed to sediment particles and form organo-silica layers around the particles (1).

#### **4. PURITY OF THE CHEMICAL**

**Degree of purity:** >90%

The notified chemical contains no hazardous impurities at levels necessary to classify it as a hazardous substance (2). Therefore, information on the purity of the chemical has been exempted from publication in the Full Public Report and the Summary Report.

**Maximum content of residual monomers:**  $\leq 3.05\%$

## **5. INDUSTRIAL USE**

The polymer is imported as a mixture of free acid (this application) and its sodium salt (NA/349). The proportions of each in the mixture are not known. The polymer mixture will be imported to Australia at a rate of > 1 tonne per annum for the first 5 years.

Densodrin CD, containing up to 10% of the polymer will be used as a waterproofing agent for leather in the leather manufacturing industry. Initially, it will be used by one company in South Australia.

## **6. OCCUPATIONAL EXPOSURE**

Densodrin CD will be imported by sea in 120 or 220 L polyethylene drums in a mixed container and transported by road to the BASF warehouse at Noble Park, Victoria. Here the drums will be unloaded by forklift and reloaded into trucks to go to the customer in South Australia. Transport workers will be involved in unloading and reloading of the product. Laboratory technicians may be required to take samples once or twice a year from the drums at the warehouse. Exposure of the transport workers should only occur in the event of accidental spillage. Exposure of the laboratory workers will be low given the sampling frequency and will be further reduced if protective clothing and chemical gloves are worn.

At the customer site the drums will be unloaded and moved to the production area by store personnel. The product will be removed from the drums using automatic dosing equipment and transferred to a mixing vessel to which water is added. This solution will be pumped from the mixing vessel into the tanning drums along with other additives and then the hides will be added. Supervisor and labourers will be involved in weighing and metering the product into tanning drums as well as the removal of the hides from the tanning drums and the drying of the hides. The applicant estimates that these activities will take approximately 15 min/day, 240 days/year. Other duties at the customer site include product sampling and analysis by laboratory assistants and equipment maintenance by contracted personnel.

All personnel at the customer site are required to wear protective clothing, eye protection and protective gloves as well as vapour respirators to protect them from the solvents in the tanning drums. The weighing stations and tanning drums are fitted with local exhaust ventilation.

## **7. PUBLIC EXPOSURE**

The applicant states that the new polymer will be available only to industrial leather processors. The treated leather may be available to the general public, but after the manufacturing process, the polymer is expected to be bound onto the leather. Therefore, the potential for public exposure to the new polymer is expected to be low.

Used drums will be rinsed with water prior to disposal. If accidental spillage occurs, it will be contained and soaked up with absorbent material before being disposed of by incineration or approved landfill as recommended in the MSDS.

Used polymer will be discharged to waste water, which in turn will be collected for treatment in an effluent treatment facility. Leaching of the new polymer is expected to be minimal as the polymer is insoluble in water.

## **8. ENVIRONMENTAL EXPOSURE**

### **. Release**

There will be no environmental release during transport except during a major accident.

At the customer, the emulsion is transferred to mixing vessels using automatic equipment and diluted with warm water. This mixture is pumped into tanning drums, together with other additives. The solution contains 6-8% Densodrin CD (0.6-0.8% polymer). Animal hides are added to the tanning drums and mixed for 6-8 hours. On completion of the tanning process, the hides are removed and allowed to dry. Minor spills during the above operations are soaked up with absorbent material for disposal to approved land fill sites or incineration. Laboratory trials have indicated that almost 99.5% of the Densodrin adheres to the leather during the tanning process leaving only about 0.5% in solution. This waste solution is discharged to the sewer for effluent treatment where the small amount of polymer remaining in solution will be adsorbed to the sludge which in turn would be disposed to landfill.

### **. Fate**

The fate of the bulk of the polymer (almost 99% of that imported) will be tied to the fate of the finished leather. Leather that has been treated with the polymer is expected to be used in making leather items, mainly shoes. Most of the treated leather will be landfilled, either as trimmings during the making of leather articles or when the goods are disposed of.

Solid waste containing the polymer, generated during formulation and application of tanning solution, and as sludge from waste water treatment is expected to be disposed of through landfill or incineration.

Polymer disposed to landfill is likely to remain immobile due to its high molecular weight and low water solubility. The high molecular weight will also prevent any bioaccumulation.

Recent literature indicates that some degree of clay-catalysed degradation of the polymer may occur, this being enhanced by soil drying (1,3-5). The products produced will be either degraded further, volatilised, incorporated into humus or oxidised to CO<sub>2</sub> (4,6).

## **9. EVALUATION OF TOXICOLOGICAL DATA**

Toxicological data are not required for polymers with NAMW > 1000 according to the *Industrial Chemicals (Notification and Assessment) Act 1989* (the Act).

## **10. ASSESSMENT OF ENVIRONMENTAL EFFECTS**

According to the Act, environmental effects testing is not required for polymers with NAMW>1000 as such polymers are too large to cross biological membranes.

The company, however, has estimated the toxicity of the polymer to bacteria to be >100 mg/L and the 96 h LC<sub>50</sub> for the fish Golden orfe (*Leuciscus idus*) to be 10-100 mg/L.

## **11. ASSESSMENT OF ENVIRONMENTAL HAZARD**

Most of the polymer will be disposed of to landfill with the leather to which it is cured. Waste from the tanning and leather industries will also be disposed to landfill or incinerated.

Polymer disposed to landfill will not present a hazard as most of it will remain bound to soil particles. It may undergo some amount of degradation releasing water soluble siloxanols but this does not seem to introduce a major hazard as these low-molecular weight species are either volatilised, degraded, incorporated into humus or oxidised to CO<sub>2</sub>.

Incineration of the polymer will produce oxides of carbon, silica and water with no major environmental hazard.

Most of the polymer discharged to waste water will be adsorbed to the sludge during waste water treatment. Even if nothing is adsorbed to the sludge, the maximum concentration of polymer in the waste water is estimated at 0.46 mg/L.

Overall the environmental hazard of the polymer can be rated as low.

## **12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS**

The notified polymer is imported as a 10% emulsion in water. In this form the polymer does not present any major physico-chemical concerns to workers.

The polymer has number average molecular weight > 1000 with a relatively low percentage of low molecular weight species (12% < 1000). Therefore it is not expected to cross biological membranes and cause systemic effects. The polymer contains a number of hazardous residual monomers/impurities, however, according to the *Approved Criteria for Classifying Hazardous Substances* (2) these levels are not high enough to classify the polymer as hazardous.

The imported product will be handled by workers at the BASF warehouse and the leather tannery. Occupational exposure will potentially occur while sampling from the imported drums or tanning vessels, weighing and metering the product into mixing vessels and removing wet hides from the tanning drums. During these operations skin and eye contact may occur. To protect themselves from other more hazardous ingredients in the tanning drums workers will be required to wear personal protective equipment (including protective clothing, gloves and eye protection). Use of this equipment will minimise exposure to the notified chemical.

Given the low toxicological and physico-chemical hazards associated with the notified polymer, under normal use situations, risk to workers should be low.

After the manufacturing process, the polymer is expected to be bound onto the leather. Therefore, public exposure to the notified polymer is expected to be negligible. In the case of accidental spillage during transport, the public may be exposed to the polymer. This is minimised by the recommended clean-up procedures.

## **13. RECOMMENDATIONS**

To minimise occupational exposure to the polymer in Densodrin CD the following guidelines and precautions should be observed:

- . if engineering controls and work practices are insufficient to reduce exposure to polymer in Densodrin CD to a safe level, then the following personal protective equipment which conforms to Australian Standard (AS) or Australian/New Zealand Standard (AS/NZS) should be worn:

safety goggles should be selected and fitted in accordance to AS 1336 (7) to comply with AS/NZS 1337 (8).

industrial clothing must conform to the specifications detailed in AS 2919 (9) and AS 3765.1 (10).

impermeable gloves or mittens conforming to AS 2161 (11) and AS 3765.1 (10).

all occupational footwear should conform to AS/NZS 2210 (12).

spillage of the notified chemical should be avoided.

good personal hygiene should be practised to minimise the potential for ingestion.

a copy of the Material Safety Data Sheet should be easily accessible to employees.

#### **14. MATERIAL SAFETY DATA SHEET**

The Material Safety Data Sheet (MSDS) for Densodrin CD was provided in Worksafe Australia format (13).

This MSDS was provided by BASF Australia Ltd as part of their notification statement. The accuracy of this information remains the responsibility BASF Australia Ltd.

#### **15. REQUIREMENTS FOR SECONDARY NOTIFICATION**

Under the *Industrial Chemicals (Notification and Assessment) Act 1989*, secondary notification of the polymer in Densodrin CD 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. Hamelink, JL. 1992. *Silicones*. In 'The Handbook of Environmental Chemistry Vol 3 Part F, Anthropogenic Compounds: Detergents'. Ed. N.T. de Oude. pp 383-394. Springer-Verlag.
2. National Occupational Health and Safety Commission, 1994, *Approved Criteria for Classifying Hazardous Substances*. Australian Government Publishing Service, Canberra.
3. Lehmann RG, Varaprath S, Annelin RB and Arndt JL. 1995. Degradation of silicone polymers in a variety of soils. *Environmental Toxicology and Chemistry* **14**, 1299-1305.
4. Carpenter JC, Cella JA and Dorn SB, 1995, Study of the degradation of polydimethylsiloxanes polymers in soil. *Environmental Science and Technology* **29**, 864-868.



5. Buch, RR and Ingebrigtsen, DN, 1979, Rearrangement of polydimethylsiloxane fluids on soil. *Environmental Science and Technology* **13**, 676-679.
6. Lehmann RG, Varaprath S, and Frye CL, 1994, Fate of silicone degradation products (silanols) in soil. *Environmental Toxicology and Chemistry* **13**, 1753-1759.
7. Standards Australia, 1994, *Australian Standard 1336-1994, Recommended Practices for Eye Protection in the Industrial Environment*, Standards Association of Australia Publ., Sydney, Australia.
8. 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.
9. Standards Australia, 1987, *Australian Standard 2919 - 1987 Industrial Clothing*, Standards Association of Australia Publ., Sydney, Australia.
10. 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 Association of Australia Publ., Sydney, Australia.
11. Standards Australia, 1978, *Australian Standard 2161-1978, Industrial Safety Gloves and Mittens (excluding Electrical and Medical Gloves)*, Standards Association of Australia Publ., Sydney, Australia.
12. 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.
13. National Occupational Health and Safety Commission, 1994, *Code of Practice for the Preparation of a Material Safety Data Sheets*, Australian Government Publishing Service, Canberra.