

File No: NA/798

21 July, 2000

**NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION  
AND ASSESSMENT SCHEME**

**FULL PUBLIC REPORT**

**Polymer V-201**

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Director  
Chemicals Notification and Assessment

**FULL PUBLIC REPORT****Polymer V-201****1. APPLICANT**

Tremco Pty. Ltd. of Suite 16, Level 3, Gateway Centre, 237 Mann Street, Gosford NSW 2250 (ACN 000024064) has submitted a [limited](#) notification statement in support of their application for an assessment certificate for Polymer V-201.

**2. IDENTITY OF THE CHEMICAL**

**Marketing Name:** V-201

**Number-Average  
Molecular Weight (NAMW):** 7971

**Weight-Average  
Molecular Weight:** 46772

**Maximum Percentage of Low  
Molecular Weight Species**

**Molecular Weight < 500:** 0.9%

**Molecular Weight < 1000:** 2.6%

**Method of Detection  
and Determination:** The polymer is identified by infrared spectroscopy and characterised by gel permeation chromatography.

**Spectral Data:** IR peaks at 2975, 2875, 2275, 1735, 1600, 1535, 1455, 1375, 1225, 1110, 930 cm<sup>-1</sup>

**3. PHYSICAL AND CHEMICAL PROPERTIES**

**Appearance at 20°C & 101.3 kPa:** Clear glassy solid

**Boiling Point:** Not determined as the polymer decomposes before boiling.

**Specific Gravity:** 0.99 g/mL at 25°C

**Vapour Pressure:** Not determined as the polymer decomposes before

boiling. The vapour pressure is likely to be low considering the high molecular weight of the polymer.

**Water Solubility:**

< 10mg/L at 25°C (low) See comments below.

**Partition Co-efficient  
(n-octanol/water):**

Not determined due to low water solubility and high n-octanol solubility (>5000g/L). The notified polymer will largely partition into n-octanol rather than water.

**Hydrolysis as a Function of pH:**

Not determined. The polyurethane bonds are possible sites for hydrolysis to occur but this would be unlikely at environmental pH range (4-9).

**Adsorption/Desorption:**

Not determined due to low water solubility. The end product containing the notified polymer becomes a cured polymeric water-insoluble material when exposed to water so would be likely to adsorb strongly to soils and not dissociate in the environment.

**Dissociation Constant:**

Not determined due to low water solubility.

**Flash Point:**

>120°C (closed cup).

**Flammability Limits:**

Not flammable.

**Autoignition Temperature:**

Not determined as the polymer decomposes before boiling.

**Explosive Properties:**

Not explosive.

**Reactivity/Stability:**

Stable.

**Comments on Physical and Chemical Properties**

The water solubility of the polymer was determined using OECD TG Method 105, the 'Flask Method'. Ten mg of the polymer were added to 1 L of water at 20°C at pH 7 and stirred for 24 hours. Similarly 50 mg of the polymer were added to 1 L of water at pH 1 and 10 and stirred. After 24 hours undissolved sample was clearly visible and it did not appear that any significant amount had dissolved in any of the test flasks.

**4. PURITY OF THE CHEMICAL**

**Degree of Purity:**

98-99%

**Hazardous Impurities:**

None

**Non-hazardous Impurities  
(> 1% by weight):**

Sodium, potassium and chlorine may be present in ionic form, all at < .001% (expressed as Na, K and HCl respectively).

**Maximum Content  
of Residual Monomers:**

<i>Chemical Name</i>	<i>CAS No.</i>	<i>Weight %</i>	<i>Health Hazard</i>
Toluene diisocyanate	26471-62-5	1.1	R23, R36/37/38, R42

The above figure for residual monomers is based on an analytical report of total isocyanate functional groups remaining after polymerisation. The final figure above is expressed as a mixture of toluene diisocyanate isomers.

Toluene diisocyanate isomers are classified as hazardous substances (National Occupational Health and Safety Commission, 1999b). They are toxic by inhalation (R23,  $\geq 2\%$ ), irritating to eyes, respiratory system and skin (R36/37/38,  $\geq 20\%$ ) and may cause sensitisation by inhalation (R42  $\geq 0.5\%$ ).

Isocyanates have national exposure standards of  $0.02\text{mg}/\text{m}^3$  time weighted average (TWA) and  $0.07\text{mg}/\text{m}^3$  short term exposure limit (STEL) (National Occupational Health and Safety Commission, 1995).

**Additives/Adjuvants:**

*Chemical name:* Dibutylbis[(1-oxododecyl)]-stannane  
*CAS No.:* 77-58-7  
*Weight percentage:* 0.0014%

*Chemical name:* Solvent naphtha (petroleum)  
*CAS No.:* 64742-95-6  
*Weight percentage:* 11.0%

Dibutylbis[(1-oxododecyl)]-stannane is not listed as a hazardous substance but organic compounds of tin carry NOHSC atmospheric exposure standards of  $0.1\text{mg}/\text{m}^3$  TWA and  $0.2\text{mg}/\text{m}^3$  STEL (National Occupational Health and Safety Commission, 1995).

## **5. USE, VOLUME AND FORMULATION**

The notified polymer will be imported as a component of the finished product Vulkem 350 at 31.5% w/w. Vulkem 350 will be used for waterproof sealing of industrial exterior structural joinery and decking. For the first 2 years, 7.5 tonnes/year of V-201 will be imported followed by 8 tonnes/year for the next 3 years.

## **6. OCCUPATIONAL EXPOSURE**

### **Importation and Distribution**

The notified polymer V-201 will not be imported as a raw material but as a component of a final product Vulkem 350 at a concentration of 31.5% w/w. Vulkem 350 will be imported in closed 19L steel cans shrink wrapped on pallets and transported by road in shipping containers to the importers warehouse. Shipping containers will be opened and the product will be stored in the original steel cans. The notifier has identified 5 storeman/handlers each working 3 hours/day, 10-15 days per year who may be exposed during these initial importation and transportation activities. Vulkem 350 is classed as a Dangerous Good (Flammable Class 3) due to the presence of solvent naphtha (Federal Office of Road Safety, 1998).

The finished product containing the notified polymer will then be transported by road and stored at 7 construction distributor sites. Seven workers have been identified each working up to 0.5 hours/day for 50 days/year who may be exposed to the polymer at this stage. As there is no requirement for decanting procedures prior to application, exposure to transport and warehouse workers to the notified polymer would only occur following inadvertent puncture of the containers. If this occurs, workers may be exposed to the polymer via dermal, ocular or pulmonary routes.

### **End Use**

Professional construction operators will obtain the product containing the notified polymer from the distributors and apply it directly from the cans to structural joinery and decking using a squeegee followed by backrolling at a rate of 1.22-1.47m<sup>2</sup>/L. Application will occur generally in the outdoors.

The notifier has identified 20 construction operators each working up to 3 hours/day for 150 days/year who may be exposed to the polymer during application. Exposure from splashes and spills would occur predominantly via the skin and eyes. However, since the product will be applied and spread onto large surfaces, exposure may also occur from inhalation of vapours. Operators will be equipped with masks, gloves and safety glasses stated to conform to the appropriate Australian standards. In addition, in poorly ventilated areas such as indoors, workers may use local forced ventilation or self-contained breathing apparatus.

Once the product has cured, the notified polymer and other paint ingredients will be immobilised in a resin matrix and not available for absorption.

## **7. PUBLIC EXPOSURE**

The notified polymer in the imported product is not to be available for sale to the general public. Following use, there is little potential for exposure to the public as the notified polymer is trapped in the cured sealant. The public would only be exposed to the notified polymer in the event of an accident during transportation..

## **8. ENVIRONMENTAL EXPOSURE**

### **Release**

Release of the polymer from spills at the storage warehouse will be minimised by bunding and spill containment procedures although the notifier has given no estimate for the amount of material likely to be spilt in an average year. Absorbent material will be used to soak up the spill then it will be incinerated. The fully cured material may be disposed to landfill.

Spills during transportation could be an environmental hazard but the small size of the steel containers and appropriate clean-up procedures should minimise the risk. No estimates of the amounts likely to be released in this way were provided. The polymer has a low water solubility and is only present as a component of sealants and coatings that are also virtually insoluble in water so should not spread through the aquatic environment. In addition, the sealant cures and forms an insoluble gelatinous mass when exposed to water.

Less than 0.2% (16 kg/annum) of the polymer, as a component of Vulkem 350, will remain as residues in the import containers. The polymer will be cured by rinsing the cans with water or leaving them exposed to the air to dry. Cans will then be disposed of, probably to landfill.

The method of application of the sealer containing the notified polymer should result in very little release of the polymer to the environment. It will be applied with a squeegee and backrolled, with excess sealant being removed by solvents. The notifier has not estimated how much of the polymer will be released by cleaning of the application equipment or whether the equipment will be cleaned or simply disposed of, most likely to landfill, after the job is completed. However, any of the polymer that is released would not be expected to remain in the aquatic environment due to its low water solubility but would quickly become associated with the sediments and soil.

Up to 1% of the import volume of the polymer or 80 kg/annum, in addition to the 16 kg/annum lost as container residues may be lost due to spills and application equipment cleaning. This equates to a total release to the environment of 96 kg/annum of the notified polymer, all of which will cure to an inert solid on exposure to ambient conditions.

### **Fate**

The polymer will be imported only as a component of a ready-to-use sealer, Vulkem 350, used in the construction industry to waterproof decks. It will be incorporated in a polymer matrix and will remain bound to the substrate until its eventual disposal, most likely to landfill.

The small amount of waste generated during application and possibly from spills (around 96 kg/annum), is expected to eventually go to landfill or be incinerated. The products of decomposition would be nitrogen oxides, carbon monoxide, carbon dioxide and hydrogen cyanide.

The majority of the notified polymer is not expected to be released to the environment until it has been fully cured into a solid polymer matrix. The resultant matrix structure should limit the hydrolysis or biodegradation potential of the polymer. Uncured material quickly polymerises in the presence of water or moisture to an insoluble mass.

Bioaccumulation of the polymer is unlikely due to the high molecular weight (7971) and

large size of the polymer even before curing. Leaching from landfill sites is not expected as the polymer has a low water solubility. Any polymer that was released to the sewer system would be expected to quickly become associated with the sediments and sludge and not remain mobile in the aquatic environment.

## 9. EVALUATION OF TOXICOLOGICAL DATA

### 9.1 Acute Toxicity

#### Summary of the acute toxicity of Polymer V-201.

<i>Test</i>	<i>Species</i>	<i>Outcome</i>	<i>Reference</i>
Acute oral toxicity	Rat	LD <sub>50</sub> > 2200mg/kg	Pucaj (1998)

#### 9.1.1 Oral Toxicity (Pucaj, 1998)

<i>Species/strain:</i>	Rat, Charles River
<i>Number/sex of animals:</i>	9 female animals used for range finding, 5 males and 5 females used for limit test.
<i>Observation period:</i>	7 days for range finding, 14 days for limit test.
<i>Method of administration:</i>	Gavage
<i>Test method:</i>	OECD TG 401, 420
<i>Mortality:</i>	None
<i>Clinical observations:</i>	In a range finding test, no mortalities or toxic symptoms were observed at any of the dose levels of 1000, 2000 or 3000mg/kg over the 7 day observation period. For the limit test, no mortalities or other toxic symptoms were observed during the 14 day study period and all animals gained body weight by the end of the study.
<i>Morphological findings:</i>	At gross necropsy, all animals were found with an undigested, plastic/rubber-like foreign object within their stomachs as a result of polymerisation of the test substance. Some animals had inflammation of gastric mucosa and several animals had hyperplasia of gastric mucosa. Gastritis and hyperplasia were most likely caused by irritation from these foreign masses. Therefore, although there were no acute systemic toxic effects from the test substance, gross findings indicate that there is potential for intestinal obstruction following oral administration.

*LD<sub>50</sub>:* >2200mg/kg

*Result:* The notified chemical was of very low acute oral toxicity in rats.

## **9.2 Overall Assessment of Toxicological Data**

Limited toxicological data were submitted as part of the notification for Polymer V-201. The NAMW of 7971 indicates that the notified polymer is unlikely to cross biological membranes readily. An acute oral toxicity test showed no signs of systemic toxicity at a dose of 2000mg/kg and thus Polymer V-201 is classified as a substance of low acute oral toxicity.

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

No ecotoxicity data were submitted.

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

The notified polymer is unlikely to present a hazard to the environment when handled, used and disposed of as proposed. On exposure to moisture at ambient conditions, the finished product is expected to cure to an inert solid. Disposal of waste polymer, which should be minimal, and discarded decking material will not pose a hazard to the environment due to the low volume (waste), high molecular weight and low water solubility of the polymer. Any fragments of the cured sealer will be of little concern as they are expected to be inert.

The decking material coated with the polymer sealant is likely to be disposed to landfill or possibly incinerated at the end of its useful life. The small amount of waste generated during application and from spills (around 96 kg/annum), is expected to eventually go to landfill or be incinerated. The products of decomposition would be nitrogen oxides, carbon monoxide, carbon dioxide and hydrogen cyanide.

Any polymer disposed to landfill is not expected to leach due to its low water solubility and should remain in the sediments and soil of the landfill site.

The environmental hazard resulting from the intended use of the notified polymer can be rated as low

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

### **Hazard Assessment**

According to the acute oral toxicity study for the notified polymer, the oral LD<sub>50</sub> was > 2200mg/kg. Thus the notified polymer possesses low oral toxicity. When manufactured, the polymer contains residual monomers such as toluene diisocyanate, present in the polymer at 1.1% w/w. Toluene diisocyanate isomers are on the NOHSC *List of Designated Hazardous*



*Substances*, being classified as toxic by inhalation, irritating to eyes, respiratory system and skin and sensitising by inhalation, with a concentration cut-off of 0.5% (National Occupational Health and Safety Commission, 1999b). Given that the concentration of residual monomer at the point of manufacture is unlikely to persist with time and after the formulation process, this assessment does not classify the polymer as hazardous according to the NOHSC *Approved Criteria for Classifying Hazardous Substances* (National Occupational Health and Safety Commission, 1999a).

Residual isocyanate levels in the finished product are < 0.5% w/w, due to evaporation and reactions with trace levels of moisture during the formulation process. As the toluene diisocyanate concentration is below its concentration cut-off (0.5%) in the polymer as imported into Australia, the product is not classified as a hazardous substance according to the NOHSC *Approved Criteria*. Nevertheless, adverse effects such as asthma have been reported overseas after exposure to the finished product containing the notified polymer, most likely due to the sensitisation properties of residual isocyanates.

The product also contains potentially hazardous particulate ingredients such as carbon black and calcium carbonate each with their own NOHSC exposure standard (National Occupational Health and Safety Commission, 1995). Because these are present only in a dissolved or suspended form in the liquid product, they will not be available for absorption. However, the imported product also contains 10-20% w/w solvent naphtha (CAS 64742-95-6). Solvent naphtha is classified as a hazardous substance with assigned risk phrases R45 – May cause cancer at  $\geq 0.1\text{Conc} < 10\%$  and R45 and R65 – Harmful, may cause lung damage if swallowed at  $\text{Conc} \geq 10\%$  (National Occupational Health and Safety Commission, 1999b).

The petroleum solvent is present in sufficient quantities to render the product a hazardous substance and a Class 3 dangerous good (flammable liquid) (Federal Office of Road Safety, 1998). The notification statement and Material Safety Data Sheet (MSDS) for the product containing the notified polymer detail a number of health effects related to the presence of solvent. These include acute dizziness, headaches and nausea and permanent nervous system damage from chronic exposure.

### **Occupational Health and Safety**

The polymer will be imported in a paint product in closed steel cans shrink wrapped onto pallets. The cans will not be opened prior to end use and exposure to the polymer by storeman/handlers during initial import and at distributor warehouses will only occur as a result of inadvertent mishandling and spillage of the product. Thus, there is little potential for occupational exposure and so the health risk to workers at these stages would be assessed as low.

Professional construction operators will apply the product containing the notified polymer to structural woodwork, generally in the outdoors. The product will be applied by squeegee followed by backrolling. Given the likelihood of splashes as the product is applied directly from the containers, there is a risk of worker exposure to the notified polymer via the skin and eyes. Moreover, rolling the product into a uniform film will produce a large surface area from which significant levels of vapours may form. Thus, it is possible that exposure to the polymer and other product ingredients may also occur by inhalation.

The imported product contains sufficient levels of solvent to render the product a hazardous substance. Chronic overexposure to solvents can produce nervous system dysfunction. The

product also contains low levels of residual isocyanates, calcium carbonate and carbon black. There are NOHSC exposure standards for these three latter ingredients. Although these substances are present at levels sufficiently low so as not to contribute to a hazardous classification, isocyanates can induce respiratory sensitisation. Because of the possibility of allergic responses to isocyanates, exposure standards for residual isocyanates - 0.02 mg/m<sup>3</sup> TWA, 0.07 mg/m<sup>3</sup> STEL, sensitiser notation, must be observed. The exposure controls for isocyanates will be sufficient also to control exposure to the solvents.

Though used mainly in the outdoors, it is possible that the product will be applied in poorly ventilated areas. In these cases, local forced ventilation should be used to prevent the buildup of vapours. In confined spaces, use of self contained breathing apparatus should be considered, to prevent worker exposure to sensitising isocyanates. Because of their allergic and pro-asthmatic properties, precautions to prevent exposure must be taken by all personnel, but especially those who either have had prior contact with isocyanates or suffer from any form of compromised respiratory function (NOHSC *Worksafe Australia Guide – Isocyanates*; National Occupational Health and Safety Commission, 1990). Health surveillance for isocyanates should be considered (National Occupational Health and Safety Commission, 1994b).

All operators should be equipped with personal protective equipment consisting of masks, gloves and safety glasses all of which conform to the appropriate Australian Standards. Measures to control exposure to isocyanates and solvent will be sufficient to control exposure to the other potentially hazardous ingredients in the paint.

Once the product has cured, the notified polymer and other sealant ingredients will be immobilised in a resin matrix and not available for absorption. Therefore, following curing, the risk of health effects in workers from the notified polymer would be assessed as low. Similarly, with regards to disposal of the polymer, the product will most likely be in a cured state by the time of disposal and in this state the risk of health effects from the immobilised polymer and other ingredients will be low.

### **Public Health**

The product containing the notified polymer will not be sold to the general public and will be used only as a waterproof sealant in industrial applications. Thus, there is negligible potential for public exposure to the notified polymer arising from its intended use. The low exposure indicates a negligible risk to public health.

## **13. RECOMMENDATIONS**

To minimise occupational exposure to Polymer V-201, the following guidelines and precautions should be observed:

- Employers should ensure that national exposure standards relevant to the polymer and product are not exceeded in the workplace. In particular, precautions and exposure standards for isocyanates must be observed (National Occupational Health and Safety Commission, 1990; 1995). In poorly ventilated areas or confined spaces, use of local forced ventilation or personal self-contained breathing apparatus complying to the relevant Australian Standard should be considered;

- Safety goggles should be selected and fitted in accordance with Australian Standard (AS) 1336 (Standards Australia, 1994) to comply with Australian/New Zealand Standard (AS/NZS) 1337 (Standards Australia/Standards New Zealand, 1992); industrial clothing should conform to the specifications detailed in AS 2919 (Standards Australia, 1987) and AS 3765.1 (Standards Australia, 1990); impermeable gloves should conform to AS/NZS 2161.2 (Standards Australia/Standards New Zealand, 1998); all occupational footwear should conform to AS/NZS 2210 (Standards Australia/Standards New Zealand, 1994);
- Spillage of the notified chemical should be avoided. Spillages should be cleaned up promptly with absorbents which should be 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.

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

The MSDS for the notified chemical was provided in a format consistent with the *National Code of Practice for the Preparation of Material Safety Data Sheets* (National Occupational Health and Safety Commission, 1994a).

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**

Due to concern related to the toxicity of toluene diisocyanate, the Director must be notified under subsection 64(1) of the Act if the polymer itself is imported into Australia.

Also, secondary notification of the notified chemical may be required if any of the circumstances stipulated under subsection 64(2) of the Act arise.

#### **16. REFERENCES**

Federal Office of Road Safety (1998) Australian Code for the Transport of Dangerous Goods by Road and Rail. Australian Government Publishing Service, Canberra.

National Occupational Health and Safety Commission (1990) Worksafe Australia Guide - Isocyanates. Australian Government Publishing Service, Canberra.

National Occupational Health and Safety Commission (1994a) National Code of Practice for the Preparation of Material Safety Data Sheets [NOHSC:2011(1994)]. Australian Government Publishing Service, Canberra.

National Occupational Health and Safety Commission (1994b) National Model Regulations for Control of Workplace Hazardous Substances [NOHSC:1005(1994)]. Australian Government Publishing Service, Canberra.

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.

National Occupational Health and Safety Commission (1999a) Approved Criteria for Classifying Hazardous Substances [NOHSC:1008(1999)]. Australian Government Publishing Service, Canberra.

National Occupational Health and Safety Commission (1999b) List of Designated Hazardous Substances [NOHSC:10005(1999)]. Australian Government Publishing Service, Canberra.

Pucaj K (1998) Acute Oral Toxicity Study of V-201 in Rats. Nucro-Technics, Scarborough, Ontario.

Standards Australia (1987) Australian Standard 2919-1987, Industrial Clothing. Standards Association of Australia, Sydney.

Standards Australia (1990) Australian Standard 3765.1-1990, Clothing for Protection against Hazardous Chemicals Part 1 Protection against General or Specific Chemicals. Standards Association of Australia, Sydney.

Standards Australia (1994) Australian Standard 1336-1994, Eye protection in the Industrial Environment. Standards Association of Australia, Sydney.

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

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.

Standards Australia/Standards New Zealand (1998) Australian/New Zealand Standard 2161.2-1998, Occupational protective gloves, Part 2: General requirements. Standards Association of Australia, Sydney.