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**NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME  
(NICNAS)**

**FULL PUBLIC REPORT**

**Fluorochemical Urethane**

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**Director  
Chemicals Notification and Assessment**

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**FULL PUBLIC REPORT****Fluorochemical Urethane****1. APPLICANT AND NOTIFICATION DETAILS**

## APPLICANT(S)

3M Australia Pty Ltd (ABN 90 000 100 096)  
2-74 Dunheved Circuit  
St Marys NSW 2670.

## EXEMPT INFORMATION (SECTION 75 OF THE ACT)

Data items and details claimed exempt from publication:

Chemical Name  
Molecular Formula  
Spectral data  
Specific use of chemical  
Structural formula  
Import volumes

## VARIATION OF DATA REQUIREMENTS (SECTION 24 OF THE ACT)

No variation to the schedule of data requirements is claimed.

## PREVIOUS NOTIFICATION IN AUSTRALIA BY APPLICANT(S)

None

## NOTIFICATION IN OTHER COUNTRIES

USA

**2. IDENTITY OF CHEMICAL**

## OTHER NAME(S)

Fluorochemical Urethane

## MARKETING NAME(S)

Not marketed by itself but as a component in a carpet treatment, Scotchguard Heavy Duty Carpet Protector.

## CAS NUMBER

None assigned

**3. COMPOSITION**

## PLC CRITERIA JUSTIFICATION

Functional Group	Category	Equivalent Weight (FGEW)
Methoxysilane	High Concern	2486

Charge Density	The notified polymer has low charge density.
Elemental Criteria	The notified polymer contains only approved elements.
Degradability	The notified polymer is not biodegradable.
Water Absorbing	The notified polymer is not a water-absorbing polymer.
Residual Monomers	All residual monomers are below the relevant cut-off.
Hazard Category	The notified polymer is not classified as a hazardous substance.

The notified polymer does not meet the PLC criteria. However, it is accepted for assessment as a PLC

on the following grounds:

While the polymer, as notified, contains the reactive methoxysilane groups, it will be imported in an aqueous formulation which will result in hydrolysis of this group prior to any exposure.

#### 4. INTRODUCTION AND USE INFORMATION

##### MAXIMUM INTRODUCTION VOLUME OF NOTIFIED CHEMICAL (100%) OVER NEXT 5 YEARS

<i>Year</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>Tonnes</i>	1-3	1-3	1-3	1-3	1-3

##### USE

The notified polymer is a component in a retail carpet treatment.

#### 6. PHYSICAL AND CHEMICAL PROPERTIES

<b>Appearance at 20°C and 101.3 kPa</b>	White to slightly bluish milky opaque emulsion
<b>Melting Point/Glass Transition Temp</b>	Not Applicable
<b>Density</b>	1330 kg/m <sup>3</sup>
<b>Water Solubility</b>	28 mg/L The test substance (0.5 g) was added to water (50 mL) and shaken at 20°C for 24 h. After 24 h the sample was centrifuged and the supernatant collected and evaporated to dryness. The residue was determined gravimetrically.
<b>Particle Size</b>	Not determined; the notified polymer will only be introduced in solution form.
<b>Degradation Products</b>	The notified polymer is expected to degrade in the environment to produce perfluorobutane sulfonate (PFBS).
<b>Loss of monomers, other reactants, additives impurities</b>	A blocking group contained in the notified polymer is expected to be released when the polymer binds a to carpet fibres.

#### 7. HUMAN HEALTH IMPLICATIONS

##### 7.1 Toxicology

##### Toxicological Investigations

The notifier submitted an acute inhalation study (MPI Research, 2002). Based on the results of the study, the 4-hour LC<sub>50</sub> in rats was greater than 2.2 mg/L. All animals survived to the study termination. No test article-related clinical signs or neurobehavioural changes were observed during the exposure nor at any observation interval during the 14 day recovery observation period. The test article had no effect on the body weight gains and no macroscopic abnormalities were observed at necropsy. Based on this information there is insufficient data to classify the notified polymer according to the *Approved Criteria for Classifying Hazardous Substances* (NOHSC, 1999).

##### Human Health Hazard Assessment

The notified polymer as introduced in an aqueous formulation meets the PLC criteria and can therefore be considered to be of low hazard.

The notified polymer is not classifiable based on the results of the acute inhalation study submitted.

## 7.2 Occupational Health

### Occupational Exposure

- The notified polymer is part of a finished product, made in the USA
- The products are shipped to another company for overlabeling.
- Exposure may occur during transport and shipping of the polymer.

### Exposure Assessment

After application and once dried, the product containing the notified polymer is cured into an inert matrix and is hence unavailable to exposure.

During transport and storage, workers are unlikely to be exposed to the notified polymer except when packaging is accidentally breached.

## 7.3 Public Health

### Public Exposure

- The product containing the notified polymer will be available to consumers through hardware stores. It is estimated that 4200 customers per year will be exposed to the product containing the notified polymer.
- The product containing the notified polymer (3%) is dispensed from an aerosol can in a foaming spray directly onto carpets and rugs. The polymer is expected to bind strongly to carpet fibres after application and following binding, it will not be bioavailable. There is little or no contact with the product on the skin during application and very little mist is produced due to the foaming spray, therefore public exposure is low.

### Exposure Assessment

The notified polymer will be sold to the public in the form of a consumer product. There is potential for public exposure the notified polymer prior to binding to carpet fibres, but this will be limited by the manner of application. Inhalation exposure during application will be limited due to the physical form (foam) of the product.

## 8. ENVIRONMENTAL IMPLICATIONS

### 8.1 Ecotoxicology

#### Ecotoxicological Investigations

No toxicological data were submitted.

#### Environmental Exposure

The majority of the notified polymer will be applied to carpet and rugs as a foaming aerosol which when dry remains on the treated article. A maximum of 5% overspray has been estimated. Up to 75% of the polymer may, overtime, be extracted from the carpet through steam cleaning and be disposed of to the sewer. The notifier indicates that over time the notified polymer may, through mechanical action, slowly wear off the carpet surface and be either vacuumed away over a period of 3-10 years or be walked-off onto surrounding ground.

At the end of their useful life, carpets and rugs to which the notified polymer is bound will be disposed of in landfill or incinerated. Empty import cans will also be disposed of in landfill. Therefore, a majority of the notified polymer will be released into the environment.

#### Fate Assessment

If incinerated, the polymer would be rapidly destroyed and converted to water vapour and oxides of carbon, nitrogen, and fluorinated by-products including HF. On disposal to landfill, the hydrocarbon and nitrogen containing portions of the polymer are likely to be slowly degraded by biotic and abiotic processes. The notified polymer is likely to be surface active and under normal conditions would be expected to bind to the surfaces of soil and sediment, and be immobile. Any polymer entering receiving waters at a sewage treatment plant is initially unlikely to become associated with either the aqueous or the sludge and sediment compartment, given the likely surface active nature of the polymer. In time, the hydrocarbon moiety may become assimilated with the organic phase, while the fluorinated moiety will remain in solution.

The fluorocarbon moiety is unlikely to be susceptible to biodegradation (Remde and Debus, 1996). This is understandable, in view of the great strength of the carbon-fluorine bond. Perfluorocarbons are more thermally stable than their corresponding hydrocarbon analogues. In particular, perfluorocarboxylic acids and perfluoroalkane sulfonic acids are considered the most thermally stable fluorinated surfactants. In addition to thermal stability, perfluorinated hydrocarbons are stable against degradation by acids, bases, oxidants and reductants (Moody and Field, 2000). Fluorinated carboxylic acids can undergo hydrolytic defluorination, reductive defluorination, and decarboxylation. To date, however, significant defluorination has only been observed for hydrolytic attack of monofluorinated carboxylic acids, and compounds with more than one fluorine atom per carbon atom are generally recalcitrant (Blake *et al.*, 1997). The notified polymer has a nominal fluorine content of ~24%. Studies have shown that fluorinated compounds with fluoride content in the order of 50% will not biodegrade over a period of 60 days (Remde and Debus, 1996). Further, fluorocarbons have little affinity for either water or organic phases and ultimately will concentrate near the surface of water bodies, for example when released in sewage treatment plant effluent. Here they are likely to be degraded by abiotic cleavage, with assistance from UV radiation, into smaller fluorocarbon species, which will be volatile and partition into the atmosphere. Here further reaction with hydroxyl radicals and action by UV radiation is expected to lead to degradation to hydrogen fluoride (HF) and precipitation to the surface in rain.

Although the high molecular weight of the notified polymer would tend to preclude bioaccumulation, recent studies have shown evidence of significant accumulation of fluorinated hydrocarbons in the blood of higher trophic level organisms, including humans. Research funded by 3M found fluorinated compounds in human blood and animal tissue in parts of the world where these are not manufactured (Moody and Field, 2000). In addition, the US EPA has stated, "This widespread presence, persistence and bioaccumulation potential and the reproductive and subchronic toxicity of the polymer raise concerns for potential adverse effects on people and wildlife" (Chemical Regulation Reporter, 2000).

The above refers to perfluorooctane sulfonate (PFOS) which has now been found in environmental samples all over the world and was formerly present in Scotchguard. The notified polymer will replace the PFOS component and contains the perfluorobutane sulfonate (PFBS) moiety. The Department of Environment and Heritage is aware of one recent publication (Taniyasu *et al.* 2003), which tested for PFBS in water, fish, birds and humans in Japan, but it was not detected. However, it is unclear whether this reflects a much lower use level in the past.

## **9. RISK ASSESSMENT**

### **9.1. Environment**

There are significant uncertainties surrounding the behaviour of fluorocarbon compounds in general in the environment in areas of partitioning behaviour, degradation, chronic toxicity and bioaccumulation. These uncertainties make overall risk characterisation very difficult to quantify at this time due to the expected breakdown over time of the polymer to PFBS or related substances.

The US EPA has placed a Consent Order on all substances involving this chemistry. This consent order sought additional testing for the ultimate fate of products involving this chemistry. Access to this testing is essential to clarify the potential environmental impact of the breakdown product.

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## 9.2 Occupational health and safety

The OHS risk presented by the notified polymer is expected to be low as it is only imported in a consumer end use product and occupational handling will be limited to sealed containers. The notified polymer may be present in formulations containing hazardous ingredients.

## 9.3 Public health

Members of the public may make dermal contact with products containing the notified polymer. However, the risk to public health will be negligible because the notified polymer is present at low concentrations and unlikely to be bioavailable. Based on the results of the inhalation toxicity study submitted health effects are not expected to arise as result of the use of the notified polymer in aerosol application.

The product is to be used in well-ventilated areas. The instructions recommend the use of fans and open doors and windows. The instructions caution against allowing small children and pets to be in contact with the wet surface. The carpet and rug product is packaged using a special valve and actuator designed so the product is dispensed with the spray can upside down, resulting in a slightly foamy application. This design minimises mist exposure and maximizes the particle size of the spray.

Following application to the carpet the notified polymer will be tightly bound to the fibres and will not be available for separate exposure.

## 10. CONCLUSIONS – ASSESSMENT LEVEL OF CONCERN FOR THE ENVIRONMENT AND HUMANS

### 10.2. Environmental risk assessment

There are significant uncertainties surrounding the behaviour of fluorocarbon compounds in general in the environment in areas of partitioning behaviour, degradation, chronic toxicity and bioaccumulation, and the potential environmental impact of the breakdown product perfluorobutane sulfonate.

### 10.3. Human health risk assessment

#### 10.3.1. Occupational health and safety

There is Low Concern to occupational health and safety under the conditions of the occupational settings described.

#### 10.3.2. Public health

There is Low Concern to public health when used in an appropriate manner as set out in the product guidelines.

## 11. Material Safety Data Sheet

The notifier has provided MSDS in accordance with the schedule item B12 of the *ICNA Act*. The accuracy of the information on the MSDS remains the responsibility of the applicant.

## 12. RECOMMENDATIONS

### CONTROL MEASURES

#### Occupational Health and Safety

- No specific engineering controls, work practices or personal protective equipment are required for the safe use of the notified polymer itself, however, these should be selected on the basis of all ingredients in the formulation.
- Guidance in selection of personal protective equipment can be obtained from Australian, Australian/New Zealand or other approved standards.



- A copy of the MSDS should be easily accessible to employees.
- If products and mixtures containing the notified polymer are classified as hazardous to health in accordance with the NOHSC *Approved Criteria for Classifying Hazardous Substances*, workplace practices and control procedures consistent with provisions of State and Territory hazardous substances legislation must be in operation.

Environment

Disposal

- The notified polymer should be disposed of through incineration at an approved hazardous waste incinerator with the proper controls for HF or to landfill.

Emergency procedures

- Spills/release of the notified polymer should be contained, collected and placed in an approved closed container along with depressurised can.

### 12.1. Secondary notification

The Director of Chemicals Notification and Assessment must be notified in writing within 28 days by the notifier, other importer or manufacturer:

- (1) Under subsection 64(1) of the Act; if
  - the notified polymer is introduced in a chemical form that does not meet the PLC criteria.
  - the notifier become aware of information pertaining to the environmental fate or toxicity of perfluorobutane sulfonate (PFBS) the notifier should make this information available to NICNAS. This should include data which becomes available under the US EPA consent order

or

- (2) Under subsection 64(2) of the Act:
  - if any of the circumstances listed in the subsection arise.

The Director will then decide whether secondary notification is required.

No additional secondary notification conditions are stipulated.

## 13. BIBLIOGRAPHY

Blake D, Howell, RD, Criddle CS (1997) Fluorinated Organics in the Biosphere. *Environmental Science and Technology*. 13 (9): 2445-2454.

Chemical Regulation Reporter, 2000. Vol. 24, No. 43, p 2118-2119.

Moody C and Field J (2000) Perfluorinated Surfactants and the Environmental Implications of their Use in Fire-Fighting Foams. *Environmental Science and Technology*, Vol. 34, No. 18, pp 3864-3870

MRI Research (2002) An acute inhalation toxicity study of T-7683.1 in rats, MRI Research Laboratory Study Identification 137-201, MPI Research Inc., USA (unpublished report, provided by the notifier).

NOHSC (1999) *Approved Criteria for Classifying Hazardous Substances* [NOHSC:1008(1999)]. National Occupational Health and Safety Commission, Canberra, AusInfo.

Remde A and Debus R (1996). Biodegradability of Fluorinated Surfactants Under Aerobic and Anaerobic Conditions. *Chemosphere* 32 (1996) pp. 1563-1574.

Taniyasu S, Kannan K, Hanari N and Yamashita N (2003) A survey of perfluorooctane sulfonate and related perfluorinated organic compounds in water, fish, birds and humans from Japan. Environmental Science and Technology, Vol. 37, No. 12, pp 2634-2639.