File No: NA/559

January 1998

NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

Polymer in Hilti HVU

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Director
Chemicals Notification and Assessment

FULL PUBLIC REPORT

Polymer in Hilti HVU

1. APPLICANT

Hilti (Australia) Pty Ltd of 23 Egerton Street SILVERWATER NSW 2128 has submitted a limited notification statement in support of their application for an assessment certificate for Polymer in Hilti HVU

2. IDENTITY OF THE CHEMICAL

Polymer in Hilti HVU has a Number-Average Molecular Weight (NAMW) greater than 1 000, however there is an estimated 40 to 50 % level of species with NAMW less than 1 000 and a 5 % level of species with NAMW less than 500. The bulk of the latter is due to one particlular non hazardous residual monomer. As transmission of species of molecular weight greater than 500 across biological membranes is limited, the notified polymer is not considered to be hazardous. Therefore the chemical name, CAS number, molecular and structural formulae, molecular weight, spectral data, details of the polymer and Hilti HVU composition and details of exact import volume have been exempted from publication in the Full Public Report and the Summary Report.

Trade Name:	Hilti HVU
Number-Average Molecular Weight (NAMW):	> 1 000
Weight-Average Molecular Weight:	> 1 000
Method of Detection and Determination:	the notifier provided an infra-red spectrum which verifies the major functionalities

3. PHYSICAL AND CHEMICAL PROPERTIES

The notified polymer is marketed as a component of Resin D 922 V-01Z. The physical and chemical data below relate to the product Resin D 922 V-01Z rather than the polymer itself unless otherwise stated.

Appearance at 20°C and 101.3 kPa:	no information provided
Boiling Point:	240°C
Density:	0.11 $kg.m^{-3}$ at 20°C
Vapour Pressure:	0.1 kPa at 20°C
Water Solubility:	< 2.2 $mg.L^{-1}$ at 25°C (notified polymer itself)
Partition Co-efficient (n-octanol/water):	log P_{ow} > 4.6 (notified polymer itself)
Hydrolysis as a Function of pH:	not determined
Adsorption/Desorption:	not determined
Dissociation Constant:	not determined
Flash Point:	101°C
Flammability Limits:	not determined
Autoignition Temperature:	not determined
Explosive Properties:	not explosive
Reactivity/Stability:	polymerisation may occur in the presence of strong acids, strong bases, radical forming substances (eg peroxides) reducing agents and/or heavy metal ions

Comments on Physico-Chemical Properties

The polymer component itself contains no charged or highly polar groups and is unlikely to be appreciably water soluble. The notifier supplied some test data derived from the "preliminary test" protocol of OECD TG 105 (2). This procedure is specific for sparingly soluble (< 10 $mg.L^{-1}$) substances (or mixtures) and involves continuously eluting the material in a column with water till analysis indicates that a constant solute concentration has been obtained. This test indicated that the new polymer has a solubility less than 2.2 $mg.L^{-1}$ in water.

The polymer contains linkages which hydrolyse under extreme pH conditions, but are unlikely to undergo these reactions under the usual environmental conditions where the pH lies between pH 4 and pH 9. Low water solubility would also make hydrolysis unlikely through limiting intimate contact between water and the

susceptible functionalities.

The notified polymer is essentially hydrophobic in character and would be expected to partition into the oil/fat phase, and this is supported by the appreciable solubility in n-octanol.

The solubility of the polymer in n-octanol was determined as greater than 100 $g.L^{-1}$ using the flask method of OECD TG 105 (2) at 20 ^{o}C which is the appropriate method for solubilities > 10 $mg.L^{-1}$. Since the water solubility was estimated at less than 2.2 $mg.L^{-1}$, the ratio of these two solubilities allows an estimation of Log P_{ow} greater than 4.6.

The hydrophobic nature of the polymer also indicates that it would adsorb to and become associated with the organic component of soils and sediments.

The polymer contains no acidic or basic groups, so dissociation constant data is not appropriate. However, the notified polymer will always be associated with two methacrylate ester diluents in the Resin D 922 V-01Z product and so it is appropriate to consider the physico-chemical properties of this mixture (see table above) rather than of the notified polymer in isolation.

4. PURITY OF THE CHEMICAL

Degree of Purity: > 95 %

Toxic or Hazardous Impurities: < 0.1 %

Maximum Content of Residual Monomers: < 5 %

5. USE, VOLUME AND FORMULATION

The notified polymer will not be manufactured in Australia but will be imported into Australia in sealed foil capsules packaged in cardboard boxes plus a larger outer box lined with a plastic bag. It will be imported as a component of an adhesive formulation for use in binding metal anchor rods and other fixtures into masonry (concrete) structures with an import volume of less than one tonne per annum.

6. OCCUPATIONAL EXPOSURE

Exposure of workers during the transport and handling of the notified chemical in the Hilti Product is expected to be negligible. In the event of an accidental piercing of capsules, worker exposure is expected to be minimal because of the chemistry that ensues.

It is estimated that 5 000 to 10 000 construction workers may use the new product

containing the notified polymer. The capsules containing the adhesive are constructed as two concentric foil capsules, the inner one containing (solid) dibenzoyl peroxide and the outer one containing the Hilti HVU formulation (less than 20% of the notified polymer). Use of the adhesive formulation involves placing the cartridges into pre-drilled holes, and then inserting the metal fastener which breaks the foil containers allowing the inner peroxide to contact the formulation of Resin D 922 V-01Z. The dibenzoyl peroxide acts as a catalyst promoting reaction between the notified polymer and other reactive monomers, such that a highly crosslinked solid polymer mass results. Setting time for the adhesive is dependent on the ambient temperature, and is stated to be 30 minutes for air temperatures between 10 and 20^0C, and five hours for temperatures between -5 and 0^0C.The possibility of incidental exposure of workers to the Hilti HVU product containing the notified chemical is reduced by the use of a foil capsule which is more elastic and less susceptible to breakage than the traditional glass capsules. Furthermore the method of application substantially reduces the risk of worker exposure to the notified polymer. Nevertheless, some worker exposure can be expected through accidental squirts of the Hilti HVU product during insertion of metal fixtures.

7. PUBLIC EXPOSURE

As the product is intended for use in the building industry,it will not be available to the general public. Following use, it will be enclosed by concrete and the potential for public exposure is negligible.

In the event of a transport accident, the small size of the individual packages will limit the extent of any spillage. As the hardener would be released with the resin, any spill would harden over a period of minutes to an hour and reduce the spread of the spilt material. The primary hazard in such a situation would be the spread of irritant dust from the hardener component.

8. ENVIRONMENTAL EXPOSURE

Release

There is little chance for release of the adhesive containing the notified material until the capsule is broken allowing the adhesive to flow around the metal bolt. It is possible that some of the adhesive could be pushed out of the hole as the metal bolt is inserted, but this would be wiped away with rags or paper towels and disposed of with rubble and other construction waste. The excess material on the cloth or paper would crosslink into a solid mass.

Fate

It is likely that old rags or paper towels used to wipe away excess of the adhesive containing the notified polymer from the holes would be either placed into landfill or possibly be incinerated. In a landfill the crosslinked material would be immobile and would be unlikely to leach into groundwaters. Over time it could be expected to

be slowly degraded as a result of slow biological and abiotic processes operative in these facilities, with production of water, methane, ammonia, nitrogen and carbon monoxide and dioxide. Incineration would destroy the material with production of water vapour and oxides of carbon and nitrogen.

Most of the material will become an integral part of masonry structures, and its fate will be that of the building rubble resulting from demolition of the old buildings. It is likely that this will be deposition into landfill.

In the event of accidental release of the non-crosslinked Resin D 922 V-01Z (eg as a result of transport accident) it is expected the polymer would adsorb onto soils and be immobilised. The small pack size should limit release in an accident situation, and in the event of material reaching the water compartment the polymer is likely to become associated with the sediments.

9. EVALUATION OF TOXICOLOGICAL DATA

No toxicological data were provided which is acceptable for polymers with import volumes less than 1 tonne per year according to the Act.

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

No ecotoxicological data were provided which is acceptable for polymers with import volumes less than 1 tonne per year according to the Act.

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

The environmental hazard from the notified polymer is small when the material is used in the indicated manner. The polymer is imported in foil cartridges which also contain the hardening agent contained within a fragile vial in the centre of the cartridge. Most of the material will become part of a solid cross-linked resin mass embedded in masonry structures, and will have little exposure to the environment. Most residual material resulting from application of the adhesive will be deposited into landfill, although some may be incinerated. In a landfill situation the material will be immobile and is expected to undergo slow biological and abiotic degradation, while incineration will destroy the notified material with production of harmless gases.

If accidentally released before it has been crosslinked into a solid mass, the polymer would associate with soils and sediments.

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

The impact of the notified polymer on the health of exposed workers is likely to be minimal. It has a NAMW greater than 1 000, and despite the relatively high levels

of species with NAMW less than 1 000 (ie. 40 to 50 % with the majority being species with MW greater than 500) minimal absorption across biological membranes is expected. Furthermore, the content of residual monomers is low (especially toxic monomers). The final concentration of the notified polymer in Hilti HVU is low and the mode of application of Hilti HVU using foil capsules is likely to minimise worker exposure to the notified polymer. Although some worker exposure (dermal, oral and ocular) may occur through careless application of Hilti HVU and/or poor work hygiene, the greater hazard will lie in exposure to benzoyl peroxide 9curing agent) which is a potential skin sensitiser (3).

The use pattern of the notified chemical and the properties of the Hilti HVU product are such that public exposure is likely to be extremely low. The public health risks associated with the notified chemical are also likely to be low.

Although the notified polymer is not considered a hazard to human health, the product containing the notified polymer, Hilti HVU, is classified as hazardous due to the presence of benzoyl peroxide (skin sensitiser) in the inner capsule of the sealed Hilti HVU cartridge.

13. RECOMMENDATIONS

To minimise occupational exposure to the notified polymer in Hilti HVU the following guidelines and precautions should be observed:

- Industrial clothing should conform to the specifications detailed in AS 2919 (4);
- Impermeable gloves or mittens should conform to AS 2161 (5);
- Spillage of the notified chemical should be avoided, spillages should be cleaned up promptly with absorbents which should then be put into containers for disposal;
- Good personal hygiene should be practised to minimise the potential for ingestion;
- A copy of the Material Safety Data Sheet (MSDS) should be easily accessible to employees.

14. MATERIAL SAFETY DATA SHEET

The MSDS for Hilti HVU containing the notified chemical was provided in accordance with the *National Code of Practice for the Preparation of Material Safety Data Sheets* (6).

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

Under the Act, secondary notification of the notified chemical 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. BIBRA Working Group 1989, *Methylene diphenyl diisocyanate*, The British Industrial Biological Research Association, p10

2. Organisation for Economic Co-operation and Development 1995-1996, *OECD Guidelines for the Testing of Chemicals on CD-Rom*, OECD, Paris.

3. 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.

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

5. Standards Australia 1978, *Australian Standard 2161-1978, Industrial Safety Gloves and Mittens (excluding electrical and medical gloves)*, Standards Association of Australia, Sydney.

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

Attachment 1

The Draize Scale for evaluation of skin reactions is as follows:

Erythema Formation	*Rating*	*Oedema Formation*	*Rating*
No erythema	0	No oedema	0
Very slight erythema (barely perceptible)	1	Very slight oedema (barely perceptible)	1
Well-defined erythema	2	Slight oedema (edges of area well-defined by definite raising	2
Moderate to severe erythema	3	Moderate oedema (raised approx. 1 mm)	3
Severe erythema (beet redness)	4	Severe oedema (raised more than 1 mm and extending beyond area of exposure)	4

The Draize scale for evaluation of eye reactions is as follows:

CORNEA

Opacity	*Rating*	*Area of Cornea involved*	*Rating*
No opacity	0 none	25% or less (not zero)	1
Diffuse area, details of iris clearly visible	1 slight	25% to 50%	2
Easily visible translucent areas, details of iris slightly obscure	2 mild	50% to 75%	3
Opalescent areas, no details of iris visible, size of pupil barely discernible	3 moderate	Greater than 75%	4
Opaque, iris invisible	4 severe		

CONJUNCTIVAE

Redness	*Rating*	*Chemosis*	*Rating*	*Discharge*	*Rating*
Vessels normal	0 none	No swelling	0 none	No discharge	0 none
Vessels definitely injected above normal	1 slight	Any swelling above normal	1 slight	Any amount different from normal	1 slight
More diffuse, deeper crimson red with individual vessels not easily discernible	2 mod.	Obvious swelling with partial eversion of lids	2 mild	Discharge with moistening of lids and adjacent hairs	2 mod.
Diffuse beefy red	3 severe	Swelling with lids half-closed	3 mod.	Discharge with moistening of lids and hairs and considerable area around eye	3 severe
		Swelling with lids half-closed to completely closed	4 severe		

IRIS

Values	*Rating*
Normal	0 none
Folds above normal, congestion, swelling, circumcorneal injection, iris reacts to light	1 slight
No reaction to light, haemorrhage, gross destruction	2 severe