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NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

Tetrakis(methoxymethyl)glycoluril

This Assessment has been compiled in accordance with the provisions of *the Industrial Chemicals (Notification and Assessment) Act* 1989 (the Act), 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 Health and Family Services.

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Director
Chemicals Notification and Assessment

FULL PUBLIC REPORT

Tetrakis(methoxymethyl)glycoluril

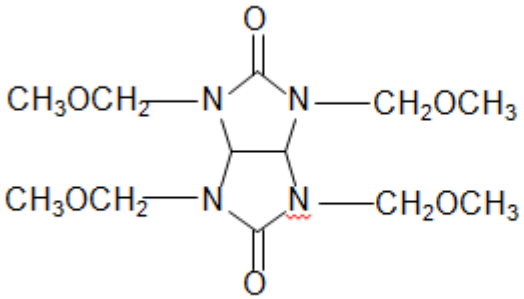
1. APPLICANT

Cytec Australia Ltd of Suite 1, 1st Floor, 7-11 Railway Street BAULKHAM HILLS NSW 2153 and H. B. Fuller Powder Coatings (Australia) Pty Ltd of 6 Marigold Place MILPERRA NSW 2214 have jointly submitted a standard notification statement in support of their application for an assessment certificate for tetrakis(methoxymethyl) glycoluril.

2. IDENTITY OF THE CHEMICAL

Chemical Name:	Imidazo[4,5-d]imidazole-2,5(1H,3H)-dione, tetrahydro-1,3,4,6-tetrakis(methoxymethyl)-
Chemical Abstracts Service (CAS) Registry No.:	17464-88-9
Other Names:	Glycoluril, 1,3,4,6-tetrakis(methoxymethyl)- Glycoluril, tetrakis(methoxymethyl)-
Trade Name:	Powderlink 1174 Resin (contains 85% notified substance) WE Polyester Powder Coating (contains less than 10% notified substance)
Molecular Formula:	$C_{12}H_{22}N_4O_6$

Structural Formula:



Molecular Weight:	318
Method of Detection and Determination:	infrared (IR) and nuclear magnetic resonance (NMR) spectroscopy
Spectral Data:	infrared spectrum; major characteristic peaks were observed at: 3 000, 2 950, 2 850, 1 730, 1 480, 1 400, 1 340, 1 260, 1 230, 1 180, 1 090, 1 040, 1 000, 910 and 800 cm^{-1}

3. PHYSICAL AND CHEMICAL PROPERTIES

Appearance at 20°C and 101.3 kPa:	white to pale yellow granulated flakes
Melting Point:	90-110°C
Density:	1 324 kg/m^3 at 25°C
Vapour Pressure:	not applicable
Water Solubility:	145 g/L at 25°C
Partition Co-efficient (n-octanol/water):	log P_{ow} = 0.516
Hydrolysis as a Function of pH:	not determined
Adsorption/Desorption:	not determined
Dissociation Constant:	not determined
Flash Point:	not determined
Flammability Limits:	not applicable
Autoignition Temperature:	not determined
Explosive Properties:	the notifiers state that the notified chemical is not explosive under normal conditions of use but excessive quantities of dust may form an explosive mixture with air in the presence of an ignition source
Reactivity/Stability:	stable

Comments on Physico-Chemical Properties

Tests were performed according to EEC/OECD test guidelines at facilities complying with OECD Principles of Good Laboratory Practice.

The notifiers state that the imidazolone rings may undergo hydrolysis under highly acidic conditions but the substance is expected to be stable in the environmental pH range.

No information was provided on the adsorption/desorption properties of the chemical. Given the chemical's high water solubility and low partition coefficient it is anticipated that it will not strongly adsorb to soils.

The notified chemical contains no dissociable hydrogens or basic functionalities.

4. PURITY OF THE CHEMICAL

Degree of Purity: ≥ 85%

Toxic or Hazardous Impurities:

Chemical name:	formaldehyde
CAS No.:	50-00-0
Weight percentage:	~ 0.05%
Toxic properties:	confirmed carcinogen with experimental carcinogenic, tumorigenic and teratogenic data; human poison by ingestion; experimental poison by ingestion, skin contact, intravenous, intraperitoneal and subcutaneous routes; human systemic effects by inhalation: lacrimation, olfactory changes and pulmonary changes; human mutation data reported; human skin and eye irritant; frequent or prolonged exposure can cause hypersensitivity leading to contact dermatitis; an air concentration of 20 ppm is quickly irritating to eyes (1)

Non-hazardous Impurities (> 1% by weight): unidentified impurities consisting of 5-15% of the notified chemical consist of dimers, trimers and oligomers

Additives/Adjuvants: none

5. USE, VOLUME AND FORMULATION

The notified chemical is used as a cross-linking agent in powder coatings for various indoor and outdoor applications, for example, computer housings, appliances, outdoor furniture and lawn mowers. The notified chemical will be imported in either Powderlink 1174 Resin (containing ≥ 85% of the notified chemical) at a rate of 4.25 to 8.5 tonnes per year for the first five years or in formulated powder coatings (containing less than 10% of the notified chemical) at a rate of 1 to 1.5 tonnes per year for the first five years.

6. OCCUPATIONAL EXPOSURE

The notified chemical will be imported in 18 kg fibre packs, 136 kg fibre drums or 208 L steel drums. It is anticipated that workers involved in transport or storage of these containers will be exposed only in the rare event of accident or leaking packaging.

The notified chemical will be incorporated into powder coatings at one site. The process for manufacturing powder coatings involves manually scooping the flakes of the notified chemical into a mixing bowl (less than 20 kg per batch) to which other components are added prior to blending. The mixing bowl is specially designed to function as a hopper and the blended materials are fed directly from the hopper to an extrusion process. Following extrusion, the material in the form of a sheet is rolled, cooled and kibbled into chips (approximately 2 cm^2 in area) which are fed directly into a bin. The bin is then transported to the mill where the chips are ground down to produce the final powder coating product which is then packaged in air and moisture tight plastic bags inserted inside cardboard boxes.

Exposure to the notified chemical during addition to the hopper is expected to be low given that it is in the form of large, non-dusting flakes, the area is well ventilated, the amount of chemical used per batch is low and the operation is of short duration.

Quality control samples of chips are collected from the bin for testing in the laboratory. The chips are ground in a grinder and sieved before being sprayed onto panels. Most of this work is conducted in a ventilated spray booth.

The notifiers have provided information on inspirable dust levels at the formulator's site and these range from 0.3 to 5.0 mg/m^3. Data from one of the joint applicant's New Zealand operations suggests that levels of inspirable dust in the grinding area range from 1 to 9 mg/m^3.

In the industrial applicators' workplaces the powder coating is manually loaded into a hopper which feeds automatically into a spray gun. The notifiers have assumed that inspirable dust levels in applicators' workplaces are less than 10 mg/m^3, in line with the levels in the formulator's workplace. However, there is evidence of great variability in these levels depending on whether proper spray booths with adequate air flow are employed. Levels of up to approximately 130

mg/m^3 have been recorded (2).

7. PUBLIC EXPOSURE

The notified chemical or reformulated products are for industrial use only and will not be available to the public.

The pubic may come in contact with products coated with powders containing the notified chemical. However, the notified chemical acts as a cross-linking agent and binds with polyester resin. Its adhesion to the substrate and physico-chemical properties of the dry coating will preclude public exposure.

Wastes collected from reformulation and coating processes will be disposed of to designated landfill. Accidental spills will result in minimal public exposure if the spills are collected and disposed of as outlined in the Material Safety Data Sheet (MSDS).

8. ENVIRONMENTAL EXPOSURE

Release

It is estimated by the notifier that residues remaining in packaging will be less than 100 kg per year (~80 kg from the imported raw material and ~20 kg from formulated powder coatings) at the maximum rate of import. The empty packaging will be disposed of to landfill in accordance with Local, State and Federal regulations.

The blending, extrusion and grinding processes in the reformulation are carried out in dust controlled environments. Dusts are collected by a baghouse filtering system. The dust collected from the baghouse is generally reconstituted into pellets which are recycled in later batches. Fines which are not recycled are disposed of to landfill in accordance with Local and State regulations. The notifier estimates that the wastage would be approximately 5% of the batch (~500 kg of the notified chemical annually).

The notifier estimates that losses from spray application of the powder coatings will be less than 25%. Spraying will take place in a spray booth and the overspray will be collected and either sieved and reused or disposed of to landfill. Taking 25% as a worst case, a maximum of 6 100 kg of the notified chemical will be disposed of to landfill per annum as waste powder coating.

Fate

Nearly all of the Powderlink 1174 to be used will become immobilised through cross-linking in the insoluble polyester matrix of the powder coating, which is bound to the articles that the coating has been applied. Thus, the fate of the majority of the notified chemical will share the fate of these articles, which is expected to be landfill at the end of the useful life of the article.

A maximum of 6 700 kg of Powderlink 1174 will be disposed of to landfill annually, as waste from formulation and application of the powder coatings. The majority of this will be encapsulated (and possibly further crosslinked) in the insoluble polymer; leaching potential is low.

The chemical was found to be not readily biodegradable in the OECD 301D Test (Closed Bottle Test), with 46.8% biodegradation observed at the end of the 28-day exposure period. This result indicates the substance to be inherently biodegradable.
Although the chemical is not readily biodegradable, the potential for bioaccumulation is low due to the low partition coefficient (log P_{ow} = 0.516) and very high water solubility of the substance.

9. EVALUATION OF TOXICOLOGICAL DATA

All of the toxicity studies were conducted with Powderlink 1174 Resin containing greater than 85% of the notified chemical.

9.1 Acute Toxicity

Summary of the acute toxicity of Powderlink 1174 Resin

Test	*Species*	*Outcome*	*Reference*
acute oral toxicity	rat	LD_{50} > 2 000 mg/kg LD_{50} = 7.07 g/kg	(3, 4)
acute dermal toxicity	rabbit	LD_{50} > 10.0 g/kg	(4)
acute inhalation toxicity	rat	LC_{50} > 0.291 mg/L	(5)
skin irritation	rabbit	non-irritant	(6, 7)
eye irritation	rabbit	moderate irritant	(4, 8)
skin sensitisation	guinea pig	non-sensitiser	(9)

9.1.1 Oral Toxicity (3, 4)

9.1.1.1 Limit Test (3)

Species/strain: rat/Sprague-Dawley

Number/sex of animals: 5/sex

Observation period: 14 days

Method of administration: gavage; suspension arachis oil

Clinical observations:	lethargy (one female); hunched posture (six animals)
Mortality:	no deaths
Morphological findings:	none
Test method:	according to OECD Guidelines (10)
LD_{50}:	> 2 000 mg/kg
Result:	the notified chemical was of low oral toxicity in rats

9.1.1.2 Standard Test (4)

Species/strain:	rat/Hilltop-Wistar
Number/sex of animals/doses:	5 males per dose; doses of 2.5, 5.0 and 10.0 g/kg
Observation period:	14 days
Method of administration:	gavage; suspension in 0.25% agar plus 0.1% Tween 80
Clinical observations:	sluggish, unsteady gait 5 to 30 minutes post-intubation
Mortality:	no deaths at 2.5 g/kg, 1 death at 5.0 g/kg and 4 deaths at 10.0 g/kg
Morphological findings:	nothing remarkable in survivors; in decedents, stomachs distended, liquid filled with glandular portions injected; intestines injected
Test method:	not stated
LD_{50}:	7.07 g/kg (confidence limits: 4.02 to 12.4 g/kg)
Result:	the notified chemical was of low oral toxicity in rats

9.1.2 Dermal Toxicity (4)

Species/strain:	rabbit/New Zealand White
Number/sex of animals:	8/unknown
Observation period:	not stated
Method of administration:	chemical moistened with water to form a paste; the paste was covered with polyethylene sheeting for 24 hours
Clinical observations:	none; no irritation observed
Mortality:	none
Morphological findings:	none
Test method:	not stated
LD_{50}:	> 10.0 g/kg
Result:	the notified chemical was of low dermal toxicity in rabbits

9.1.3 Inhalation Toxicity (5)

Species/strain:	rat/Sprague-Dawley
Number/sex of animals:	5/sex
Observation period:	14 days
Method of administration:	the solid test material was ground with a mortar and pestle and sieved through a size 20 and 60 mesh screen; the material was packed in the dust container of a Wright Dust Feeder using a hydraulic press; dry compressed air was supplied to the dust feeder at approximately 8-12 psi backpressure, causing a dust aerosol to be expelled into a glass diffuser; the diffuser served to remove larger particles and mix the dust aerosol with additional room air before entering the exposure chamber; exposure was for four hours; the mass median equivalent aerodynamic diameter was 3.7 μm and the total respirable concentration was 0.137 mg/L

Clinical observations:	upon removal from the chamber 3 rats appeared normal and 7 rats exhibited minor abnormalities: slight lacrimation (2 rats), clear or dried red nasal discharge (3 rats), white or red material on the facial area (3 rats), brown ano-genital staining (1 rat); on the day following exposure, 8 of the 10 rats appeared normal, 1 displayed slight dried nasal discharge and 1 displayed slight red material around the facial area; all animals appeared normal from days 2 to termination
Mortality:	none
Morphological findings:	5 males and 3 females exhibited mottled appearance or foci on the lungs; 1 male and 1 female exhibited urinary bladders vascularised and distended with a thin yellow fluid; the female also exhibited dark red renal lymph nodes larger than normal; one male displayed larger than normal mandibular lymph nodes; one female exhibited a spleen that was larger than normal, thickened and mottled red; one female was free of macroscopic abnormalities
Test method:	according to OECD Guidelines (10)
LC_{50}:	> 0.291 mg/L
Result:	the notified chemical was not acutely toxic by inhalation in rats exposed for four hours to a concentration of 0.291 mg/L (0.137 mg/L respirable concentration) in air

9.1.4 Skin Irritation (6, 7)

9.1.4.1 Study #1 (6)

Species/strain:	rabbit/New Zealand White
Number/sex of animals:	3/unknown
Observation period:	3 days
Method of administration:	0.5 g of Powderlink 1174 Resin placed under occlusive dressing for 4 hours

Test method:	unspecified
Result:	no erythema or oedema was observed in any animal at any time point; the notified chemical was not a skin irritant in rabbits

9.1.4.1 Study #2 (7)

Species/strain:	rabbit/New Zealand White
Number/sex of animals:	3/male
Observation period:	3 days
Method of administration:	0.5 g of Powderlink 1174 Resin was moistened with distilled water and placed under a semi-occlusive dressing for 4 hours
Test method:	according to OECD Guidelines (10)
Result:	one animal exhibited slight erythema at 1 hour post-treatment; no other erythema or oedema was observed in any other animal; the notified chemical was not a skin irritant in rabbits

9.1.5 Eye Irritation (4, 8)

9.1.5.1 Range finding study (4)

Species/strain:	rabbit/unspecified
Number/sex of animals:	6/unspecified
Observation period:	72 hours
Method of administration:	100 mg of Powderlink 1174 Resin into one eye

Primary irritation scores[1] of unirrigated eyes:

Mean Values[1]:

	Time after instillation		
	1 day	***2 days***	***3 days***
Cornea	12.5	8.3	2.5
Iris	3.3	0.8	0.0
Conjunctivae	10.0	8.0	3.3

[1] primary irritation scores were calculated as twice the sum of the values for conjunctival effects (redness, chemosis and discharge), maximum value of 20; five times the value for iridal effects, maximum value 10; five times the product of the values for corneal effects (opacity and area), maximum value 80; the values used are Draize (11) scores (see Attachment 1 for Draize scales)

Test method: not specified

Result: the notified chemical was a moderate irritant to rabbit eyes

9.1.5.2 Main Study (8)

Species/strain: rabbit/New Zealand White

Number/sex of animals: 6/unspecified

Observation period: 7 days

Method of administration: 97 mg of Powderlink 1174 Resin into the conjuntival sac of the right eye of each rabbit

Draize scores[1] (11) of unirrigated eyes:

	Time after instillation														
Animal	**1 hour**			**1 day**			**2 days**			**3 days**			**7 days**		
Cornea	**o[a]**	**a[b]**		**o[a]**	**a[b]**		**o[a]**	**a[b]**		**o[a]**	**a[b]**		**o[a]**	**a[b]**	
1	d[2]	3		1	2		1	1		1	1		0	0	
2	d	1		1	1		1	1		0	0		0	0	
3	d	2		1	2		1	1		0	0		0	0	
Iris															
1		1			1			0			0			0	
2		0			1			1			0			0	
3		1			1			0			0			0	
Conjunctiva	**r[c]**	**c[d]**	**d[e]**	**r[c]**	**c[d]**	**d[e]**	**r[c]**	**c[d]**	**d[e]**	**r[c]**	**c[d]**	**d[e]**	**r[c]**	**c[d]**	**d[e]**
1	2	2	2	2	2	1	1	1	0	1	0	0	0	0	0
2	2	2	3	2	2	2	2	1	1	1	1	1	0	0	0
3	2	2	2	2	2	1	2	1	0	1	1	0	0	0	0

[1] see Attachment 1 for Draize scales [2] d = dulling of the normal lustre of the cornea
[a] opacity [b] area [c] redness [d] chemosis [e] discharge

Test method: according to OECD Guidelines (10)

Result: the notified chemical was a moderate irritant to rabbit eyes

9.1.6 Skin Sensitisation (9)

Species/strain: guinea pig/Dunkin Hartley

Number of animals: 20 test; 10 control (sex unknown)

Induction procedure: injections (0.1 mL) in the shoulder region of:

i. Freund's Complete Adjuvant (FCA) plus distilled water (1:1);
ii. 25% w/v solution of Powderlink 1174 Resin in water;
iii. 25% w/v emulsion of Powderlink 1174 Resin in a 1:1 preparation of FCA plus water

on day 7 the same region was topically treated with a 75% w/v aqueous solution of

Powderlink 1174 Resin under occlusive dressing for 48 hours

Challenge procedure: on day 21 the right flank of each animal was treated with a 75% aqueous solution of Powderlink 1174 Resin under occlusive dressing for 24 hours

Challenge outcome:

	Test animals		***Control animals***	
Challenge concentration	***24 hours****	***48 hours****	***24 hours***	***48 hours***
50%	0/20**	0/20	0/10	0/10
75%	0/20	0/20	0/10	0/10

* time after patch removal
** number of animals exhibiting positive response

Test method: according to OECD Guidelines (10)

Result: the notified chemical was not a skin sensitiser in guinea pigs

9.2 Repeated Dose Toxicity

No data supplied.

9.3 Genotoxicity

9.3.1 *Salmonella typhimurium* Reverse Mutation Assay (12)

Strains: TA 1535, TA 1537, TA 1538, TA 98 and TA 100

Concentration range: 667 - 10 000 μg/plate

Test method: according to OECD Guidelines (10)

Result: the notified chemical was not mutagenic in any of the strains tested in either the presence or absence of metabolic activation provided by rat liver S9 fraction

9.3.2 Chromosomal Aberration Assays (13, 14)

9.3.2.1 Bone Marrow Cells of the Mouse (13)

Species/strain:	mouse/ICR
Number and sex of animals:	5/sex/group
Doses:	0, 1 250, 2 500 and 5 000 mg/kg
Method of administration:	by gavage in corn oil on 5 consecutive days; approximately 1.5-2.5 hours prior to euthanasia the animals were injected intraperitoneally with 2 mg/kg of colchicine after which bone marrow was collected
Test method:	Internal protocol no. 451
Result:	the notified chemical did not induce chromosomal aberrations in bone marrow cells of the mouse

9.3.2.2 Chinese Hamster Ovary Cells (14)

Doses:	without metabolic activation: rat liver S9 fraction: - 500 and 1 250 μg/mL (10 hour harvest - 500 to 5 010 μg/mL (20 hour harvest) - 2 500 to 5 010 μg/mL (30 hour harvest with metabolic activation: - 1 250 to 5 010 μg/mL (10 and 20 hour harvests)
Test method:	internal protocol no. 437B
Result:	without S9: - significant increases in induced chromosomal aberrations at 2 500 and 3 750 μg/mL at the 20 hour harvest and a weakly significant increase at 3 750 μg/mL at the 30 hour harvest (doses above 3 750 μg/mL were not analysed for chromosomal aberrations) with S9:

- significant increases in induced chromosomal aberrations at 3 750 μg/mL and 5 010 μg/mL at the 20 hour harvest

release of formaldehyde into the culture medium was noted at levels which may have been responsible for inducing chromosomal aberrations (15)

9.4 Overall Assessment of Toxicological Data

The notified chemical was of low acute oral toxicity in rats (LD_{50} > 2 000 mg/kg in a limit test and LD_{50} = 7.07 g/kg in males in a standard test). It was of low dermal toxicity in rabbits (LD_{50} > 2 000 mg/kg) and was not acutely toxic via the inhalation route at a concentration of 0.291 mg/L administered to rats for 4 hours. No data on repeated dose toxicity were supplied.

The notified chemical was not a skin irritant but was a moderate eye irritant in rabbits and was not a skin sensitiser in guinea pigs. It was not mutagenic in *Salmonella typhimurium* and did not induce chromosomal aberrations in bone marrow cells of mice *in vivo*. However, chromosomal aberrations in chinese hamster ovary cells *in vitro* were observed but were attributed to release of formaldehyde into the culture medium.

The notified chemical would not be classified as hazardous in accordance with Worksafe Australia's *Approved Criteria for Classifying Hazardous Substances* (Approved Criteria) (16) in relation to the toxicological data provided. Despite the fact that the notified chemical would not be classified as hazardous in relation to eye irritancy, it was considered to be a moderate eye irritant in rabbits on the basis of moderate conjunctival effects persisting for 24 hours. Classification as hazardous according to the Approved Criteria requires persistence of the effects for 72 hours.

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

The following ecotoxicity studies have been supplied by the notifier. The tests were carried out to OECD Test Methods.

Test	*Species*	*Results*
Acute Toxicity	bluegill sunfish (*Lepomis macrochirus*)	LC_{50} > 1 000 mg/L

The ecotoxicity data for the notified chemical indicate that the chemical is practically non-toxic to bluegill sunfish. During the test it was noted that the test material was slow to dissolve and it is unclear whether all the test material was in solution

during the test. This is in contrast to the claimed high water solubility for the chemical.

The notifier states that no data were available for *Daphnia magna* acute immobilisation or algal growth inhibition and that consideration be given for the omission of these data on the grounds of limited environmental exposure. This is acceptable given the very low toxicities to fish and the likely very low level of exposure to the aquatic compartment.

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

The low environmental exposure of the chemical as a result of normal use indicates that the overall environmental hazard should be negligible. Once incorporated into powder coatings the chemical will be inert and bound to the article to which it coats.
A maximum of 6 700 kg of Powderlink 1174 will be disposed of to landfill annually, as waste from formulation and application of the powder coatings. The majority of this will be encapsulated (and possibly further crosslinked) in the insoluble polymer, the leaching potential is low.

The overall environmental hazard from the use of the chemical is rated as low.

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

The toxicological data supplied indicate that the notified chemical may be a moderate eye irritant but should not exhibit acute toxicity via the oral and dermal routes. It should not be skin irritant or sensitiser and is unlikely to be genotoxic. An acute inhalation toxicity study was conducted in rats. The maximum concentration used in the study (0.291 mg/L) would not rule out classification as toxic according to the Approved Criteria since this would require an LC_{50} between 0.25 and 1 mg/L. No repeat dose data were provided. The notifiers argued that the molecule is highly polar as indicated by the relatively high water solubility (145 g/L) and low log P_{ow} (0.516) and that this indicates relatively rapid clearance and, therefore, limited potential for bioaccumulation. The lack of repeat dose data was accepted on this basis following the provision of quantitative exposure data.

Exposure of workers involved in transport and storage is unlikely except in the event of an accident.

During formulation of powder coatings, exposure to the notified chemical in its purest form is only possible at the stage of scooping the flakes into the hopper for mixing with other ingredients such as resins and pigments. The flakes were stated to be non-dusting, the workplace is well ventilated and the time taken is short. Therefore, exposure at this point is expected to be low. Nevertheless, gloves and eye protection as described below should be worn.

At the single site where reformulation of the notified chemical into powder coatings is to occur, measurements of inspirable dust in the atmosphere range up to 5.0 mg/m^3 and are conducted every three months. In the absence of other information, it is assumed that the concentration of the notified chemical in the airborne dust will be the same as is added to the formulation, that is, a maximum of 7%. If the notified chemical is at a concentration of 85 to 95% in the technical grade material, the concentration of notified chemical in air may be a maximum of 0.67 mg/m^3 (0.95 X 0.07 X 10 mg/m^3). In shops where powder coatings are applied this figure would be applicable in most cases. However, in some shops powder coating may be conducted in 'walk-in' spray booths and the dust concentration can be of the order of 100 mg/m^3 (2) in which case the concentration of notified chemical in air would be about 10-fold higher.

The notifiers have calculated intake factors (an intake factor is a measure of the quantity of the chemical in the dust a worker is likely to inhale) of 9.39×10^{-3} m^3/kg/day for workers involved in powder coating reformulation and 0.15 m^3/kg/day for applicators. The average particle size of the formulated powder coatings was measured at 40 - 43 μm with a respirable fraction (particle size less than 7 μm) of 4%. Using the figure of 4%, and assuming that this fraction was the major contributor, the absorbed dose was calculated at 2.5×10^{-4} mg/kg/day for reformulators and 4.0×10^{-3} mg/kg/day for applicators. If exposure to applicators in some shops is about 10-fold higher as noted above, the absorbed dose could be about 0.04 mg/kg/day. These figures assume 100% bioavailability of the notified chemical but this is unlikely given its use as a cross-linking agent. Therefore, given the likely potentially low acute toxicity of the notified chemical, its likely limited potential for bioaccumulation and likely low chronic dose level, the risk of adverse health effects to workers involved in reformulation or application of powder coatings is expected to be low. Nevertheless, in shops where 'walk-in' spray booths are used, particulate respirators as described below should be employed.

The risk of adverse public health effects resulting from contact with the notified chemical is expected to be negligible, as such contact is only likely when the notified chemical is incorporated into the cured coating which is adhered to the substrate.

13. RECOMMENDATIONS

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

- Safety goggles should be selected and fitted in accordance with Australian Standard (AS) 1336 (17) to comply with Australian/New Zealand Standard (AS/NZS) 1337 (18);

- Industrial clothing should conform to the specifications detailed in AS 2919 (19);

- Impermeable gloves or mittens should conform to AS 2161 (20);
- All occupational footwear should conform to AS/NZS 2210 (21);
- Dust levels should be maintained below Worksafe Australia's exposure standard for nuisance dusts of 10 mg/m^3 (22); however, if dust levels above 10 mg/m^3 are unavoidable, a particulate respirator which provides a full head covering should be worn and should comply with AS/NZS 1715 (23) and AS/NZS 1716 (24);
- Spillage of the notified chemical should be avoided, spillages should be cleaned up promptly and should then be put into containers for disposal in accordance with Local, State or Federal government regulations;
- Good personal hygiene should be practised to minimise the potential for ingestion;
- A copy of the MSDS should be easily accessible to employees.

For a more detailed description of engineering controls and work practices which will serve to minimise exposure chemicals in powder coatings the study on triglycidylisocyanurate (2) undertaken by NICNAS should be consulted.

14. MATERIAL SAFETY DATA SHEET

The MSDS for the notified chemical and for a powder coating containing it were provided in accordance with the *National Code of Practice for the Preparation of Material Safety Data Sheets* (25).

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

15. REQUIREMENTS FOR SECONDARY NOTIFICATION

Under subsection 64(1) of the Act, secondary notification of the notified chemical shall be required if significant exposure of the aquatic compartment is expected in which case ecotoxicity results daphnia and algae will be required. Secondary notification will be required should any of the circumstances stipulated under subsection 64(2) of the Act arise.

16. REFERENCES

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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