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NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

AMIDE RESIN IN CHEMITYLEN SGF-50

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Director
Chemicals Notification and Assessment

FULL PUBLIC REPORT

AMIDE RESIN IN CHEMITYLEN SGF-50

1. APPLICANT

ACI Fibreglass of 117 Frankston Road DANDENONG VIC 3175 has submitted a limited notification statement in support of their application for an assessment certificate for “Amide Resin in Chemitylen SGF-50”.

2. IDENTITY OF THE CHEMICAL

The notified chemical is a water dispersible compound containing hydrocarbon, amide and amine groups, intended for use in sizing formulations for glass fibres.

The chemical name, CAS number, molecular and structural formulae, molecular weight and spectral data have been exempted from publication in the Full Public Report and the Summary Report at the request of the notifier.

Trade Name: Chemitylen SGF-50

3. PHYSICAL AND CHEMICAL PROPERTIES

The physical and chemical properties of the notified chemical were not available. The physical and chemical data summarised below relate to the product, Chemitylen SGF-50, which comprises 57% the notified chemical, 22% acetic acid and 21% water.

Appearance at 20°C and 101.3 kPa: dark brown liquid

Boiling Point: 100-118°C

Specific Gravity: 1.0288

Vapour Pressure: 2.18 kPa at 20°C

Water Solubility: completely soluble in water (see notes below)

Partition Co-efficient (n-octanol/water):	not determined (see notes below)
Hydrolysis as a Function of pH:	amide link may hydrolyse under extreme pH conditions (see notes below)
Adsorption/Desorption:	not determined (see notes below)
Dissociation Constant:	not determined, the pKa expected to be between 9.8 and 10.7 (see notes below)
Flash Point:	54°C (closed cup method)
Flammability Limits:	Upper Explosive Limit = 19.9% Lower Explosive Limit = 4.0%
Autoignition Temperature:	not determined
Explosive Properties:	not determined
Reactivity/Stability:	stable under normal conditions of use

Comments on Physico-Chemical Properties

The notified chemical is completely soluble in water as would be expected from the high proportion of amino groups which will be protonated in the usual environmental pH region giving the molecules a high positive ionic charge. However, data on the visual appearance of mixtures of the new chemical in water at 20^{o}C (at pH 5.1) in concentrations ranging from less than 10% to 90% by weight indicated variable phase behaviour, and at concentrations less than 10% the material appeared to be only partially dispersed, while for concentrations between 15 and 70% by weight the mixture appeared to be a homogeneous dispersion, but apparently not transparent. At concentrations higher than 70% by weight the mixture was homogeneous and transparent. These observations suggest that while the notified chemical is dispersible in water, it does not form a true solution, although water appears to be soluble in the notified chemical up to 25% by weight.

The molecules contain a single amide linkage, which could be expected to hydrolyse under extreme pH conditions, but should be stable in the usual environmental pH region between 4 and 9.

No data on n-octanol/water partitioning was provided, but the material is highly miscible with water (hence implying low P_{OW}) and should not partition into the oil phase.

Similarly, no data on adsorption/desorption were provided, but the polar nature of the compound and high water solubility indicate that it will not associate with the organic component of soils and sediments. However, the material will have substantial positive charge under the usual environmental pH conditions, and

consequently will be expected to adsorb onto the (usually) negatively charged surfaces of silicate minerals in soils through ion exchange mechanisms.

The pKa was not determined, but the notifier correctly indicated that the pKa of the contained primary and secondary amino groups is expected to be between 9.8 and 10.7. Consequently the chemical will be protonated and carry substantial positive charge in the usual environmental pH region between 4 and 9. Solutions of the new chemical appear to be fully protonated, since the pH measured for the mixtures with water alluded to above (at 20^{o}C) were apparently always near 5.1.

The high positive charge carried on the molecules is probably responsible for the expected strong adhesion to the glass fibres which usually carry a negative surface charge.

The product has a flash point of 54^{0}C and is therefore classified as a Dangerous Goods, Class 3, Resin Solution, flammable, Packaging Group III (1).

4. PURITY OF THE CHEMICAL

Degree of Purity: high

5. USE, VOLUME AND FORMULATION

The notified chemical is to be used as a size for glass fibres, which aids the adhesion to a polymer resin matrix when used in the production of fibreglass items.

The notified chemical will not be manufactured in Australia, but will be imported as an aqueous solution product, Chemitylen SGF-50. Chemitylen SGF-50 contains 57% the notified chemical. The estimated import quantity of Chemitylen SGF-50 is expected to be less than 800 kg per year, and to remain at this level for the next five years. This equates to an annual import of the notified chemical of less than 460 kg.

6. OCCUPATIONAL EXPOSURE

Chemitylen SGF-50 will be imported into Australia in 20 L steel drums. Waterside workers, transport drivers and warehouse workers will only handle the imported chemical in its packaged form and would only be exposed to the material in the event of an accident.

The process of applying the size to the extruded fibres will be performed at one location in Australia only. Dermal contamination will be the main route of occupational exposure in workers. Inhalation exposure is also possible in the absence of vapour pressure data for the notified chemical.

The size operators will dilute a drum (20 L) of Chemitylen SGF-50 500 times with water in a large stainless steel mixing vessel (10 000 L), residue in the drums will be rinsed out with water and added to the batch of size emulsion. The resultant emulsion, estimated to contain less than 0.11% of the notified chemical, is then pumped to a recirculating tank from which it is continuously fed to the size application equipment under automatic control.

The size is applied to the hot extruded glass fibres by passing them over a rotating graphite roller, the underside of which is immersed in a trough of the sizing emulsion. The glass fibres are then wound onto spirals and the size is bound to the glass surface through heat curing. As the applying process will be under automatic control in a closed tank system, the size operators could be exposed to both concentrated and diluted forms of Chemitylen SGF-50 only during mixing.

The forming operators will clean the application equipment after use. They could be exposed to the diluted Chemitylen SGF-50 or the fibreglass coated with the sizing.

Mixing or cleaning will last for approximately five minutes each time.

7. PUBLIC EXPOSURE

The notified chemical is used to treat fibreglass reinforcing. Minimal opportunity for public exposure to the notified chemical exists during the application process.

Treated glass fibre contains approximately 0.011% of the notified chemical which adheres to the outer surface of the fibres. Under normal circumstances the public will only come into contact with the notified chemical as a cured resin coating glass fibre reinforcing, and only if they are using the glass fibre in a do-it-yourself fibreglassing application. The effective exposure from this contact is likely to be minimal. As most finished fibreglass products will enclose both the fibre and its chemical coating within the fibreglass resin, the majority of the public will not come into contact with the notified chemical.

In the event of a transport accident the primary hazard from the product Chemitylen SGF-50 would be derived from its low flash point (54°C) and the presence of 22% acetic acid, rather than from the properties of the notified chemical itself.

As the product is water soluble, dispersion and dilution of larger spills would be possible, with smaller spills recovered by adsorption onto vermiculite or sand followed by disposal to landfill in accordance with Local government regulations.

8. ENVIRONMENTAL EXPOSURE

Release

The notifier states that significant release of the material can be expected as a consequence of the application process, and around 10% (ie 80 kg of notified chemical per year) is lost as a result of leaks and spillage of the sizing emulsion, while a further 20% (ie 160 kg of notified chemical per year) is lost as a consequence of being coated onto scrap fibreglass. The liquid released as spillage is passed to a waste water treatment plant at the ACI facility (a SEPA dissolved air flotation plant) where it is expected that 90% (ie 72 kg per year) of the notified material will become associated with waste sludge. The notifier has indicated that the chemical would comprise less than 0.057% of the waste sludge from the ACI plant, which is treated as a "prescribed waste", and presumably this is disposed of via incineration or placement into a secured landfill. The remaining material not assimilated into sludge (ie 8 kg per year) will be released to the sewer. Based on 60 days per annum use of the new sizing compound, this amounts to release of around 130 grams per day to sewer, and since an average of 300 000 L per day are discharged from the ACI plant, the new compound is likely to be released at an effective concentration of around 0.44 $mg.L^{-1}$. This PEC (predicted environmental concentration) calculation assumes that the dissolved air flotation plant used in treating the liquid waste captures 90% of the compound into the waste sludge, but no data supporting this assumption was included in the notification. However, when released into the sewer system the notified material is expected to become associated with suspended organic matter (negatively charged) which is usually present in high concentrations in raw sewage, and would therefore probably become assimilated into sediments or sewage plant sludge.

Fate

Incineration of waste sludge containing the notified material would lead to the chemical's destruction with production of water vapour, and oxides of carbon and nitrogen. In a landfill the polymer discarded with the waste glass will be immobilised through being strongly bound to the glass fibres, and will be subject to very slow degradation through the biological and abiotic processes operative in these facilities, and would eventually be converted to methane, ammonia, and carbon dioxide.

No information on biodegradation accompanied the notification, but it is likely that if associated with soils and sediments (eg in a landfill), the material would be slowly degraded through the action of bacteria. In an aerobic environment this could be expected to release water, and oxides of carbon and nitrogen, while under anaerobic conditions degradation to water, methane and ammonia could be expected.

No bioaccumulation data were included in the notification, but the very high water solubility indicates low potential for bioaccumulation.

9. EVALUATION OF TOXICOLOGICAL DATA

No toxicological studies were provided for the notified chemical. This is acceptable according to the Act as the annual import volume of the notified chemical is anticipated to be less than 1 000 kg.

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

No ecotoxicological data were provided which is acceptable for chemicals with import volume less than 1 tonne per year according to the Act. However, amino compounds are well known to be toxic to aquatic life (2), and any release into receiving waters with the usual population of aquatic organisms could be expected to be detrimental (see further notes in Environmental Hazard below).

The notifier supplied some data derived from Quantitative Structure Activity Relationships using the ECOSAR program from US EPA. The results derived from these models depend critically on the value of log P_{OW} used as input, and consequently the calculations were performed using log P_{OW} equals to -2, 0 and 2. The data are summarised in the table below, and this clearly illustrates the strong dependence of the calculated toxicity on the value of Log Pow used as input to the model.

CALCULATED ECOTOXICITY DATA FROM ECOSAR

Log Pow	-2	0	2
Fish (species not indicated)			
LC_{50} (96 h)	> 1 000 $mg.L^{-1}$	> 1 000 $mg.L^{-1}$	165 $mg.L^{-1}$
Daphnia			
LC_{50} (48 h)	> 1 000 $mg.L^{-1}$	179 $mg.L^{-1}$	12 $mg.L^{-1}$
Green algae			
EC_{50} (96 h)	> 1 000 $mg.L^{-1}$	169 $mg.L^{-1}$	23 $mg.L^{-1}$

The environmental conditions (eg temperature, water pH and dissolved oxygen levels etc) for which this model may be valid were not indicated. Consequently this model derived information should be regarded as a guide to potential toxicity only, and in the absence of quantitative test data or more thoroughly detailed modelling methodology, the notified chemical should be regarded as potentially toxic to aquatic life.

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

The environmental hazard from the notified chemical is low when the product is used in the indicated manner. However, the material is potentially toxic to aquatic life, particularly if released into receiving waters containing low concentrations of suspended solids. The notifier indicates that some material (around 8 kg per

annum) will be released to metropolitan sewer system from the ACI waste water treatment plant (approximate concentration of the notified material in the plant effluent 0.44 $mg.L^{-1}$), and that the toxicity of the released compound will be strongly mitigated through it becoming quickly associated with negatively charged colloidal material which is present in high concentrations in raw sewage. This conclusion is supported by the published studies (2). Also, since the discharge is to a metropolitan sewer where the dilution factor could be expected to be considerable, the effective PEC in the sewage plant discharge would be significantly smaller (possibly by 2 to 3 orders of magnitude) than the concentration discharged in the ACI plant effluent.

A large amount of the material is likely to be placed into landfill associated with scrap fibreglass, and this is expected to be degraded very slowly through biological and abiotic landfill processes to water, ammonia and methane. Some of the chemical may be incinerated with waste sludge, which would result in its complete destruction with formation of water vapour and oxides of carbon and nitrogen.

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

As a limited notification only needed to be submitted, no toxicological information has been provided on the notified chemical. The physical and chemical data provided by the notifier relate to the product containing 57% of the notified chemical rather than the notified chemical itself. In the circumstance of insufficient information, a hazard classification of the notified chemical could not be made.

Waterside workers, transport drivers and warehouse workers will handle the drums containing the notified chemical. However, the likelihood of significant exposure to the notified chemical during transport and storage is minimal under the normal conditions.

At the production site, the size operators will handle the notified chemical for a short time during mixing and sizing. They will be exposed to both the concentrated (57%) and the diluted solutions (0.11%) of the notified chemical. The forming operators will only handle the diluted solution during cleaning. The cleaning is expected to take a few minutes every day.

Although occupational exposure to the notified chemical will be of short duration for each category of workers, most of the workers will handle the diluted solution of the notified chemical. Personal protective equipment (PPE) is recommended to minimise the possible adverse health effects in the absence of toxicological data.

The product, Chemitylen SGF-50 contains 22% acetic acid. Acetic acid is on the NOHSC's List of Designated Hazardous Substances (3) with a cutoff concentration of 10% for irritation. NOHSC has established an exposure standard (TWA 10 ppm or STEL 15 ppm) for acetic acid (4). The primary hazardous impurity (1.2%), tetra-ethylenepentamine, is a severe eye and skin irritant (5). Tetraethylenepentamine

is on the NOHSC's List of Designated Hazardous Substances (3) with a cutoff concentration of 1% for irritation. Following curing of the resin, any of the impurity not driven off by the curing process will be incorporated into the resin. Based on the available data, Chemitylen SGF-50 is classified as a hazardous substance. The Material Safety Data Sheet (MSDS) for the product indicates that it is a skin, eye, respiratory and gastrointestinal tract irritant.

Chemitylen SGF-50 has a flash point of 54^0C and classified as Dangerous Goods Class 3, flammable, Packaging Group III (1). Special precautions are needed to be taken by the transport and storage workers in accordance to the ADG Code.

Public contact with glass fibre reinforcing prior to incorporation into fibreglass products will be minimal and limited to those using the material in do it yourself projects. The effective exposure from this contact is likely to be minimal. Once the glass fibre has been incorporated into fibreglass components public contact with the notified chemical will be negligible and exposure essentially zero.

13. RECOMMENDATIONS

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

- Safety goggles should be selected and fitted in accordance with Australian Standard (AS) 1336 (6) to comply with Australian/New Zealand Standard (AS/NZS) 1337 (7);
- Industrial clothing should conform to the specifications detailed in AS 2919 (8) and AS 3765.1 (9);
- Impermeable gloves or mittens should conform to AS 2161 (10);
- 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;
- Special precautions for Class 3 Dangerous Goods should be taken during transport and storage of Chemitylen SGF-50 to comply with ADG Code (1);
- Local exhaust and general ventilation of the work area should be used to control the atmospheric concentration of acetic acid from Chemitylen SGF-50 below the NOHSC Exposure Standard (4);
- 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 accordance with the *National Code of Practice for the Preparation of Material Safety Data Sheets* (11).

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. Federal Office of Road Safety 1992, *Australian Code for the Transport of Dangerous Goods by Road and Rail*, 5th edn, Australian Government Publishing Service, Canberra.

2. Nabholz, J.V., Miller, P. & Zeeman, M. 1993, 'Environmental Risk Assessment of New Substances under the Toxic Substances Control Act Section Five', in *Environmental Toxicology and Risk Assessment, American Society for Testing and Materials*, ASTM STP 1179, Philadelphia, pp. 40-55.

3. National Occupational Health and Safety Commission 1994, *List of Designated Hazardous Substances [NOHSC:10005(1994)]*, Australian Government Publishing Service, Canberra.

4. 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.

5. Registry of Toxic Effects of Chemical Substances database 1993, 'RTECS'.

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

7. 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.

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

9. 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.

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

11. 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.