File No: NA/678

April 1999

NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

Polyamine Adduct in SikaGard-63N Part B

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Director
Chemicals Notification and Assessment

FULL PUBLIC REPORT

Polyamine Adduct in SikaGard-63N Part B

1. APPLICANT

Sika Australia Pty Limited of 55 Elizabeth Street Wetherill Park NSW 2164 has submitted a limited notification statement in support of their application for an assessment certificate for the Polyamine Adduct in SikaGard-63N Part B.

2. IDENTITY OF THE CHEMICAL

The polyamine adduct (i.e. the notified chemical) is an ingredient of SikaGard-63N Part B which is used in a two part epoxy resin, highly chemical resistant coating (SikaGard-63N). SikaGard-63N Part B contains large excesses of 1,3-benzenedimethanamine (m-XDA) and 5-amino-1,3,3-trimethylcyclohexanemethanamine (IPD). Information regarding the chemical name, CAS number, molecular and structural formulae and spectral data for the Polyamine Adduct in SikaGard-63N Part B have been exempted from publication in the Full Public Report and the Summary Report.

Marketing Name: Polyamine Adduct in SikaGard-63N Part B (containing 14.9% notified chemical)

3. PHYSICAL AND CHEMICAL PROPERTIES

The notified chemical is never isolated in a pure form during synthesis or reformulation. The following physical and chemical properties correspond to SikaGard-63N Part B, which contains 14.9% w/w notified chemical.

Appearance at 20°C and 101.3 kPa:	SikaGard-63N Part B is a yellow, low viscosity liquid with an amine odour
Boiling Point:	247°C (mXDA and IPD)
Specific Gravity:	1.1
Vapour Pressure:	0.03 mmHg at 25°C (m-XDA)
Water Solubility:	miscible with water; see comments below

Partition Co-efficient (n-octanol/water):	log P_{ow} = 6.9 (approx. value, based on calculation for similar product); see comments below
Hydrolysis as a Function of pH:	no hydrolysable groups
Adsorption/Desorption:	see comments below
Dissociation Constant:	pK_a = 10-11; see comments below
Particle Size:	not applicable as notified chemical is a liquid
Flash Point:	>101°C
Flammability Limits:	not flammable, but is a combustible liquid
Autoignition Temperature:	no data available
Explosive Properties:	product not flammable under normal conditions of use, but will support combustion and produce oxides of nitrogen and carbon.
Reactivity/Stability:	corrosive

Comments on Physico-Chemical Properties

The notifier has estimated the boiling point for the new chemical to be the same as m-XDA and IPD as it was produced in the presence of a large excess of these two products. The vapour pressure was also based on m-XDA, a major component of the polyamine adduct.

No water solubility data were provided with the notification. The notifier states that the liquid is miscible with water even though the presence of the hydrophobic bisphenol A moiety in the adduct would detract from significant aqueous solubility. The presence of this group should not confer affinity for water on the adduct, but the material also contains several primary and secondary amino groups which would be protonated and hence positively charged in the usual environmental pH region (4-9) and this will favour water solubility.

The notifier provided a calculated estimate for the value of log P_{ow} of 6.91. This implies a very high affinity for the oil phase. However, this calculation is based on a fragmentation technique which assumes that none of the numerous amine groups are charged. In the aqueous environment under environmental pH (4-9), these would certainly be protonated and carry positive charges. This would dramatically reduce the true value for log P_{ow} and would be likely to confer considerable water solubility.

The primary and secondary amino groups of the adduct will have pK_a values of between 10 and 11, based on di- and triethylamine. Hence, within the pH range of 4-9 these will be protonated

and confer a positive charge (cationic form) on an adduct molecule. Thus it is likely that the notified chemical will be adsorbed onto the negatively charged surfaces of silicate minerals through electrostatic interactions.

The adduct contains no linkages which will be susceptible to hydrolytic degradation in the usual environmental pH region.

4. PURITY OF THE CHEMICAL

The polyamine adduct will be manufactured during the production of SikaGard-63N Part B. After synthesis, the adduct comprises 18% by weight of its reaction mixture. This mixture is not subjected to any purification/separation process, but instead other ingredients are immediately added to form the final SikaGard-63N Part B product. The concentration of the polyamine adduct in SikaGard-63N Part B is approximately 14.9% by weight.

Hazardous Impurities and Additives in SikaGard-63N Part B:

Chemical name:	1,3-benzenedimethanamine (m-XDA)
CAS No.:	1477-55-0
Weight percentage:	30-40
Use:	adduct ingredient
Hazardous properties:	severe skin irritant; NOHSC exposure standard is 0.1 mg/m^3 (peak limitation); can be absorbed through skin
Chemical name:	5-amino-1,3,3-trimethylcyclohexanemethanamine (IPD)
CAS No.:	2855-13-2
Weight percentage:	30-40
Use:	adduct ingredient
Hazardous properties:	harmful in contact with skin and if swallowed (R21/22); causes burns (R34); may cause sensitisation by skin contact (R43)
Chemical name:	benzyl alcohol
CAS No.:	100-51-6
Weight percentage:	<5%
Use:	plasticiser
Hazardous properties:	harmful by inhalation and if swallowed (R20/22)

Chemical name:	2,4,6-tris(dimethylaminomethyl) phenol
CAS No.:	90-72-2
Weight percentage:	<5%
Use	catalyst
Hazardous properties	harmful if swallowed (R22); irritating to eyes and skin (R36/38)

5. USE, VOLUME AND FORMULATION

The polyamine adduct (i.e. the notified chemical) is an ingredient of SikaGard-63N Part B which is used in a two part epoxy resin, highly chemical resistant coating (SikaGard-63N). The coating material is designed to afford maximum protection against corrosion, weathering and severe chemical attack. The final coating mix, containing 12% SikaGard-63N Part B (which itself is 14.9% notified adduct by weight) will be used by tradesmen for industrial applications.

A total of 850 kg/annum of the polyamine adduct will be manufactured by Sika Australia Pty Limited, located at 55 Elizabeth Street, Wetherill Park, NSW 2164.

6. OCCUPATIONAL EXPOSURE

The notified chemical will only exist as an ingredient of the liquid product SikaGard-63N Part B. As the molecular weight of the notified chemical is relatively high and the vapour pressure is expected to be low, the main route of exposure will be dermal. The product has a low viscosity and if mists are generated during the mixing of large quantities, inhalation exposure to mists containing the notified chemical would be possible.

Manufacture and Packaging

Both the polyamine adduct and the SikaGard-63N Part B will be manufactured at the Sika Australia site in Wetherill Park, Sydney.

The raw materials are manually decanted from their storage containers for weighing. They are then transferred into a sealed mixing vessel (2000L, fitted with local exhaust ventilation) and stirred mechanically until the solution is clear. Epoxy resin is slowly added in portions and the mixture is maintained at a temperature above 80°C until all epoxy groups have fully reacted with the amine groups. Once the reaction is complete, further ingredients are added to the mixture to form the SikaGard-63N Part B.

The contents of the mixing vessel are then transferred via a hose to a filling machine, which is enclosed within a separate chamber and the area is bunded to contain spills. The SikaGard-63N

Part B product will be filled into 1.2kg metal containers and sealed. Each container will then be packaged with SikaGard-63N Part A to form a kit, which is then packed into a cardboard box for warehousing and distribution.

It is estimated that 4 process operators, 4 packaging operators 2 laboratory staff and 2 warehouse staff potentially will be exposed to the notified chemical at the manufacturing site. Manufacturing operators are potentially exposed by skin contamination for 7.5 hours per day for 10 days each year during cleaning of the mixing vessel and other processing equipment. Exposure during mixing is unlikely as the mixer is enclosed. Manufacturing operators will wear overalls, natural rubber gloves, goggles and half face respirators.

The packaging operators are potentially exposed for a similar duration during transfer of the product to the filling machine. Skin contamination may occur in the event of overfilling of containers and when handling and cleaning the transfer hoses. Packaging operators will also wear overalls, natural rubber gloves, goggles and respirators.

All dispensing and manufacturing will be performed within bunded areas. Cleaning of equipment will be carried out using an automated, large-scale washing machine using detergents and a solvent such as Solvesso 150. All rinsates and wastes will be collected into drums and disposed of to a liquid waste facility by a licensed contractor. It is expected that overalls, PVC gloves and chemical safety goggles will be worn by process operators and waste contractors during the handling of product wastes.

Maintenance staff may also be exposed to the notified chemical during work on the mixing vessel and other plant equipment. Laboratory staff are likely to handle small quantities only; however, skin contamination may occur in the event of spillage. Warehouse staff at the manufacturing site would only be exposed if the packaging is breached.

Transport and Storage

The final product is transported by road from the manufacturing site to warehouses and customer sites, including approximately 1000 retail outlets (e.g. industrial suppliers and hardware stores) across Australia. Warehouse staff will unload cartons of SikaGard-63N Part B and store them in approved purpose built storage units. Warehouse and transport staff would only be exposed to the notified chemical in the event of an accident. The notifier estimates that packaged goods could be handled by 10-14 warehouse staff for 2 hours per day, 75 days per year and by transport workers (5-10) for 3-12 hours per day, 12 days per year.

As with the warehouse and transport staff, it is considered unlikely that retail workers will be exposed to the notified chemical as they would only handle packaged SikaGard-63N Part B product.

End-use

The notifier states that the product will be sold only to professional tradesmen for industrial applications and not the public, but does not indicate how sale to the public will be restricted.

Instructions to applicators are contained on the product data sheet and MSDS. No special education and training have been indicated by the notifier.

For application, the metal insert containing Part B is removed and Part B is scraped out using a paintbrush or spatula and added to Part A. The two parts are stirred and the mixture (containing approximately 1.8% w/w of the notified chemical) is then left to stand for approximately three minutes before applying. The pot life of the mixture (2kg batch) is 10-30 minutes, depending on the temperature. The coating is normally applied to the surface with a paintbrush, nylon roller or spatula. The majority of the curing process is complete within 5-16 hours. Full curing takes between 9-15 days.

Skin contamination with the notified chemical may occur during mixing of the two parts, during application of the mixture and during cleaning of the application equipment. Once the curing process is complete, further exposure to the notified chemical cannot occur.

The Material Safety Data Sheet (MSDS) and product data sheet recommend the use of personal protective clothing, PVC gloves and chemical safety goggles by tradesmen when preparing and using SikaGard-63N. A half-face respirator with organic vapour cartridge is also recommended when working in poorly ventilated areas (e.g. in confined spaces).

7. PUBLIC EXPOSURE

Neither the notified chemical or the SikaGard-63N Part B product will be sold to the public. SikaGard-63N Part B will only be used for industrial applications (i.e. coating of industrial surfaces, tanks and equipment) by professional applicators. Although members of the public will make dermal contact with articles coated with the product containing the notified chemical, exposure will be negligible because of its low concentration (approximately 1.8% w/w) and cured state of the chemical in the coatings, where it is bound within the polymer matrix.

8. ENVIRONMENTAL EXPOSURE

Release

The notifier anticipates that approximately 22.4kg of SikaGard-63N Part B (3.34 kg of notified chemical) will be released annually as a result of manufacturing activities. Of this, 2.4kg are expected from spills and leaks, while the remaining 200kg will result from cleaning the manufacturing equipment.

Spillage and leaks of material will be contained within bunded areas at the site of manufacture and treated with other waste solutions and solvents in the treatment plant at the Sika facility. It is expected that most of the notified adduct will become associated with the waste sludge and will then be disposed of into landfill or incinerated. The notifier indicates that disposal of such residues is undertaken by a waste removal contractor.

The production equipment is cleaned using a high boiling point hydrocarbon solvent (Solvesso 150) in a semi-automatic process. The notifier indicates that the spent solvent is recovered after the cleaning process, and is periodically collected by a waste contractor for solvent recycling. It is assumed that residuals of the notified material contained within the waste solvent are recovered into waste sludge and are either incinerated or placed into landfill.

In using the product as a epoxy resin coating, it is expected that 4.7kg of the notified adduct will be released per year as a consequence of leaks and spills (2.4kg), cleaning application equipment (2kg) and residuals left in containers (0.3kg). The spilt material is allowed to cure and solidify before being disposed of into landfill and similarly the residual material of parts A and B of the surfacing formulation are combined in the tins, allowed to cure and disposed of to landfill.

It is likely that under conditions of normal use on industrial surfaces such as concrete floors and asbestos cement (through application by brush, roller or spatula), some of the cured surface material will be abraded and associate with dusts. This material would most likely be collected by vacuum cleaners or swept up and deposited into landfill with cleaning waste. Some may enter storm water/sewerage systems as a consequence of hosing out industrial premises.

At the end of their useful life, the concrete floors would be broken up and the residue placed into landfill, or possibly used as clean backfill in new constructions. In either case the notified chemical will be contained within a highly crosslinked polymer matrix and will be immobile.

Fate

Material disposed of into landfill will be incorporated and immobile in a solid matrix. The matrix will be very slowly degraded through the biological and abiotic processes operative in landfills and will degrade to gases such as methane, ammonia, and carbon dioxide. A similar fate is predicted for the cured material associated with old broken concrete used as backfill. Any uncured material released as a result of accidents is likely to become protonated in the environment due to the high content of primary and secondary amino groups and this will confer high water solubility on the released material. However, it is likely that the positive charges will enable adsorption onto negatively charged ion exchange sites on soil and clay particles. Consequently the material would become associated with sediments and be slowly broken down by natural biological and abiotic processes. Similarly, it is likely that any particles of cured material (e.g. from abraded dusts) released into stormwater or sewerage systems would deposit into sediments and slowly destroyed through these processes.

Biodegradation data are not required for this notification category. The notifier indicates that non-cyclic amines are not readily biodegradable and persist in the environment. In the absence of corresponding data for the notified chemical, it must be assumed that it would behave in a similar fashion and not be readily biodegradable. However, the potential for bioaccumulation is low due to the expected high water solubility of the charged species predominating in the aquatic environment and to the expected low exposure to water.

9. EVALUATION OF TOXICOLOGICAL DATA

No toxicology data were provided for the notified chemical. This is acceptable for chemicals notified in this category. The MSDS for SikaGard-63N Part B contains health hazard information which relates to the other components in the product.

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

No ecotoxicological data are required for chemicals notified in this category. However, the notifier has indicated that the final product is harmful to aquatic organisms, probably due to the high content of amine groups and recommends that it be prevented from entering sewers or stormwater. There were no other data available regarding effects on the environment.

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

The new material will be manufactured and packaged in Australia by the notifier. The environmental hazard from the notified chemical is expected to be low when it is manufactured and used in the indicated manner. The final product may be highly toxic to aquatic organisms if released into the environment alone; however, this is unlikely to occur except following accidental spillage. Most release to the environment will be in association with an epoxy resin as part of a semi-solid, highly crosslinked mass coated onto surfaces, which will immobilise the toxic material. Released material is expected to be placed into landfill, where very slow degradation processes will decompose the material to water and the usual landfill gases such as ammonia, methane and carbon dioxide. Furthermore, all releases of the chemical will be widespread and diffuse at very low concentrations.

If any of the non-crosslinked material were to enter the water compartment, its inherent potential toxicity is likely to be mitigated through assimilation of the chemical into sediments, where it would be expected to slowly degrade through biotic and abiotic processes.

The notified chemical is therefore not likely to present a hazard to the environment when it is stored, transported and used in the typical manner, even at maximum release to the environment.

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

The notified chemical is never isolated from other chemicals in the reaction mixture. There are no toxicological data for the notified chemical so the health effects classification cannot be determined.

All adduct reagents, as well as the plasticiser and catalyst, are included on the NOHSC *List of Designated Hazardous Substances* (NOHSC, 1994a) and given the concentrations, SikaGard-63N Part B is determined to be a hazardous substance according to the NOHSC *Approved Criteria for Classifying Hazardous Substances* (NOHSC, 1994b). It warrants the risk phrases R21/22 (harmful in contact with skin and if swallowed), R34 (causes burns) and R43 (may cause sensitisation by skin contact. The MSDS states there is also a risk of serious eye damage and respirative irritation and sensitisation. SikaGard-63N Part B is a Class 8 (Corrosive) Dangerous Good and a Schedule 5 Poison as indicated on the label and/or MSDS.

Occupational Health and Safety

Worker exposure to the substances comprising SikaGard-63N Part B would primarily be via inhalation of vapours and skin contact (e.g. from liquid spills and splashes). Skin contamination to the notified chemical may occur during manufacture and packaging through spills and leaks during the transfer and filling operations. Exposure may also occur during cleaning and maintenance of plant and equipment. Due to the known severe hazards of the ingredients, strict precautions to control exposure must be taken.

Precautions regarding safe handling during use of SikaGard-63N Part B have been provided on the MSDS and label. These include to use the product only in well-ventilated areas. Local exhaust ventilation and good general ventilation should also be provided during manufacture and packaging of the notified polymer adduct.

The health risk to transport and storage workers is low, as exposure to the notified chemical and other ingredients is unlikely to occur unless packaging is breached. Laboratory workers will only handle small quantities; however, due to the hazardous nature of the chemicals present, strict precautions as described above should be taken to minimise the health risk.

For workers mixing Part A and Part B, applying the product and cleaning equipment, precautions to prevent skin and respiratory contamination should be taken. A half-face respirator with organic vapour cartridge should be worn indoors, in confined spaces and where ventilation is poor.

According to the MSDS, spillages should be absorbed with dry sand, vermiculite or special spill absorbent for organic materials. Workers cleaning up spills are to wear eye, skin and respiratory protective equipment. The absorbed material is collected and sealed in properly labelled steel containers and disposed of using a licensed incinerator, who should also wear protective clothing, gloves and goggles.

There is a NOHSC exposure standard for m-XDA of 0.1 mg/m^3 peak limitation (NOHSC, 1995). Employers are responsible for ensuring that this exposure standard is not exceeded in the workplace.

Public Health

Based on the intended use pattern and its physico-chemical properties, the polyamine adduct in SikaGard-63N Part B does not appear to represent a significant hazard to public health.

13. RECOMMENDATIONS

To minimise occupational exposure to the polyamine adduct and SikaGard-63N Part B (containing the polyamine adduct) the following guidelines and precautions should be observed :

- 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), AS 3765.1 (Standards Australia, 1990a) and AS 3765.2 (Standards Australia, 1990b);
- Impermeable gloves should conform to AS 2161 (Standards Australia, 1978) and AS/NZS 2161.2 (Standards Australia/Standards New Zealand, 1998);
- All occupational footwear should conform to AS/NZS 2210 (Standards Australia/Standards New Zealand, 1994a);
- Respirators should conform to AS 1715 and AS 1716 (Standards Australia/Standards New Zealand, 1994b,c);
- Work in confined spaces should conform to AS 2865 (Standards Australia, 1995);
- Ensure adequate ventilation in all work areas;
- 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 appropriate MSDS should be easily accessible to employees;
- The NOHSC exposure standard for m-XDA should not be exceeded in the workplace.

14. MATERIAL SAFETY DATA SHEET

The Material Safety Data Sheet for the SikaGard-63N Part B product was provided in a format consistent with the *National Code of Practice for the Preparation of Material Safety Data Sheets* (NOHSC, 1994c). It contains adequate instructions for dealing with occupational and environmental emergencies.

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

Secondary notification of the chemical is required if any of the following circumstances are notified under subsection 64(1) of the Act :

- the annual volume of introduction exceeds one tonne;
- products containing the notified chemical are available for sale to the public.

Secondary notification of the notified chemical shall be required if any of the circumstances stipulated under subsection 64(2) of the Act arise.

16. REFERENCES

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

National Occupational Health and Safety Commission (NOHSC, 1994b) Approved Criteria for Classifying Hazardous Substances [NOHSC:1008(1994)]. Australian Government Publishing Service, Canberra.

National Occupational Health and Safety Commission (NOHSC, 1994c) 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 (NOHSC, 1995) Exposure Standards for Atmospheric Contaminants in the Occupational Environment [NOHSC:3008(1995); NOHSC:1003(1995)]. Australian Government Publishing Service, Canberra.

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

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

Standards Australia (1990a) Australian Standard 3765.1-1990, Australian Standard Clothing for Protection Against Hazardous Chemicals Part 1: Protection Against General or Specific Chemicals. Standards Australia, Sydney.

Standards Australia (1990b) Australian Standard 3765.2-1990, Australian Standard Clothing for Protection against Hazardous Chemicals Part 2: Limited Protection Against Specific Chemicals. Standards Australia, Sydney.

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

Standards Australia (1995) Australian Standard 2865-1995, Safe Working in Confined Spaces. Standards Australia, Sydney.

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

Standards Australia/Standards New Zealand (1994a) Australian/New Zealand Standard 2210-1994, Australian/New Zealand Standard Occupational Protective Footwear. Standards Australia and Standards New Zealand, Sydney/Wellington.

Standards Australia/Standards New Zealand (1994b) Australian/New Zealand Standard 1715-1994, Australian/New Zealand Standards for the Selection, Use and Maintenance of Respiratory Protective Devices. Standards Australia and Standards New Zealand, Sydney/Wellington.

Standards Australia/Standards New Zealand (1994c) Australian/New Zealand Standard 1716-1994, Australian/New Zealand Standard Respiratory Protective Devices. Standards Australia and Standards New Zealand, Sydney/Wellington.

Standards Australia/Standards New Zealand (1998) Australian/New Zealand Standard 2161.2-1998, Australian/New Zealand Standard Occupational Protective Gloves Part 2: General Requirements. Standards Australia and Standards New Zealand, Sydney/Wellington.