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**NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION
AND ASSESSMENT SCHEME**

FULL PUBLIC REPORT

Polymer in Beckopox Special Hardener SEH 622

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Director
Chemicals Notification and Assessment

FULL PUBLIC REPORT**Polymer in Beckopox Special Hardener SEH 622****1. APPLICANT**

Hoechst Australia Ltd, 606 St Kilda Road, Melbourne Victoria 3004.

2. IDENTITY OF THE CHEMICAL

Based on the presence of the residual monomer isophorondiamine, the product Beckopox Special Hardener SEH 622 can be classified as being hazardous (1). The polymer on its own, however, would not be expected to be hazardous. Therefore, the chemical name, CAS number, molecular formula, structural formula, molecular weight, spectral data and monomer composition of the polymer have been exempted from publication in the Full Public Report and the Summary Report.

Other name: Aliphatic polyamine (polymer) internally modified

Trade names: Beckopox Hardener SEH 622; Beckopox Special Hardener SEH 622; Beckopox Special Hardener SEH 622W; Beckopox Hardener EH 623; Beckopox Special Hardener EH 623; Beckopox Spezial Haerter EH 623

Maximum percentage of low molecular weight species (molecular weight <1000): 67%

3. PHYSICAL AND CHEMICAL PROPERTIES

The following physico-chemical data were provided for Beckopox Special Hardener SEH 622.

Appearance at 20°C and 101.3 kPa:	yellowish liquid
Odour:	amine-like
Boiling Point:	>90°C (based on water content)
Specific Gravity:	1100 kg/m ³ at 25°C
Vapour Pressure:	<0.01 kPa at 25°C (based on vapour pressure of water)
Water Solubility:	>100 g/L at 20°C
Partition Co-efficient (n-octanol/water) log P_{o/w}:	not determined
Hydrolysis as a function of pH:	not determined
Adsorption/Desorption:	not determined

Flash Point:	>100°C
Flammability Limits:	not determined (water-based product)
Decomposition Temperature:	starts at approximately 170°C Decomposition
Products:	acrylonitrile; carbon dioxide; carbon monoxide; nitrous oxides and hydrogen chloride
Autoignition Temperature:	>450°C (attributable to residual monomer content)
Explosive Properties:	not determined (based on negligible vapour pressure and water- based product)
Reactivity/Stability:	not an oxidising agent; will react with acids forming the corresponding amine salts; decomposes at approximately 170°C to form acrylonitrile
Particle size:	not applicable, will be in liquid form

Comments on Physico-Chemical Properties:

The chemical only exists as a suspension in water on import and is always associated with water until its final use where it is crosslinked and becomes unavailable to the environment.

No data were provided for hydrolysis; however the polyamine is not expected to hydrolyse as it is transported and diluted further for marketing as an aqueous suspension. The chemical structure of the polymer does not appear to contain any hydrolysable functionalities.

No data were provided for partition coefficient: the polymer is water soluble with a range of molecular weight. Therefore the partition coefficient would be hard to measure but would be expected to be low.

No data were provided for adsorption/desorption: however polyamine substances would be expected to sorb strongly to soil (2).

4. PURITY OF THE CHEMICAL

Degree of purity: >60%

Toxic or hazardous impurities:

- . **Chemical name:** m-xylylenediamine
Synonyms: methylamine, m-phenylenebis; 1,3-bis(aminomethyl)benzene; m-xylene alpha,alpha'-diamine; 1,3-benzenedimethanamine
CAS No.: 1477-55-0
weight percentage: 3%
Toxic properties: severe skin and eye irritant; oral rat LD₅₀ 930 mg/kg; dermal rabbit LD₅₀ 2000 mg/kg; rat inhalation LD₅₀ 700 ppm (3)
mild sensitiser in guinea pig (4)
TWA 0.1 mg/m³; significant exposure can occur via the skin (5)
- . **Chemical name:** isophorondiamine
Synonym: 5-amino-1,3,3-trimethyl
CAS No.: 2855-13-2
Weight percentage: 3%
Toxic properties: may burn eyes and skin; may be irritating if inhaled (4)
may be sensitising to the skin (6)

Non-Hazardous impurity:

- . **Chemical name:** water
CAS No.: 7732-18-5
Weight percentage: 10-30%

Maximum content of residual monomers: 6%

5. INDUSTRIAL USE

The notified polymer is a polyamine which will be imported into Australia in liquid form. The imported product contains 10-30% residual water and is known as Beckopox Special Hardener SEH 622. Beckopox Special Hardener SEH 622 will be used in combination with epoxy resins as additives for cement systems for industrial or commercial applications only. There are two major uses for the notified chemical. The first will be as a component in epoxy systems for mineral substrates which will be used for the undercoating and covering of storage halls, car-parks and garages, and for the coating of walls in hospitals. The second major use will be as a component in epoxy modified mortar to be used in the restoration of concrete. It will mainly be used for the coating of floors in industrial buildings but is in use in the restoration of concrete bridges in other parts of the world. A further use of the notified chemical will be as a component in corrosion protection systems where it will be used to coat metals, plastics and other substrates.

The annual import volume for the polymer is >1 tonne per annum.

The notified polymer has been manufactured and sold in Europe for a number of years.

6. OCCUPATIONAL EXPOSURE

Occupational exposure may result during transportation, storage, reformulation, packaging of the notified chemical or during application of the end product.

The notified substance will be imported in 200 L lined steel drums to the Hoechst Australia factory/warehouse in Victoria and later forwarded to one site in NSW for dilution and final use packaging. Worker exposure to the notified chemical should not result during transportation and warehousing except in the event of an accident.

An estimated 16 personnel will be involved in handling and reformulating the notified chemical. Initially, these operations will be conducted at one site only. During formulation of the end-use product, Beckopox Special Hardener SEH 622 will be pumped from the 200 L steel drums into an automatic mixing vessel, where it will be diluted with water and then refilled into either 200 L steel drums or 10/20L pails. System operators will not directly handle the product as the entire operation will be automated. Additionally, the notifier states that reformulation will be conducted under local exhaust ventilation and workers will be instructed to wear appropriate personal protective equipment (including industrial standard coveralls, PVC or rubber gloves and safety goggles. Production will be conducted ~4-8 hours/month. Under the conditions described by the notifier, exposure to the notified polymer will be low.

Workers involved with the analysis and quality assurance of the final diluted product, will be exposed to small amounts of the notified chemical on an infrequent basis. The maximum exposure period, estimated by the notifier, is two hours per month for each worker.

Workers may be exposed to the notified polymer during application of the end-products. The number of workers is unknown as the market for the product has not yet been established. The extent of worker exposure will depend on the polymer concentration in the end-use products, the personal protective equipment worn and the duration of exposure. For use as a floor coating, the notified chemical will be present at ~19% in one part of a two-pack system. The two parts will be mixed on site before use, resulting in a final polymer concentration of 2-3%. Mixing the epoxy systems for mineral substrates will require mixing a product containing 36% notified polymer with another product to give a final polymer concentration of 16%. The packaging will be designed to allow full-pack quantities to be used each time. Once the mixture is formed and applied to the surface to be treated, it will undergo a hardening reaction with the resin component. After the product has cured (up to 24 hours) there should be negligible worker exposure as the notified polymer will be bound into a system with good abrasion and chemical resistance properties. The notifier expects that workers will wear barrier cream to unprotected skin as well as gloves and goggles during application.

The percentage of the polymer in the final mix, when used as a component in corrosion protecting systems was not stated.

7. PUBLIC EXPOSURE

When used as an additive to cement systems, the notified polymer is incorporated into a solid mixture which may be covered and as such, is not accessible to the public. When used as a floor covering, the epoxy system is not expected to be covered by a topcoat. Under such conditions, the polymer is not expected to leach from the surface, because it is tightly bound in a matrix which is resistant to degradation. When used as a component in corrosion protecting systems, the notified chemical will be covered by one or more top coats, preventing contact with the notified polymer.

The compound is not manufactured in Australia and exposure to the public during

reformulation is expected to be minimal. The notified polymer will be stored in 200 L steel drums, and transported by road. Disposal of waste materials will be by incineration or by landfill.

Temperatures above 170°C promote decomposition of the notified polymer to acrylonitrile which is a hazardous product. Degradation products formed during pyrolysis include carbon monoxide, carbon dioxide, nitrous oxides and hydrogen chloride.

8. ENVIRONMENTAL EXPOSURE

. Release

The company states that the polyamine is imported as a formulation with 10-30% water in 200 litre lined steel drums. There is a potential for spillage during transport to and from the warehouse and the factory.

The release of polyamine into the factory during dilution and packaging may come from accidental spillage during filling of the blender, drum filling, and mill cleanup operations.

Areas in the plant where spill may occur are adequately banded and lead to collection sumps. The factory waste control technology is expected to collect between 0.36 and 0.89 kg of the notified chemical per month that will be disposed of by a licensed waste contractor either to a regulated landfill or an approved industrial waste incinerator.

Empty 200 litre drums are either used to store the final formulated product or dispatched to a drum recycler.

The polyamine is part of a two part mix. Environmental release as spillage during mixing or equipment washings will fall to the soil in the vicinity of the work area. The notified substance is by then in a hardened and immobile form after reaction with the epoxy resin in the other part of the mix. This residue will be collected during the site cleanup and is usually consigned to landfill.

. Fate

One test has been submitted on the Ready Biodegradability of the formulation containing the notified substance. The test carried out under OECD guideline 301F measured the respiration occurring as the test chemical is biodegraded.

After 28 days testing the result was that Beckopox Special Hardener SEH 622 at a concentration of 188 mg/L exhibited no change in Biological Oxygen Demand and was rated as not biodegradable under the conditions of the test.

Environmental exposure is expected to be low because of precautions taken to prevent release during formulation and packaging, and also the provision of a small single use retail pack that limits the volume of exposure during application.

The waste from spillages in the formulating plant and in transport may be consigned to landfill where the amine polymer is expected to be sorbed to the soil and immobilised as is the case with polyethyleneamines (2). Biodegradation is not expected to be a breakdown route. The notified substance in the environment has the ability to bioaccumulate because of the lack of biodegradation exhibited in tests but bioavailability will be limited due to the large molecular size.

Fate of the notified substance is linked to the disposal of the concrete fabrications into which it is incorporated. The concrete rubble from building demolitions is usually directed to landfill where the epoxy resin is expected to remain immobile and not exhibit any

leaching or biodegradation.

9. EVALUATION OF TOXICOLOGICAL DATA

An acute oral toxicity study was submitted for assessment.

As the notifier could not provide sufficient evidence that the number-average molecular weight of the notified polymer was > 1000, a standard notification was submitted. The notifier applied for variation of the requirements for submission of data on toxicology. Due to the presence of relatively high levels of hazardous residual monomers, the polymer can be classified as hazardous. Strict control measures to minimise exposure will be required. Therefore, the notifier's variation to schedule requirements for toxicity data is acceptable.

The polymer on its own is not expected to be hazardous.

9.1.1 Oral Toxicity (7)

This study was carried out according to OECD Guideline No: 401 (8).

A single dose of 2000 mg/kg of Beckopox Special Hardener SEH 622 in water was administered by gavage to 10 Wistar rats (five males and five females). These animals were observed for 14 days. No deaths were noted during the study. Gain in bodyweight was not affected. No abnormal clinical signs were observed in all the animals studied. Necropsy revealed no macroscopically visible changes.

The results of this study indicate an oral LD₅₀ of >2000 mg/kg for Beckopox Special Hardener SEH 622 (>1600 mg/kg for the notified polymer) in male and female rats.

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

Environmental toxicity data has been provided for fish and for a bacteria that may be present in sewerage treatment systems and water.

Fish toxicity

The toxicity of Beckopox Special Hardener SEH 622 to Zebra Fish *Brachydanio rerio* was assessed in static water conditions over a 96 hour period with nominal concentrations of the test substance. There is no method available for determination of the concentration of the notified substance below 20 mg/L.

Beckopox Special Hardener SEH 622 Toxicity to fish

Toxicity levels	48 h mg/L	96 h mg/L
LC ₀	0.22	0.22
LC ₅₀	0.5-1	0.5-1
LC ₁₀₀	1	1

The LC₅₀ (96 hour) was assessed at between 0.5-1 mg/L. This result would classify the notified substance as highly toxic to fish according to the standard used by the United States Environment Protection Agency (9). This toxicity is not unexpected as polyamines are known to be acutely toxic to aquatic organisms in the laboratory at concentrations

between 0.5 and 10 mg/L (10). However, toxicity is attenuated in the environment through sorptive interactions with particulates and dissolved organic carbon.

Bacterial toxicity

Two tests were carried out.

The first examined the potential for inhibition of the bacteria contained in sewerage sludge according to OECD guideline 209. Exposure of the activated sludge to the test material resulted in a reduction of the respiration rate, reported as the Environmental Concentration (EC). The test concentrations ranged from 15.6 to 1000 mg/L and the results after a three hour exposure are shown in the table below.

Beckopox Special Hardener SEH 622 Activated Sludge Test

Evaluation parameter	Concentration mg/L
EC ₂₀	90
EC ₅₀	247
EC ₈₀	677.5

A standard chemical and control solution were used for comparison with the test chemical. The results in the summary provided by the testing organisation are expressed as a range for the EC₅₀ of between >100 and 1000 mg/L. Beckopox Special Hardener SEH 622 would rate as being practically non-toxic to the organisms present in sewerage sludge.

The second test was for exposure on a specific water bacteria *Pseudomonas putida* according to guideline, DIN 38 412 Part 8. This test is to show the activity of the test material on cell reproduction inhibition.

Beckopox Special Hardener SEH 622 Bacterial toxicity: *Pseudomonas putida*

Evaluation parameter	Test 1 Concentration mg/L	Test 2 Concentration mg/L
EC ₁₀	3.1	1.8
EC ₅₀	4.1	3.2
EC ₁₀₀	5.7	6.8

Concentrations of the test chemical used were between 1 and 16 mg/L nominal. The test carried out over a period of 16±1 hours at constant temperature and under continuous aeration, control and standard reference solutions were also used for comparison.

In the results a steep increase in the dose effect curve was noted at a concentration of 3.9 mg/L. Flocculation of the test chemical was noted when the stock solution was prepared and this may have caused variation of concentrations on further dilution. The EC₅₀ results for the test were given by the tester to lie in the range of >1 to 10 mg/L. Beckopox Special Hardener SEH 622 would rate as being of moderate toxicity to water bacteria.

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

The polyamine is unlikely to present a hazard to the environment when it is incorporated into the concrete mix and applied in the proper manner. In this case the notified substance is crosslinked to the epoxy resin in the two part mix and also encapsulated in the concrete.

Exposure to the environment could occur from spillages during the loading of the mixer or when concreting equipment is washed down. In this case the spill is to soil where the resin is quickly bound to the soil in the immediate or vicinity of the mixing operation.

The main environmental hazard is to water organisms and may arise from spillage of the unmixed polyamine during storage or transport as a result of accident. Again the polyamine is expected to bond quickly to the soil or sediment present at the site of the spill. Addition of the recommended adsorbent material or soil would immobilise the spill and allow collection and disposal.

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

No work-related injuries or diseases have been reported from the use of the notified chemical. No reports have been made of the notified chemical causing health conditions or affecting existing health conditions. No incidents are known of human exposure to the notified chemical which have resulted in adverse health conditions.

The notified polymer will decompose at approximately 170°C forming acrylonitrile (Flash point 0°C) which has hazardous properties (3). The notified polymer has 67% low molecular weight polymers (<1000) and 6% hazardous residual monomers. The low molecular weight constituents may cross biological membranes and cause systemic effects. The presence (3%) of the skin sensitiser, isophorondiamine, requires that the product Beckopox Special Hardener SEH 622 be classified as hazardous (1). Furthermore, based on the properties of the impurities m-xylylenediamine and isophorondiamine, and the monomer components epoxy resin (CAS No. 25068-38-6) and acrylonitrile (CAS No. 107-13-1) (2), the polymer in Beckopox Special Hardener SEH 622 may exhibit eye, skin and respiratory irritant properties. Sensitisation, as well as genotoxic and teratogenic effects may also be possible.

The major route of worker exposure to the notified chemical will be through skin contact. Inhalation of the monomers is possible at elevated temperatures (>90°C) if ventilation is insufficient. The chemical, however, will normally be used at room temperature. Therefore, exposure via the inhalational route should not be a concern.

With appropriate personal protective equipment to prevent skin and eye contact, worker exposure to the notified chemical should be minimal.

The potential for public exposure to the notified polymer will be minimal. Additionally, as the polymer in Beckopox Special Hardener SEH 622 is not expected to be exposed to elevated temperatures, public exposure to hazardous decomposition or pyrolysis products is not anticipated.

Therefore, under normal use conditions when control and precautionary measures are implemented, the notified chemical is unlikely to present a significant health or safety risk to workers or the public.

13. RECOMMENDATIONS

To minimise occupational exposure to the polymer in Beckopox Special Hardener SEH 622 the following guidelines and precautions should be observed.

- . The work place should be well ventilated and in a factory environment, local exhaust ventilation should be used.
- . Where possible engineering controls such as enclosed systems should be used.
- . Atmospheric concentrations of m-xylylenediamine should be kept below the recommended exposure standard:

TWA 0.1 mg/m³ (5).
- . If work practices and engineering methods are insufficient to reduce exposure to the notified chemical to a safe level the following personal protection equipment which comply with Australian Standards should be worn:
 - . respirator (AS 1715, AS 1716) (11,12);
 - . splash-proof goggles, face-shield or safety glasses as appropriate (AS 1336, AS 1337) (13,14);
 - . impervious elbow length gloves (AS 2161) (15);
 - . impervious protective clothing (AS 3765.1, AS 3765.2) (16,17); and
 - . safety shoes.
- . Elevated temperatures should be avoided to minimise inhalation exposure to hazardous residual monomers.
- . Good work practices should be implemented to avoid splashings or spillages.
- . Good housekeeping and maintenance should be practised. Spills should be cleaned up promptly using inert absorbents for disposal according to State regulations. Personal protective equipment should be worn during cleaning.
- . Personal hygiene should be observed.
- . The notified chemical should be stored in sealed robust containers in well ventilated appropriately designed facilities away from heat.
- . A copy of the Material Safety Data Sheet (MSDS) should be easily accessible to employees.

14. MATERIAL SAFETY DATA SHEET

The MSDS for Beckopox Special Hardener SEH 622 was provided in Worksafe Australia format (18). The MSDS was provided by Hoechst Australia Ltd as part of their notification statement. It is reproduced here as a matter of public record. The accuracy of this information remains the responsibility of Hoechst Australia Ltd.

15. REQUIREMENTS FOR SECONDARY NOTIFICATION

Under the Industrial Chemicals (Notification and Assessment) Act 1989 (the Act), secondary notification of the polymer in Beckopox Special Hardener SEH 622 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

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