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NATIONAL INDUSTRIAL CHEMICALS
NOTIFICATION AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

E-1242E POLYMER

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For Enquiries please contact Ms Mai Le at:

Street Address: 92 Parramatta Rd Camperdown, NSW 2050, AUSTRALIA

Postal Address: GPO Box 58, Sydney 2001, AUSTRALIA

Telephone: (61) (02) 565-9466 **FAX (61) (02) 565-9465**

Director
Chemicals Notification and Assessment

FULL PUBLIC REPORT**E-1242E POLYMER****1. APPLICANT**

Rohm and Haas Australia Pty Ltd of Hays Road, Point Henry, Geelong, Victoria 3221.

2. IDENTITY OF THE CHEMICAL

Polymer name: E-1242E

Trade name: Emulsion E-1242E

**Maximum percentage of low molecular weight species
(molecular weight < 1000):** 3.5%

Maximum content of residual monomers: <0.1%

Based on the nature of the chemical and the data provided, E-1242E polymer is considered to be non-hazardous. Therefore, the following details have been exempted from publication: chemical name, Chemical Abstract Services Registry Number, molecular and structural formulae, molecular weight, import/manufacture volume, information on the manufacture and use processes, weight percentage of the monomers and number-average molecular weight.

3. PHYSICAL AND CHEMICAL PROPERTIES

E-1242E polymer will be imported and manufactured as an aqueous based emulsion, containing 51% solids. Therefore, most of the physical and chemical properties listed below are based on the emulsion.

Appearance at 20°C and 101.3 kPa: Milky white liquid

Odour: Acrylic

Glass-transition temperature: 32°C

Average density of polymer particle: 1150 kg/m³

Density of emulsion: 1076 kg/m³ (emulsion)

pH: 3.9 - 5.0

Vapour pressure: Not applicable to an aqueous emulsion of a high molecular weight polymer.

Water solubility: Emulsion E-1242E is a colloidal dispersion of polymer particles which is completely miscible with water. The dried supernatant (after centrifugation) had moderate water solubility (determined as 1.3% by weighing of residue after evaporation). The notifier has not found a procedure to determine what fraction of these extractables is polymer. However, it is likely that unreacted oligomers are responsible for the apparent solubility.

Hydrolytic stability: No increased carboxylic acid functionality and little carboxylic acid salt were detected after 7 days at pH 2.3 and pH 8.9 (at 24°C), respectively, using IR spectroscopy (sensitivity not stated). Due to its water insolubility and colloidal nature, the polymer is unlikely to readily undergo hydrolysis.

Partition Co-efficient: Not applicable to emulsion, nor
(n-octanol/water) to residual dried polymer.

Soil adsorption-desorption: Not measured, but the polymer would be expected to be immobile in soils, particularly after drying.

Dissociation constant: "Not measured as the substance is not appreciably water soluble." The polymer contains no acidic or basic groups.

Flammability limits: Non-flammable. The polymer will degrade to its monomers, and oxides of carbon and hydrogen when heated in air.

Autoignition temperature: >400°C

Explosive properties: Non-explosive

Thermal stability: Stable at room temperature. Temperatures above 177°C may cause decomposition.

Spectral data: Infrared spectrum for E-1242E polymer was provided by the notifier.

4. METHOD OF DETECTION AND DETERMINATION

The polymer can be separated by chromatography and identified by infrared spectroscopy.

5. INDUSTRIAL USES

Emulsion E-1242E will be used as an adhesive in the light manufacturing industry for the assembly of paper products. The adhesive is applied by a metering roller to bond phenolic resin impregnated fluted paper and then heat cured. The paper products will be used in certain residential and commercial electrical appliances.

Initially the emulsion will be imported and later manufactured within Australia if demand is sufficient. The emulsion has been manufactured and used in commercial processes in the United States for over 13 years.

6. MANUFACTURE

Although the substance will be imported initially, it is expected to be manufactured within the first year at the Geelong Plant of the notifier. The manufacture of the polymer emulsion involves placing the monomers into a closed emulsification tank with the emulsifier. The monomer mix is fed via a closed system to the polymerisation kettle, to which is added the catalyst to initiate polymerisation reactions. Additional catalyst and a number of adjuvants, including preservatives, are added and the final product is filtered and transferred to bulk storage or 200 kg drums. After manufacture there will be no reformulation of the product before use.

7. OCCUPATIONAL EXPOSURE

Emulsion E-1242E will be distributed in 200 L sealed drums, hence, occupational exposure during transit is likely to be minimal under normal circumstances.

Manufacturing

Process workers involved in the manufacturing of Emulsion E-1242E will include process operators, weigh-up operators, packers, laboratory technicians, maintenance and waste disposal workers.

The process operators are isolated from the process by control panel operation in a positive pressure control room with airlock. Local ventilation is provided at plant vessel openings whenever direct charging of raw materials is required and also at drum openings during charging. A scrubber unit receives fumes extracted from closed reaction vessels. The notifier states that workers in the processing plant who may come into contact with the emulsion will be required to wear protective clothing, goggles and gloves.

The filter cake, in used filter bags, is manually transferred from the filter system to drums. These drums are transferred to an approved site under EPA licence. Workers discharge the water/polymer effluent and maintain the coagulation pit in the open. The notifier states that protective overalls, goggles and impervious gloves will be worn by these workers.

Use

Similar types of process workers, to those in the manufacturing plant, will operate the user plant. In this plant, application of the emulsion as an adhesive will not be fully isolated. The adhesive will be pumped from the drums into a mixing vessel, blended with other materials and applied to paper by a glue coating machine. The paper will then be dried in an oven. The oven and the work place will be fitted with extraction systems. The notifier states that workers will wear protective clothing, eye protection, gloves and face masks wherever appropriate.

Worker exposure to the emulsion is expected to be low under the above manufacturing and use conditions. Protective clothing should be worn by workers who may have direct contact with Emulsion E-1242E.

8. PUBLIC EXPOSURE

Under normal conditions, the potential for public exposure to Emulsion E-1242E, and thus to the polymer, will be low. The emulsion will be transported in 200 L sealed drums. It will be used as aqueous based adhesive in the light manufacturing industry for the assembly of paper products. Volatile components are not expected to be present in the dried adhesive.

Approximately 1.5 tonnes of polymer per annum will be produced as waste from the glue coating operation. If manufacturing takes place in Australia a further 1 tonne per annum of waste polymer is expected to be produced. The waste is released to a coagulation pit, treated and the resultant solid cake is disposed of to a regulated landfill site.

9. ENVIRONMENTAL EXPOSURE

Waste polymer emulsion is generated from the filtration and filling operation during its manufacture and from the water/polymer effluent coagulation pit. The notifier estimates that the filter cake contains approximately 80% substance, with $175 \text{ kg}\cdot\text{year}^{-1}$ ($25 \text{ kg}\cdot\text{day}^{-1}$ on 7 days of the year) being disposed of to landfill. The control technology coagulation pit involves the use of ferrous sulphate and sodium hydroxide to form a ferrous hydroxide gel which settles the polymer as a coagulum leaving cleared waste water which is sent to an evaporation pond. The coagulum is pumped to a series of lagoons at the plant site where it dries to solid cake resulting in $875 \text{ kg}\cdot\text{year}^{-1}$ ($125 \text{ kg}\cdot\text{day}^{-1}$ on 7 days of the year) coagulum solid cake which is disposed of to landfill. Landfill will be the only disposal route for waste substance.

Accidental spills of the polymer emulsion are contained by the stepwise addition of ferric chloride and lime to form a coagulate which can be dried and disposed of to landfill. It is not envisaged that any emulsion polymer will be released directly to the aquatic environment.

The product will be transported in 200 L drums to customers throughout Australia. The notifier estimates that approximately 3 tonnes per annum of waste product (1.5 tonnes of Emulsion E-1242E)

will be generated from the production process and disposed of to landfill. Although there is no indication of the number of customers, it is likely that, given its wide distribution (assume 6 states), no more than 250 kg.year⁻¹ Emulsion E-1242E will be disposed of to a single landfill site.

The substance is unlikely to undergo hydrolysis in the landfill situation, given the lack of hydrolytic activity in acidic (pH 2.3) and alkaline (pH 8.9) conditions, and should remain largely immobile.

The adhesive containing the polymer is applied to phenolic resin impregnated paper and then heat cured to dryness. As the product is catalysed when mixed, it will, upon drying form an insoluble solid polymer which, given its intended use, is unlikely to regenerate to emulsion in the presence of water. Very slow deterioration of this film may occur as a result of polymer chain scission through UV absorption. This, however, is unlikely to occur as the appliances will be used for internal applications in buildings. Under extreme heat conditions (fire) the adhesive film containing the polymer would combust emitting oxides of carbon and nitrogen.

10. EVALUATION OF TOXICOLOGICAL DATA

Toxicological data on the polymer E-1242E were not provided in the notification. However, skin irritation and genotoxicity data were provided for a structurally similar polymer, Emulsion E-1070 (or Emulsion E-1126).

10.1 Skin Irritation

A repeat insult patch test in humans was carried out with four types of non-woven rayon webbing impregnated with Emulsion E-1070. The rayon webs were sealed under tape on the upper arm of 10 human volunteers for 24 hours and removed for 24 to 48 hours. The applications were repeated 14 more times. Two weeks after the last application the humans were challenged with impregnated rayon webbing for 24 hours. The skin was observed before and after each application. No visible changes were noted during repeated application nor upon challenge. Under the conditions of this study, Emulsion E-1070 is not a human skin irritant or sensitiser (2).

10.2 Genotoxicity

Emulsion E-1126, was tested at concentrations of 0.001 to 5 µl/plate with *Salmonella typhimurium* strains TA 1535, TA 1537, TA 98 and TA 100. A saline buffer solution was used as a negative control. The tests were carried out in the presence and absence of microsomes (liver extract from Aroclor 1254 pre-induced rats). One statistically significant increase in revertants/plate was observed with TA 98 at 5 µl/plate, in the presence of metabolic activation. However, this result was not observed when the test using TA 98 was repeated. No other statistically significant changes in revertants/plate were observed. Positive controls were also tested, however no results were given. The results indicate that

Emulsion E-1126 was not mutagenic under the conditions of this study (3).

10.3 Overall Assessment of Toxicological Data

Toxicological data on E-1242E polymer were not included in the notification. The polymer has a high molecular weight (> 1,000) and is therefore unlikely to cross biological membranes (4).

An analogous emulsion, Emulsion E-1126 (or E-1070) was not a mutagenic in an Ames test and was found to be non irritating and non sensitising to human skin when applied in a rayon web as a repeated insult patch test.

11. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY

The polymer, E-1242E has a high molecular weight (>1,000) and is therefore unlikely to cross biological membranes such as skin and gastrointestinal tract. In toxicity tests, a similar polymer was not a human skin irritant nor sensitiser and was non-mutagenic in an Ames test.

The percentage of residual monomers in E-1242E Emulsion is <0.1% and thus should not pose a significant risk to workers. After curing, residual volatile monomers are not expected to be present.

Public and occupational exposure to Emulsion E-1242E, and hence to E-1242E polymer, is expected to be low due to its manner of use and disposal. Therefore, due to low exposure and apparent low toxicity, it is unlikely that E-1242E polymer will pose a significant health and safety hazard to workers and the public.

12. ASSESSMENT OF ENVIRONMENTAL EFFECTS

The notifier has provided ecotoxicological data for Emulsion E-1126, an analogous material to the notified substance.

The following test results were provided for aquatic species:

<u>Test</u>	<u>Species</u>	<u>Result</u>
Acute toxicity	Fathead minnow	96 h LC ₅₀ = 4.7 mg.L ⁻¹
Acute toxicity	Fathead minnow	96 h NOEC < 1.1 mg.L ⁻¹
Acute toxicity	Daphnia magna	48 h LC ₅₀ = 6.5 mg.L ⁻¹
Acute toxicity	Daphnia magna	48 h NOEC = 1.7 mg.L ⁻¹

The tests were conducted according to OECD Guidelines 202 and 203 using nominal test concentrations in suspension.

The above results indicate that Emulsion E-1126 is moderately toxic to aquatic fauna. This is typical for polymers containing functional groups of a chemical class noted for its acute toxicity to aquatic organisms at concentrations between 0.5 and 10 mg.L⁻¹

and in some cases below 0.3 mg.L⁻¹. The toxicity of compounds containing this type of functionality arises because they bind readily to gills when tested for fish toxicity in deionised water. This can give rise to toxic effects due to reduction of oxygen transfer across damaged membranes or through effects on the ionic balance. However, the literature records that toxicity is greatly reduced in the environment because of preferential binding to dissolved organics in surface water.

However, given the stated use of the chemical as a heat-cured adhesive for paper products for industrial and domestic electrical appliances, environmental exposure of the substance to the aquatic compartment should only occur in the event of an accidental spill.

13. ASSESSMENT OF ENVIRONMENTAL HAZARDS

There appears to be no off-site discharge of substance to the aquatic compartment and as such the environmental hazard is expected to be extremely low, despite moderate toxicity to aquatic organisms.

The notified substance is a high molecular weight polymer with minimal chemical reactivity and as such is unlikely to degrade or be mobile in landfill situations.

The predicted environmental hazard is minimal.

14. RECOMMENDATIONS FOR THE CONTROL OF PUBLIC AND WORKER EXPOSURE

To minimise public and worker exposure to E-1242E polymer, the following guidelines and precautions should be observed:

- . observe good personal hygiene practices;
- . the workplace should be well ventilated and enclosed systems should be fitted with local exhaust ventilation when Emulsion E-1242E is used;
- . good housekeeping and maintenance are essential. Disposal should be in accordance with local regulations; and
- . a copy of the Material Safety Data Sheet should be readily accessible to employees.

15. MATERIAL SAFETY DATA SHEET

The Material Safety Data Sheet (MSDS) for Emulsion E-1242E is provided at Attachment 1. This MSDS was provided by Rohm and Haas Australia Pty Ltd as part of their notification statement. It is reproduced here as a matter of record. The accuracy of this information remains the responsibility of Rhom and Haas Australia Pty Ltd.

16. REQUIREMENTS FOR SECONDARY NOTIFICATION

Under the *Industrial Chemicals (Notification and Assessment) Act 1989* (the Act), secondary notification of E-1242E polymer shall be

required if any of the circumstances stipulated under subsection 64(2) of the Act arise. No other specific conditions are prescribed.

17. REFERENCES

1. National Occupational Health and Safety Commission, *Exposure Standards for Atmospheric Contaminants in the Occupational Environment*, Australian Government Publishing Service, Canberra, 1991.
2. *Repeated Insult Patch Tests in Humans with Rayon Webs containing Experimental Emulsion E-1070*. Food and Drug Research Laboratories, Inc. Report No. 74RC-1010. Data on file, Rohm and Haas Company, 1974.
3. *Experimental Emulsion E-1126, Microbial Mutagen Test*. Report No. 78R-1079. Data on file, Rhom and Haas Company, 1978.
4. United States Federal Register, 40 CFR Part 723, *Premanufacture Notification Exemptions; Exemptions for Polymers*, 1984.