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**NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME
(NICNAS)**

FULL PUBLIC REPORT

Eastman AQ2350 Copolyester

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**Director
Chemicals Notification and Assessment**

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FULL PUBLIC REPORT

Eastman AQ2350 Copolyester

1. APPLICANT AND NOTIFICATION DETAILS

APPLICANT(S)

Eastman Chemical Ltd. (ABN: 40 003 039 405)
Level 8, 15 Talavera Road
NORTH RYDE NSW 2113

NOTIFICATION CATEGORY

Limited: Polymer with NAMW ≥ 1000 (greater than 1 tonne per year).

EXEMPT INFORMATION (SECTION 75 OF THE ACT)

Data items and details claimed exempt from publication:

Chemical name, CAS number, molecular and structural formula, molecular weight, spectral data, purity and impurities, analytical methods of detection and determination, import volumes and use.

VARIATION OF DATA REQUIREMENTS (SECTION 24 OF THE ACT)

Variation to the schedule of data requirements is claimed as follows:

- absorption/desorption coefficient
- dissociation constant
- flash point
- explosive properties
- oxidising properties

PREVIOUS NOTIFICATION IN AUSTRALIA BY APPLICANT(S)

None

NOTIFICATION IN OTHER COUNTRIES

USA (PMN P00-1151, November 2000)

2. IDENTITY OF CHEMICAL

MARKETING NAME(S)

Eastman AQ 2350 Copolyester

Number-average molecular weight: >1000

SPECTRAL DATA

ANALYTICAL METHOD

The notified polymer can be identified by IR, UV/Vis or NMR. The notifier has provided copies of the spectra.

3. COMPOSITION

DEGREE OF PURITY

High

HAZARDOUS IMPURITIES/RESIDUAL MONOMERS

None

NON HAZARDOUS IMPURITIES/RESIDUAL MONOMERS ($>1\%$ by weight)

None

ADDITIVES/ADJUVANTS

None

POLYMER CONSTITUENTS

The polymer is comprised of monomers that are listed on AICS.

DEGRADATION PRODUCTS

The notified polymer is expected to be stable under normal conditions.

LOSS OF MONOMERS, OTHER REACTANTS, ADDITIVES, IMPURITIES

No information provided.

4. INTRODUCTION AND USE INFORMATION

MODE OF INTRODUCTION OF NOTIFIED CHEMICAL (100%) OVER NEXT 5 YEARS

Imported as neat polymers

MAXIMUM INTRODUCTION VOLUME OF NOTIFIED CHEMICAL (100%) OVER NEXT 5 YEARS

<i>Year</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>Tonnes</i>	<300	<300	<300	<300	<300

USE

Hot-melt adhesive for application in non-woven goods, packaging, book binding and labelling. The polymer is applied as a melt, typically as a molten bead or spray depending on the adhesive need for the manufactured article.

5. PROCESS AND RELEASE INFORMATION

5.1. Distribution, Transport and Storage

PORT OF ENTRY

Nor known

TRANSPORTATION AND PACKAGING

The notified polymer will be imported in 20 kg or 136 kg polyethylene lined drums, and transported from the wharf to the notifier's warehouse. It will be distributed by road to customer sites.

5.2. Operation Description

Manufacture

The notified polymer will not be manufactured in Australia.

Reformulation

Formulation of the adhesive may occur at up to ten customer sites. The polymer will be weighed and charged into a hopper of a tumble blender where it is melted and mixed with other ingredients at 75% to form the adhesive. After formulation the adhesive product is dried.

Use

The adhesive product is applied as a molten bead or spray depending on the article being manufactured.

5.3. Occupational exposure

Number and Category of Workers

The transport and storage of the notified polymer will involve a maximum of four workers. At each customer site, between 20 and 80 workers will be exposed to the polymer.

Exposure Details

Dermal and inhalation exposure to dusts and fumes of the polymer may occur when the workers are weighing and introducing the polymer to the blender and during the melt extrusion for substrate bonding. Workers may be exposed to fumes from the molten polymer product during bonding. These operations are carried out under local exhaust ventilation.

5.4. Release

RELEASE OF CHEMICAL AT SITE

No release is expected as the notified polymer will not be manufactured in Australia.

RELEASE OF CHEMICAL FROM USE

Since the polymer is shipped as solid pellets, there should be little contamination of the containers which will be recycled. The vast majority of the notified polymer will be used as a raw material in manufacturing adhesives. Therefore, all of the notified polymer will be used in an industrial setting.

The polymer is melted and mixed with other additives to form the hot-melt adhesive. Losses of the polymer are not expected to be significant as the polymer can be melted and reused. The notifier indicates that an overall material loss rate of below 1% will be collected and disposed of by incineration or to landfill.

The molten adhesive would be applied by hot melt applicator that could be readily cleaned with warm water. It is not clear what is the concentration of the notified chemical in the washwater. It is expected that <0.5% of the imported polymer volume will be required to be disposed of in the application process for the manufactured articles. The notifier expects the customer to properly dispose of washwater according to applicable environmental and industrial regulations, and therefore does not expect waste water to have an adverse effect on sewage treatment facilities.

In its ultimate end use in customers' formulation, the notifier estimates about 75% would be targeted for consumer products (such as non-woven goods) and the other 25% for case and carton sealing, book binding, etc. The notifier is not certain of the percentage of the product the customer will recycle. Should treated articles be recycled, the polymer adhesive will become dispersed in the water column. The polymer adhesive will then either be removed by drying and recovering for reuse or disposed of to sewer with the wastewater. The notifier indicates that it is possible to recover nearly 100% of the polymer from wastewater for reprocessing, though does not indicate what percentage is likely to occur in Australia.

Solid wastes are disposed of by landfill or incineration. Environmental exposure of articles containing the polymer product through leaching in landfill is not expected. Once the adhesive is dried, the polymer should become inert by the hardening process. Incineration of the solid will yield products of water, oxides of carbon and sulphur, with a small amount of sodium salts in the ash.

5.5. Disposal

Waste will be collected and disposed of by landfill or incineration.

5.6. Public exposure

The extent of public exposure to articles containing the notified polymer is indeterminate, but may be high depending on the nature of the applications for which the notified polymer is used, for example, application to non-woven goods.

6. PHYSICAL AND CHEMICAL PROPERTIES

Appearance at 20°C and 101.3 kPa Solid, yellow pellets.

Melting Point 81°C

METHOD OECD TG 102 Melting Point/Melting Range.

Remarks The determination was performed by differential scanning calorimetry
TEST FACILITY SafePharm Laboratories (2001a)

Density 1335 kg/m³ at 19.5°C

METHOD OECD TG 109 Density of Liquids and Solids.
Remarks The density was determined by a gas comparison pycnometer
TEST FACILITY SafePharm Laboratories (2001a)

Vapour Pressure 8.6×10^{-11} Pa at 25°C.

METHOD EC Directive 92/69/EEC A.4 Vapour Pressure.
Remarks The vapour pressure was determined using a vapour pressure balance. It was measured over a temperature range to enable extrapolation to 25°C. Linear regression analysis was used to calculate the vapour pressure at 25°C.

The result indicates that the notified polymer is very slightly volatile (Mensink *et al* 1995)
TEST FACILITY SafePharm Laboratories (2001b)

Water Solubility Miscible in all proportions with water at 20°C

METHOD OECD TG 105 Water Solubility.
Remarks EC Directive 92/69/EEC A.6 Water Solubility (Shake-flask method).
Mixtures of test substance and water were added to six flasks. The flasks were shaken at approximately 30°C and left standing at 20°C for a period of not less than 24 h. The contents of the flasks were visually observed and the pH of the solution measured where technically possible. No analysis could be performed due to the high solubility producing unfilterable mixtures and thus the water solubility was based on visual inspection. It was evident that no solid material remained in any of the samples and that the test material produced increasingly viscous solutions through the gel-like samples.

The result indicates that the test substance is soluble in water at concentrations ranging from 5.05-94.9 % w/w at 20°C
TEST FACILITY SafePharm Laboratories (2001a)

Hydrolysis as a Function of pH Estimated half-life: > 1 year

METHOD OECD TG 111 Hydrolysis as a Function of pH.
EC Directive 92/69/EEC C.7 Degradation: Abiotic Degradation: Hydrolysis as a Function of pH.

pH	T (°C)	$t_{1/2}$ < days >
4	25	>365
7	25	>365
9	25	>365

Remarks Sample solutions were prepared at a nominal concentration of 500 mg/L at buffers of pH 4, 7 and 9. The sample solutions were maintained at 50°C for a period of 5 days. Aliquots of the sample solutions were taken from the flasks at 0, 2.4 and 120 h and the concentrations of the sample solutions were determined by GPC. However, no significant profile change was observed during the course of the test indicating the notified polymer had not undergone any significant change. Validation for the recovery of analysis was performed and found to be within acceptable limits. The estimated half-lives of the test substance at pHs of 4, 7 and 9 were found to be >1 year at 25°C.

TEST FACILITY SafePharm Laboratories (2001a)

Partition Coefficient (n-octanol/water) log Pow at 21°C = -2.22

METHOD	OECD TG 117 Partition Coefficient (n-octanol/water), HPLC Method. EC Directive 92/69/EEC A.8 Partition Coefficient.
Remarks	Based on the approximate solubilities of the test substance in n-octanol and water in the preliminary test, six partition measurements were performed at 21°C. The flasks were shaken over a five minutes period. After separation, aliquots of both phases were taken for analysis. The concentration of the test substance in the aqueous phase was determined by GPC and in the organic phase, by spectrophotometry. The test was performed at approximately neutral pH. It was evident from the aqueous phase analysis that some low molecular weight impurities were present.. Spectrophotometric analysis of the organic phases was employed due to the chromatographic deterioration with n-octanol.
TEST FACILITY	The log Pow was determined to be ≤ -2.22 indicating the test substance has a poor affinity for n-octanol. SafePharm Laboratories (2001a)

Adsorption/Desorption Test not performed

Remarks	The OECD test method is not applicable to the test substance as it contains organic acid groups. Furthermore, the test material is a polymer which has no suitable reference standards structurally related to it for HPLC estimation. The notified polymer is considered to be highly soluble in water and thus is likely to be mobile in soil. However, as a consequence of its anionic nature, the notified polymer may be immobilised through adsorption onto soil particles and sediments.
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Dissociation Constant Test not performed

Remarks	The notifier indicates that the test was not performed because the polymer is a complex polymeric material. Based on the structural formula of the test substance, there are three functional groups that can dissociate. These are carboxylic acid, sodium sulphonic acid and aliphatic alcohol groups which have approximate dissociation constants of 4, 1 and 14, respectively.
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Particle Size Solid pellets

Flammability Limits Not highly flammable

METHOD	92/69/EEC A.10 Flammability (solids)
Remarks	The notified polymer is combustible and will burn in a fire, evolving noxious fumes (oxides of carbon, sulphur and sodium-containing compounds).
TEST FACILITY	SafePharm (2001c)

Autoignition Temperature > 400°C

METHOD	92/69/EEC A.16 Relative Self-Ignition Temperature for Solids.
Remarks	
TEST FACILITY	SafePharm (2001c)

Explosive Properties Not determined

Reactivity

Remarks	The notified polymer: <ul style="list-style-type: none"> • is not expected to have oxidising properties based on its structure and experience in use. • will react with strong oxidising agents. • is stable under normal conditions
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- will not undergo hazardous polymerisation

7. TOXICOLOGICAL INVESTIGATIONS

<i>Endpoint and Result</i>	<i>Assessment Conclusion</i>
Rat, acute oral Genotoxicity - bacterial reverse mutation	LD50 >2500 mg/kg bw – low toxicity Non-mutagenic

7.1. Acute toxicity – oral

TEST SUBSTANCE	AQ2350
METHOD	OECD TG 423 Acute Oral Toxicity – Acute Toxic Class Method. EC Directive 92/69/EEC B.1 tris Acute Oral Toxicity – Acute Toxic Class Method.
Species/Strain	Rat/Sprague-Dawley CD
Vehicle	Distilled water
Remarks - Method	Three male and three female rats were dosed 2000mg/kg bw once only by gavage following fasting. The animals were observed for deaths or sign of overt toxicity ½, 1, 2 and 4 hours after dosing and subsequently once daily for 14 days
RESULTS	
LD50	> 2500 mg/kg bw
Signs of Toxicity	There were no deaths and no signs of systemic toxicity. All animals showed expected bodyweight gains over the study period.
Effects in Organs	No abnormalities were noted at necropsy.
Remarks - Results	
CONCLUSION	The notified polymer is of low toxicity via the oral route.
TEST FACILITY	SafePharm Laboratories (2002)

7.8. Genotoxicity - bacteria

TEST SUBSTANCE	Eastman AQ 2350 Copolyester
METHOD	OECD TG 471 Bacterial Reverse Mutation Test. EC Directive 2000/32/EC B.13/14 Mutagenicity – Reverse Mutation Test using Bacteria.
Species/Strain	Plate incorporation procedure <i>S. typhimurium</i> : TA1535, TA1537, TA98, TA100. <i>E. coli</i> : WP2 uvrA.
Metabolic Activation System	S9
Concentration Range in Main Test	a) With metabolic activation: 50-5000 µg/plate. b) Without metabolic activation: 50-5000 µg/plate.
Vehicle	Dimethyl sulphoxide
Remarks - Method	
RESULTS	No significant increases in the frequency of revertant colonies were recorded for any of the strains of bacteria, at any dose level either with or without metabolic activation.
Remarks - Results	The notified polymer was non-toxic to the strains of bacteria used in the preliminary test (TA100 and WP2uvrA). An oily precipitate was observed at 5000 µg/plate but this did not prevent the scoring of revertant colonies.

CONCLUSION

The notified polymer was not mutagenic to bacteria under the conditions of the test.

TEST FACILITY

SafePharm Laboratories (2000)

8. ENVIRONMENT

No toxicological data were provided.

9. RISK ASSESSMENT

9.1. Environment

9.1.1. Environment – exposure assessment

Release

Based on the environmental release, it is expected that the exposure of the notified polymer to the environment will be low. Assuming 25% of the entire import volume ($200 \times 0.25 = 50$ tonnes) is released to sewer during recycling and not removed during sewage treatment processes, the daily release on a nationwide basis to receiving waters is estimated to be 125 kg/day. Assuming a national population of 19,500,000 and that each person contributes an average 200 L/day to overall sewage flows, the predicted environmental concentration (PEC) in sewage effluent on a nationwide basis is estimated as 35 µg/L.

Amount entering sewer annually	200 tonnes
Population of Australia	19.5 million
Amount of water used per person per day	200 L
Number of days in a year	365
Estimated PEC	35 µg/L (35 ppb)

Based on the respective dilution factors of 0 and 10 for inland and ocean discharges of effluents, the PECs of the notified polymer in freshwater and marine water may approximate 35 or 3.5 µg/L, respectively.

Fate

The notified polymer is a high molecular weight polymer and is considered to be very slightly volatile (8.6×10^{-11} Pa at 25°C). Therefore, its loss to the atmosphere is unlikely to be significant from the aquatic environment. In view of the negative log P_{ow} and high molecular weight, the bioaccumulation potential is considered to be low (Connell 1990). Leaching in landfill is unlikely to occur as once the adhesive is dried, the polymer should become inert by the hardening process. Abiotic or slow biotic processes are expected to be largely responsible for the degradation of the notified chemical disposed of to landfill.

9.1.2. Environment – effects assessment

No ecotoxicological data were submitted.

9.1.3. Environment – risk characterisation

As the majority of the notified polymer will be incorporated into the manufactured articles and should become inert by the hardening process, treated articles when landfilled or incinerated are unlikely to be a hazard to the environment.

As not all treated articles will be recycled, the estimated PEC value is expected to be significantly lower. The notifier estimates that 25% of the use would be targeted for case and carton sealing, book binding, etc. In the recycling of the treated articles, the polymer adhesive will then either be removed by drying and recovering for reuse or disposed of to sewer with the wastewater.

Poly(aromatic sulfonate/carboxylate) with molecular weight > 1000 are of moderate concern for toxicity to aquatic organisms depending on the monomers they contain. Monomers of low concern are sulphonated benzene (Boethling and Nabholz 1997). The notified polymer as such is unlikely to give rise to significant toxicity. Therefore, with the estimated low PECs, the environmental risk to the aquatic environment is unlikely to arise under the reported use pattern.

9.2. Human health

9.2.1. Occupational health and safety – exposure assessment

As customers have not yet been identified, details of the hot melt process of applying the finished adhesives were not provided. End-use manufacturers typically have automated systems. Local exhaust ventilation would normally be provided to remove fumes, and closed systems would be used where necessary. Intermittent dermal and inhalation exposure to dusts and fumes of the polymer may occur when workers are weighing and introducing the polymer to the blender and during melt extrusion for substrate bonding. Exposure to fumes may also occur during bonding of the molten polymer to the substrate. Workers wear personal protective equipment including face shields and heat resistant gloves to protect against thermal burns.

9.2.2. Public health – exposure assessment

Although members of the public may be exposed to a large number of articles containing the notified polymer, exposure to the polymer itself is likely to be low, as the polymer is bound in a solid matrix and positioned between layers of material that have been glued together. Public exposure is unlikely during formulation and application of the hot-melt adhesives, nor during transport of the notified polymer.

9.2.3. Human health - effects assessment

The acute oral LD₅₀ for the notified polymer is > 2500 mg/kg bw, and it was not mutagenic in a Bacterial Reverse Mutation Test. No other toxicity data were submitted. The polymer is a high molecular weight polyester, composed of non-hazardous monomers so absorption is unlikely. It is not expected to be irritating to skin or eyes, or to be a skin or respiratory sensitiser.

9.2.4. Occupational health and safety – risk characterisation

Opportunity for exposure to the notified polymer exists during the reformulation of the polymer into the final adhesive product and during the application of the product. However, given the high molecular weight of the polymer, its low acute toxicity, and the engineering controls employed, the risk to occupational health and safety attributable to the notified polymer is considered low. Personal protective equipment is expected to obviate the risk of thermal injury.

9.2.5. Public health – risk characterisation

The notified polymer is of low hazard and presented in articles in a form which is not likely to lead to significant public exposure. The risk to public health is considered negligible.

10. CONCLUSIONS – ASSESSMENT LEVEL OF CONCERN FOR THE ENVIRONMENT AND HUMANS

10.1. Hazard classification

Based on the available data the notified polymer is not classified as hazardous under the NOHSC *Approved Criteria for Classifying Hazardous Substances*.

10.2. Environmental risk assessment

The chemical is not considered to pose a risk to the environment based on its reported use pattern.

10.3. Human health risk assessment

10.3.1. Occupational health and safety

There is low concern to occupational health and safety under the conditions of the occupational settings described.

10.3.2. Public health

There is negligible concern to public health when used in the intended manner.

11. MATERIAL SAFETY DATA SHEET

11.1. Material Safety Data Sheet

The MSDS of the notified polymer provided by the notifier was in accordance with the NOHSC *National Code of Practice for the Preparation of Material Safety Data Sheets* (NOHSC, 1994a). It is published here as a matter of public record. The accuracy of the information on the MSDS remains the responsibility of the applicant.

11.2. Label

The label for the notified polymer provided by the notifier was in accordance with the NOHSC *National Code of Practice for the Labelling of Workplace Substances* (NOHSC, 1994b). The accuracy of the information on the label remains the responsibility of the applicant.

12. RECOMMENDATIONS

CONTROL MEASURES

Occupational Health and Safety

- Employers should ensure that the following personal protective equipment is used by workers to minimise occupational exposure to the notified chemical as introduced:
 - Respiratory protection
 - Face shield
 - Gloves

Guidance in selection of personal protective equipment can be obtained from Australian, Australian/New Zealand or other approved standards.

- A copy of the MSDS should be easily accessible to employees.
- If products and mixtures containing the notified polymer are classified as hazardous to health in accordance with the NOHSC *Approved Criteria for Classifying Hazardous Substances*, workplace practices and control procedures consistent with provisions of State and Territory hazardous substances legislation must be in operation.

Environment

- Do not allow material or contaminated packaging to enter drains, sewers or water courses.

Disposal

- The notified polymer should be disposed of in landfill or be destroyed through incineration.

Emergency procedures

- Spills/release of the notified polymer should be handled by shovelling up and placing in a container for salvage or disposal.

Secondary notification

The Director of Chemicals Notification and Assessment must be notified in writing within 28

days by the notifier, other importer or manufacturer:

- (1) Under Section 64(2) of the Act:
 - if any of the circumstances listed in the subsection arise.

The Director will then decide whether secondary notification is required.

No additional secondary notification conditions are stipulated.

13. BIBLIOGRAPHY

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