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

FULL PUBLIC REPORT

Adduct JW 2184

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**Director
Chemicals Notification and Assessment**

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FULL PUBLIC REPORT

Adduct JW2184

1. APPLICANT AND NOTIFICATION DETAILS

APPLICANT

Vantico Pty Ltd
235 Settlement Road
Thomastown Victoria 3074

NOTIFICATION CATEGORY

Limited: polymer with NAMW \geq 1000 (greater than 1 tonne per year)

EXEMPT INFORMATION (SECTION 75 OF THE ACT)

Data items and details claimed exempt from publication:

Chemical name

Other names

CAS number

Molecular formula

Structural formula

Molecular weight

Identity of toxic or hazardous impurities

PREVIOUS NOTIFICATION IN AUSTRALIA BY APPLICANT(S)

Commercial Evaluation Permit: CEC 480 (Permit No 438, July 2000)

NOTIFICATION IN OTHER COUNTRIES

PMN lodged with USEPA as Hardener HW 2934

2. IDENTITY OF CHEMICAL

MARKETING NAME(S)

Adduct JW2184

A component of Hardeners HW 2934 and XD 4414

METHODS OF DETECTION AND DETERMINATION

ANALYTICAL METHOD Infrared (IR) spectroscopy, GPC and HPLC data

Remarks A reference spectrum was supplied by the notifier.

3. COMPOSITION

DEGREE OF PURITY

The adduct is made in an in situ process which always has other components present. It never occurs in isolation and cannot be tested for purity. The adduct contains approximately 12% Hardener LO.

In the Hardener XD 4414, the calculated % Adduct JW 2184 is 71% and in the Hardener HW 2934 it is 82%.

ADDITIVES/ADJUVANTS

No additives or adjuvants are used.

4. INTRODUCTION AND USE INFORMATION

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

The notified polymer will not be manufactured in Australia. It will be imported in a ready-to-use form for the retail market and industry. The notifier indicated that in the future they may manufacture the polymer locally.

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>	10				100

USE

The notified polymer will be used as a component in a mix of hardeners, which will be used in various adhesive systems. The contents of a tube of resin and a tube of hardener are squeezed out and mixed manually using an implement such as an ice cream stick. When the hardener is mixed 1:1 with the resin, the level of the notified polymer is 36% in the case of Hardener XD 4414 (mixed with Resin XD 4428) or 41% in the case of Hardener HW 2934 (mixed with Araldite AW 2104). The adduct in the adhesive mix becomes fully bound during the curing reaction.

The adhesives may be applied either by manual mixing and spreading or by the use of automatic mixing/metering equipment.

5. PROCESS AND RELEASE INFORMATION

5.1. Distribution, Transport and Storage

PORT OF ENTRY

Not provided

IDENTITY OF MANUFACTURER/RECIPIENTS

Vantico Pty Ltd

TRANSPORTATION AND PACKAGING

The notified polymer will be imported in a ready-to-use form for the retail market in 4 mL aluminium tubes, 50 mL syringe packs and 200 mL cartridges. The imported products will be transported from the dockside by road to the Vantico Pty Ltd site.

If the hardeners are to be manufactured locally, they will be packaged in larger volumes of up to 20 L in pails.

5.2 Operation Description

Manufacturing

Initially the notifier does not propose manufacturing the polymer in Australia. The polymer will be imported in ready-to-use hardeners for the retail market and possibly industrial customers. The notifier indicated that after the first 3 years of import, the polymer may be manufactured in Australia and formulated into hardeners. In addition, the notified polymer may be used as an ingredient in the development of new hardeners.

If manufacturing of the notified polymer was to occur locally, then Hardener LO (component of the notified polymer) will be imported and used to manufacture the notified polymer. The notified polymer would then be blended with other ingredients including extenders, fillers, pigments and coupling agents to formulate hardeners. The notified polymer would be transferred from the drum to the mixing vessel by a metered pump. The drums or mixing vessel may be heated (~60°C) to facilitate the pouring of the

hardener. A typical batch of hardener would be 500-1000 kg. The formulated hardeners will be automatically dispensed into 200 L drums for industrial customers or smaller amounts for the retail market.

End Use

The hardeners containing the notified polymer will be used in adhesives systems designed for use on wood, ceramic and glass surfaces. The two components of the adhesive system, the hardener and the epoxy resin, would be mixed 50:50, manually in the case of the Do-It-Yourself (DIY) user or perhaps mechanically in the case of the industrial user. Once mixed, the two components react very quickly and the adhesive is expected to be used within a short duration of time (ie. 5-10 minutes). Application will be manually to the surface to be adhered using a brush, roller or notched spreader. After two to three hours, the adhesive film will have dried. Complete curing may take up to 24 hours. Application to marine structures such as boats will be done in dry dock rather than on submerged surfaces.

The % of the notified polymer (which becomes fully bound during the curing reaction) in the adhesive mix is calculated as 36% in the case of Hardener XD 4414 (mixed with Resin XD 4428 at a ratio of 1:1 parts by weight) or calculated as 41% in the case of Hardener HW 2934 (mixed with Araldite AW 2104 at a ratio of 1:1 parts by weight).

5.3 Occupational exposure

Number and Category of Workers

<i>Category of Worker</i>	<i>Number</i>	<i>Exposure Duration</i>	<i>Exposure Frequency</i>
Dockside and transportation	5-10	1-10 hours/day	20 days/year
Warehousing	15-30	2 hours/day	75 days/year
Manufacturing operators	6-10	8 hours/day	8-16 days/year
Packaging operators	2-4		
Warehouse staff	6-8	2 hours/day	75 days/year
Transportation	5	1-10 hours/day	20 days/year
End users	Large number	6-8 hours/day	300 days/year

Exposure Details

During formulation operations, skin contamination may occur while mixing /blending the ingredients in the mixing vessel, decanting into containers and cleaning up spills and equipment. However, the formulation plant uses a closed process system, where the mixing vessels are closed and fitted with local exhaust ventilation. In addition, the decanting, transfer and cleaning operations are to be carried out in well-ventilated areas. Workers will wear personal protective equipment during decanting, transfer and cleaning operations (chemical goggles/face shields, impermeable gloves and protective overalls). Organic vapour respirators will also be worn if the ventilation is not adequate.

Worker exposure during transport and storage will be limited to accidental spillage.

During end-use, the adhesive product is expected to be frequently used (industrial users). Workers may mix and apply the adhesive by hand or, in the case of large operations, by use of automatic mixers and metering equipment. Workers will wear chemical goggles/faceshield, impermeable gloves and protective overalls.

Home handy persons may also use the product containing notified polymer. Exposure is expected to be similar, but on a smaller scale, to that expected in industrial situations and the level of protection worn is likely to be less stringent.

Domestic and building site waste is commonly collected. Dermal exposure to the notified polymer may occur, but at this point, the adhesive mix should be cured and hence exposure to the notified polymer is not bioavailable.

5.4. Release

RELEASE OF CHEMICAL AT SITE

Assuming the notified polymer is manufactured in Australia, the following would apply:

- Release of the notified polymer during formulation of the hardeners through accidental spills/leaks, cleaning of plant equipment and as residue on empty import drums is likely to be low. The manufacturing/formulation site is fully bounded and spillages would be collected in the holding pit under the factory. The notifier estimates that 0.1% of each batch of hardener may be spilt resulting in the release of 100 kg of the notified polymer per annum. This estimate is conservative and may be as high as 1%. Spilt material will be contained and collected using an inert material such as sand or vermiculite.
- The plant equipment will be cleaned out using a solvent, Eposolve 70. The notifier estimates that 0.5% hardener per batch will be generated as waste in this way. This equates to a release of 500 kg of notified polymer per annum. The solvent waste will be collected and sent for off-site for recycling.
- The notifier estimates that up to 0.5% polymer will remain in the empty import drums. This equates to 500 kg per annum. Empty drums will be collected by a licensed waste contractor and sent off-site for disposal.

RELEASE OF CHEMICAL FROM USE

There are two potential release points for the polymer during use of the adhesive systems. First, unused adhesive mix could result in the release of up to 250 kg of notified polymer per annum. The adhesive mix will be allowed to cure before disposal. Second, up to 250 kg of notified polymer per annum may remain in the hardener residue in empty containers. Further release may result from the disposal of old partially used containers. Most of this waste should end up in landfill.

5.4. Disposal

Empty containers of hardeners and unused adhesive mix will be disposed to landfill.

If the hardeners are to be manufactured in Australia the following would apply:

- The empty drums will be collected by a licensed waste contractor and disposed of according to local, state and federal regulations.
- Cleaning solvent waste containing the polymer will be collected in 200 L drums and taken by a licensed solvent recycling contractor for distillation. The notifier states that the residual sludge is incinerated to a granular material that is disposed of by landfill.
- Waste hardener will either be disposed of by incineration or by reaction in the correct stoichiometric ratio with epoxy resin to form a cured inert polymer that can be disposed of by landfill.

5.5. Public exposure

The notified polymer will be available for sale to the general public in Araldite adhesive DIY products, containing up to 82% of notified polymer. Therefore, public exposure to the notified polymer may occur through the use of these products. The potential for public exposure to the notified polymer during transport is considered low.

6. PHYSICAL AND CHEMICAL PROPERTIES

Hardener JW2184 is an adducted form of Hardener LO. This hardener is never isolated and contains up to 12% free Hardener LO.

APPEARANCE AT 20°C AND 101.3 kPa	Slightly yellow, viscous liquid
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BOILING POINT	225°C (Hardener LO)
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Remarks	No test reports were supplied by the notifier.
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DENSITY	1150 kg/m ³
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Remarks No test reports were supplied by the notifier.

VAPOUR PRESSURE

Remarks Not determined. The notified polymer is not likely to be volatile.

WATER SOLUBILITY

Remarks Not determined. The polymer contains a hydrophobic monomer that is likely to confer low solubility in water. However, there are other monomers such as Hardener LO likely to confer solubility

HYDROLYSIS AS A FUNCTION OF PH

Remarks Not determined. The notified polymer does not contain any functional groups likely to participate in hydrolysis under environmental conditions.

PARTITION COEFFICIENT (n-octanol/water)

Remarks Not determined. The partition coefficients for the monomeric units of the notified polymer have been calculated using ACD software. The log Pow of the polymer may be higher. Based on this QSAR data the notified polymer should partition mainly in the octanol phase, but this conclusion should be treated with caution.

ADSORPTION/DESORPTION

– main test

Remarks Not determined. Given that the notified polymer is predicted to have a moderate log Pow, it may associate with organic matter in soils and sediments.

DISSOCIATION CONSTANT

Remarks Not determined. The notified polymer is not likely to dissociate under environmental conditions, pH 4-9.

PARTICLE SIZE

Remarks Not applicable as the notified polymer is a liquid

FLASH POINT >129°C (closed cup)

Remarks No test reports were supplied by the notifier.

FLAMMABILITY LIMITS

Remarks The notified polymer is not flammable. However, it is combustible and upon heat, liberates flammable gases.

AUTOIGNITION TEMPERATURE

Remarks Not provided

EXPLOSIVE PROPERTIES

Remarks Not expected to be explosive, based on structure.

REACTIVITY

Remarks Stable under normal environmental conditions. Upon heat liberates toxic and flammable decomposition products.

7. TOXICOLOGICAL INVESTIGATIONS

No toxicology studies were provided on the notified polymer for assessment.

8. ENVIRONMENTAL EFFECTS

8.1. Environmental fate

No environmental fate data were provided.

Bioaccumulation

No bioaccumulation data were provided. The relatively high molecular weight of the notified polymer indicates that it is unlikely to bioaccumulate despite its expected low solubility in water (Connell, 1990).

8.2. Environmental Effects

The notifier has provided toxicity reports for the polymer (described below). In addition to the notified polymer there are un-reacted monomeric components, separately tested as toxic to aquatic organisms, in the test substance, therefore, the following data do not necessarily reflect the toxicity of the notified polymer (adduct).

8.2.1. Acute/chronic toxicity to aquatic invertebrates

TEST SUBSTANCE HW 2934 containing approximately 82% Adduct JW2184

METHOD OECD TG 202 Daphnia sp. Acute Immobilisation Test – static, pH

Species	<i>Ceriodaphnia dubia</i>
Exposure Period	48 hours
Auxiliary Solvent	16:1 acetone:Dimethyl sulphoxide
Water Hardness	40-48 mg CaCO ₃ /L
Analytical Monitoring	None
Remarks - Method	A solvent control was included in the test.

RESULTS

Concentration mg/L		Number of <i>C. dubia</i>	Number Immobilised	
Nominal	Actual		24 h [acute]	48 h [acute]
0		40	1	4
Solvent control		20	0	1
0.04		20	0	3
0.12		20	2	2
0.37		20	1	5
1.1		20	5	15
3.3		20	18	19
10		20	19	20

LC50 0.7 mg/L at 48 hours

NOEC (or LOEC) 0.37 mg/L at 48 hours

Remarks - Results The EC50 values were calculated using nominal concentrations of the test substance by Trimmed Spearman-Kärber Analysis. Mean immobilisation in the controls and solvent controls at 48 hours was 10% and 5% respectively, indicating that the test was valid. The EC50 for the reference substance was 4.1 µg/L indicating the validity of the test method.

CONCLUSION The notified polymer would be classified as highly toxic to daphnids (Mensink et al. 1995) but this is complicated by the presence of un-reacted monomer Hardener LO.

TEST FACILITY CSIRO Centre for Advanced Analytical Chemistry (2001a)

8.2.2. Algal growth inhibition test

TEST SUBSTANCE HW 2934 containing approximately 82% Adduct JW2184

METHOD OECD TG 201 Alga, Growth Inhibition Test.

Exposure Period 72 hours

Concentration Range Nominal	0-20 mg/L
Concentration Range Actual	Not determined.
Auxiliary Solvent	16:1 acetone: Dimethyl sulphoxide
Remarks - Method	A solvent control was included in the test.

RESULTS

<i>Biomass</i>	
<i>EC50</i>	<i>No-observed-effect-concentration</i>
<i>mg/L at 72 h</i>	<i>mg/L</i>
3.6	2.5

Remarks - Results The EC50 values were calculated using nominal concentrations of the test substance by Trimmed Spearman-Kärber Analysis. The coefficient variation in the controls was 33% greater than the acceptability limit of 20%. The reference substance, copper, was toxic to algae under the test conditions, inhibiting cell yield by 20%, but was not significantly different to the controls due to the large coefficient of variation. The solvent control was within test acceptability limits. All test concentrations were compared to the solvent control.

CONCLUSION The notified polymer would be classified as moderately toxic to algae (Mensink et al. 1995) but this is complicated by the presence of un-reacted monomer Hardener LO.

TEST FACILITY CSIRO Centre for Advanced Analytical Chemistry (2001b).

9. RISK ASSESSMENT

9.1. Environment

9.1.1. Environment – exposure assessment

It is expected that minimal exposure to the environment is likely to occur during the use of imported ready-to-use hardeners containing the notified polymer. Up to 500 kg per annum of the notified polymer could be disposed of to landfill. Most of this waste would be cured adhesive in which case the polymer will be incorporated into the inert matrix of the epoxy resin and unavailable to the environment. Half of this amount would be released as residues in empty containers of hardener. If the containers are destroyed in landfill, the notified polymer is likely to associate with soils and sediments due to its expected low solubility in water and the predicted moderate to high log Pow.

At the end of their useful lives, articles adhered with the adhesive (and cured through the agency of the hardeners containing the notified polymer) would be disposed of to landfill.

If the notifier chooses to use the polymer to formulate the hardeners in Australia, rather than import them in a ready-to-use form, there is potential for increased environmental exposure. In this case an additional release of up to 1100 kg per annum may occur. A proportion of this waste would be incinerated, destroying the notified polymer and generating water and oxides of sulphur and carbon. The remainder would be disposed to landfill where it may persist until it is slowly degraded through abiotic and biotic processes. In landfill the polymer is likely to associate with soils and sediments due to its expected low solubility in water and the predicted moderate to high log Pow.

9.1.2. Environment – effects assessment

The notified polymer was moderately toxic to algae but highly toxic to daphnids. The most sensitive species were *C. dubia* with a reported EC50 of 0.37 mg/L at 48 hours. The polymer mix includes 12% un-reacted monomer (Hardener LO) also known to be toxic to aquatic organisms therefore complicating conclusions regarding ecotoxicity. However, exposure of the aquatic environment from the proposed use is likely to be very low.

9.1.3. Environment – risk characterisation

The notified polymer does not pose a significant hazard to the environment based on its reported use pattern because there will be low environmental exposure. The majority of the polymer will be chemically bound into the cured polymeric matrix of the adhesives in which it is used once the hardeners and resins have been mixed and applied.

If the notifier finds that sales of the adhesive system justify local manufacture of the hardeners, the small amount of polymer that may be released will not be to the aquatic environment. A proportion of this waste may be disposed by landfill. In landfill the polymer is likely to remain associated with soils and sediments. The polymer should not bioaccumulate given its relatively high molecular weight (Connell, 1990).

9.2. Human Health

9.2.1 Human health - effects assessment

No toxicological data were available on the notified polymer. It has a NAMW greater than 1000 and there is a significant amount of residual monomer (12% Hardener LO). As the notified polymer has similar reactive functional groups to the monomers, the toxicity profile of the notified polymer is taken to be similar to Hardener LO.

The Material Safety Data Sheet (MSDS) for Adduct JW 2184 specified the risk phrase R36/38: irritating to eyes and skin. No information was provided on the chronic health effects. The oral rat LD50 was reported to be 3000 mg/kg.

Considering that the adduct itself is never isolated and contains Hardener LO as a residual monomer and based on the available data, the notified polymer (adduct) is classified as hazardous under the National Occupational Health and Safety Commission's (NOHSC) *Approved Criteria for Classifying Hazardous Substances* (1999b), with the risk phrase R36/38: irritating to eyes and skin.

The products Hardener HW 2934 and Hardener XD 4417 are classified as hazardous according to NOHSC *Approved Criteria for Classifying Hazardous Substances* (NOHSC 1999b). The following risk phrases were specified on the MSDS:

R36/38: Irritating to eyes and skin

R43: May cause sensitisation by skin contact

The MSDS for the notified polymer and products reported that they are not expected to be irritating to the respiratory system. For Hardener HW2934, the oral LD50 in rats is 2300 mg/kg; for Hardener XD 4414, the oral LD50 in rats is >5000 mg/kg.

9.2.2. Occupational health and safety – risk characterisation

Dermal and ocular exposure can occur during certain formulation processes. However, given that exposure to significant amounts is limited because of the engineering controls and personal protective equipment worn by workers, the risk of adverse effects is low.

During end-use, hand/ocular contamination with the adhesive may occur, particularly, when the adhesive product is mixed and applied by hand (up to 82% notified polymer in the formulated hardener product and up to 41% notified polymer in the adhesive mix). Therefore, there is some risk of eye irritation, and perhaps slight skin irritation arising from contact with the notified polymer during this process. Inhalation exposure to the notified polymer is not expected as it is not volatile. In order to minimise the risk of adverse health effects, workers using the hardener products containing the notified polymer should wear personal protective equipment including overalls, gloves and face shield/goggles.

After application and once dried, the adhesive containing the notified polymer is cured into an inert matrix of the epoxy resin and is hence unavailable to exposure. Therefore, the risk of adverse health effects to cured material is minimal.

During transport and storage, the health risk to workers is not considered significant given the physical form of the product and the packaging.

9.2.3. Public health – risk characterisation

The notified polymer will be available for sale to the general public as a component of Araldite adhesive DIY products. Although the notified polymer is expected to cause skin and eye irritation, this is not uncommon for adhesive chemicals of this type. Furthermore, the general public will only be exposed to the notified polymer through a conscious choice to use DIY Araldite adhesive products, for which it is common to prevent/minimise skin and eye contact. Many similar adhesive products are presently available for sale to the public through retail outlets. Therefore, the risk to public health from the notified polymer is likely to be low.

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

10.1 Environment

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

10.2 Human health – Occupational health and safety

There is Low Concern to occupational health and safety under the conditions of the occupational settings described.

10.3 Human health – public

There is Negligible Concern to public health when used according to the set conditions

11. MATERIAL SAFETY DATA SHEET

The MSDS for the notified polymer, Adduct JW 2184, and the products Hardeners HW 2934 and XD 4414 containing it were provided in a format consistent with the *National Code of Practice for the Preparation of Material Safety Data Sheets* (NOHSC, 1994a).

These MSDS were provided by the applicant as part of the notification statement. They are reproduced here as a matter of public record. The accuracy of this information remains the responsibility of the applicant.

12. LABEL

The label for the notified polymer, Adduct JW 2184, and the products Hardeners HW 2934 and XD 4414 containing it provided by the notifier were 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.

13. RECOMMENDATIONS

REGULATORY CONTROLS

- Use the following risk and safety phrases for the notified polymer:
 - R36/38: Irritating to eyes and skin
 - S36 Wear suitable protective clothing
 - S37 wear suitable gloves
 - S39 wear eye/face protection
 - S24 Avoid contact with skin
 - S25 Avoid contact with eyes

The risk phrase R36/38 should be used for products/mixtures containing $\geq 20\%$.

CONTROL MEASURES

Occupational Health and Safety

- Employers should implement the following engineering controls to minimise occupational exposure to the notified polymer:
 - Exhaust ventilation during formulation of the notified polymer and hardeners
- Employers should implement the following safe work practices to minimise occupational exposure during handling of the notified polymer and hardeners:
 - Prevent splashes and spills
- Employers should ensure that the following personal protective equipment is used by workers to minimise occupational exposure to the notified polymer:
 - Chemical resistant gloves, protective overalls, and goggles/faceshield.

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

Disposal

- The notified polymer should be disposed of to landfill or by incineration.

Emergency procedures

- Spills/release of the notified polymer should be handled by absorbing into dry, inert material and placed into labelled drums for 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:

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.

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