File No LTD/1117

13 January 2004

NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME (NICNAS)

FULL PUBLIC REPORT

Polymer in Photoglaze U179

This Assessment has been compiled in accordance with the provisions of the *Industrial Chemicals (Notification and Assessment) Act 1989* (Cwlth) (the Act) and Regulations. This legislation is an Act of the Commonwealth of Australia. The National Industrial Chemicals Notification and Assessment Scheme (NICNAS) is administered by the Department of Health and Ageing, and conducts the risk assessment for public health and occupational health and safety. The assessment of environmental risk is conducted by the Department of the Environment and Heritage.

For the purposes of subsection 78(1) of the Act, this Full Public Report may be inspected at:

Library
National Occupational Health and Safety Commission
25 Constitution Avenue
CANBERRA ACT 2600
AUSTRALIA

To arrange an appointment contact the Librarian on TEL + 61 2 6279 1161 or + 61 2 6279 1163.

This Full Public Report is available for viewing and downloading from the NICNAS website or available on request, free of charge, by contacting NICNAS. For requests and enquiries please contact the NICNAS Administration Coordinator at:

Street Address:	334 - 336 Illawarra Road MARRICKVILLE NSW 2204, AUSTRALIA.
Postal Address:	GPO Box 58, SYDNEY NSW 2001, AUSTRALIA.
TEL:	+ 61 2 8577 8800
FAX	+ 61 2 8577 8888.
Website:	www.nicnas.gov.au

Director

Chemicals Notification and Assessment

TABLE OF CONTENTS

FULL PUBLIC REPORT

Polymer in Photoglaze U179

1. APPLICANT AND NOTIFICATION DETAILS

APPLICANT(S)
Lord Chemical Products (Australia) Pty Ltd (ABN 85 085 209 712)
21 Beverage Drive
Tullamarine VIC 3043

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:
Identity of chemical;
Composition;
Polymer information; and
Exact import volume

VARIATION OF DATA REQUIREMENTS (SECTION 24 OF THE ACT)
No variation to the schedule of data requirements is claimed.

PREVIOUS NOTIFICATION IN AUSTRALIA BY APPLICANT(S)
None

NOTIFICATION IN OTHER COUNTRIES
None

2. IDENTITY OF CHEMICAL

MARKETING NAME(S)
Polymer in Photoglaze U179

DEGRADATION PRODUCTS
Caprolactone was identified as the major degradation product.

LOSS OF MONOMERS, OTHER REACTANTS, ADDITIVES, IMPURITIES
None

4. INTRODUCTION AND USE INFORMATION

MODE OF INTRODUCTION OF NOTIFIED CHEMICAL (100%) OVER NEXT 5 YEARS
The notified polymer will be imported as a component of a partially formulated ultraviolet (UV) curable ink vehicle, Photoglaze U179, at a concentration of 52%. Photoglaze U179 is used as a base resin in the manufacture of screenprinting inks, overprint varnishes and coatings. The manufactured inks and varnishes will contain 12 to 16% notified polymer.

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

Year	*1*	*2*	*3*	*4*	*5*
Tonnes	<10	<10	<10	<10	<10

USE
Component of ink for screen-printing process.

5. PROCESS AND RELEASE INFORMATION

5.1. Distribution, Transport and Storage

PORT OF ENTRY
Not stated

IDENTITY OF MANUFACTURER/RECIPIENTS
Lord Chemical Products (Australia) Pty Ltd (ABN 85 085 209 712)
21 Beverage Drive
Tullamarine VIC 3043

TRANSPORTATION AND PACKAGING
Photoglaze U179 will be imported into Australia in 247L (55 gallons) pails. It will be stored at the notifier's warehouse prior to distribution by road to a single customer. At the customer's site, the partially formulated ink vehicle will be used in the manufacture of UV curable inks for screen-printing process. Manufactured inks will be packed in 5 kg cans, 20 kg pails or 200 kg drums, stored and distributed by road to printing press companies all over Australia.

5.2. Operation Description

Ink Manufacture
No repackaging of the imported product containing the notified polymer (Photoglaze U179) is required prior to ink manufacture. Photoglaze U179 will be transferred from the drum into the mix tank where acrylate monomers, pigments, flow additives and photoinitiators are added. Transfer operations will be via a tap attached to the threaded drum bung. The reactants are mixed using a mechanical stirrer in a closed mixing tank. Once the desired product mixture is achieved, the ink is gravity fed into storage containers of various sizes through a filler head attached to the mixing tank. The ink is stored and sold to printing press companies Australia wide for use in screen-printing process.

Ink Application
Application is claimed to be typical of screen-printing application where the screen size is normally dictated by the substrate being printed. During screen print operation, the ink is applied by forcing the material through the screen mesh using some type of squeegee. Atomisation of the ink is not likely to occur. Majority of process is automated and require minimal manual intervention, if any. Once the ink is applied, the printed substrate will pass through a UV cure oven where the ink is cured to form a durable, chemically resistant film.

5.3. Occupational exposure

Number and Category of Workers

Category of Worker	*Number*	*Exposure Duration*	*Exposure Frequency*
Transport and storage	12 (max)	none	none
Ink formulation and packaging	2-3	2 hrs/week	52 weeks/year
Printing application	20	8 hrs/day	365 days/year

Exposure Details
There may be exposure to the notified polymer when the imported product is transferred from drums to the mix tank. The mixing tank is enclosed and located in a ventilated area. In addition to protective gloves and safety eyewear, respiratory protection may be required depending on the volatility of chemical components being used to formulate the ink. Exposure to the notified polymer

could also occur from spills when drumming off and when overfilling the containers. Similar protective equipment to that when handling the imported product will apply when handling the formulated ink.

Exposure to ink spatter may occur during ink application. Personal protective equipment worn by workers include protective overalls, nitrile or neoprene gloves and protective eyewear. Respiratory protection is also recommended, if local ventilation is inadequate.
After application, the ink on the treated substrate is UV cured to form a chemically resistant film. In this form, the notified polymer is not available for separate exposure.

5.4. Release

RELEASE OF CHEMICAL AT SITE
Release of the notified polymer at the reformulation plant is expected to be minimal as mixing vessels are flushed with a small amount of a range of solvents when cleaning the equipment. The waste solvents are used only for this purpose and are disposed of by a licensed hazardous waste contractor. In the case of a spill, an absorbent media should be used with subsequent disposal as hazardous waste. Spills on the ground are advised to be dug out as quickly as possible by trained personnel and checked with a photo ionisation detector to determine completeness of soil removal. The notifier claims the soil could then either be incinerated (recommended) or biologically remediated. Releases to water are claimed to result in adsorption to sediment due to the high density and insolubility of the polymer. However, the polymer should be regarded as moderately soluble with subsequent potential exposure to aquatic organisms. Any polymer adsorbed to sediment would require treatment as per contaminated soil.

RELEASE OF CHEMICAL FROM USE
Any vapours from the printing presses are extracted and treated before being exhausted. The notifier claims there is almost no solid waste remaining in empty containers or on the screen presses. The containers are usually cleaned and reused or disposed of as solid waste.

5.5. Disposal

Any notified polymer present in waste solvents during cleaning of equipment used in ink manufacture is disposed of by a licensed hazardous waste contractor. Any waste polymer from the empty container will be disposed of as solid waste. Exposure to sunlight will cause the inks to crosslink and form a solid inert waste.

5.6. Public exposure

The public in unlikely to be exposed to the notified polymer during transport, storage and ink manufacture, except in the event of an accidental spill. The formulated ink is intended for specific industrial applications and will not be available to the public.

The public may make dermal contact with materials printed with inks containing the notified polymer. However, at this stage the ink has dried and cured, and is firmly attached to the printed material and not available for exposure.

6. PHYSICAL AND CHEMICAL PROPERTIES

Appearance at 20°C and 101.3 kPa Colourless, high viscosity liquid

Melting Point 215 to 230°C

METHOD	OECD TG 102 Melting Point/Melting Range.
Remarks	Measured by differential scanning calorimetry (DSC).
TEST FACILITY	Lord Corporation Analytical Chemistry (2003)

Density 1080 kg/m^3

METHOD	OECD TG 109 Density of Liquids and Solids.

Remarks	Pycnometer method.
TEST FACILITY	Lord Corporation Analytical Chemistry (2003)

Vapour Pressure Not determined

Remarks	The notified polymer is a high viscosity, intractable liquid. To measure the vapour pressure, the notified polymer needs to be purified by removing the THF solvent present in the manufactured polymer. The removal of THF resulted in a near solid sample with 14.4% remaining THF and other purification methods are expected to result in gelation of the polymer.

Water Solubility <0.03 g/L at 20ºC

METHOD	OECD TG 105 Water Solubility. EC Directive 92/69/EEC A.6 Water Solubility.
Remarks	The duplicate column elution extractions of the polymer from solution did not produce a mean above the detection limit of 30 mg/L. The test is accordingly unable to distinguish whether the notified polymer is insoluble or moderately soluble.
TEST FACILITY	Lord Corporation Analytical Chemistry (2003)

Hydrolysis as a Function of pH Not determined

Remarks	While the polymer contains ester and urethane groups, it is not expected to hydrolyse under ambient conditions but may hydrolyse in strong acid or base in combination with high temperature (200°C) and pressure.

Partition Coefficient (n-octanol/water) Not determined

Remarks	No visible solubility was observed on mixing 0.1 g of the polymer in 50 mL of octanol. From structural considerations, the polymer is expected to be more soluble in octanol than water.

Adsorption/Desorption Not determined

Remarks	Although no testing was done, it is expected that the polymer will adsorb to, or be associated with, soil and organic carbon.

Dissociation Constant Not determined

Remarks	No dissociable groups are present.

Particle Size Not determined

Remarks	The notified polymer is liquid.

Flash Point >93ºC (closed cup)

TEST FACILITY	Lord Corporation Analytical Chemistry (2003)

Flammability Limits Not determined

Remarks	The polymer is expected to be non-flammable but it is combustible.

Autoignition Temperature 454ºC

METHOD	ASTM D1929-96
TEST FACILITY	ETC Laboratories (2003)

Explosive Properties Not determined

Remarks Based on the chemical structure, the polymer is not expected to have explosive properties.

Reactivity

Remarks Heat or friction could lead to formation of gel. The notified polymer will also form into a gel upon exposure to UV light.

7. TOXICOLOGICAL INVESTIGATIONS

No toxicity data were submitted.

8. ENVIRONMENT

8.1. Environmental fate

No environmental fate data were submitted.

8.2. Ecotoxicological investigations

No ecotoxicity data were submitted. The notifier claims that the polymers in the ink will cross link upon exposure to UV (eg. sunlight) and become an inert solid.

9. RISK ASSESSMENT

9.1. Environment

9.1.1. Environment – exposure assessment

Exposure of the polymer to the environment during transportation and reformulation is not expected to be high except in cases of accidental spills, for which procedures are in place to limit release. Therefore releases of the polymer in these cases is not expected to be high.

During use, the polymer is not expected to volatilise due to its high viscosity and high melting point. As well all vapours from the screen printing process are extracted and treated before being exhausted.

The notifier claims there is almost no solid waste remaining during use and that containers are usually cleaned and reused or disposed of as solid waste. It is assumed that liquid wastes generated during cleaning are disposed of to the sewer. Although the notified polymer makes up 12-16% of manufactured inks and varnishes, any wastes entering a STP are expected to be greatly diluted according to the following scenario:

Assuming 10 tonnes of the notified polymer were used per year with a total of 1% released to STPs across the country from daily use, an estimated 0.27 kg per day would be released to surface water. With the use distributed across the entire population of Australia, the predicted environmental concentration (PEC) in receiving rivers would be 0.04 µg/L assuming 50% stays in the effluent and 50% partitions to the sludge of the STP based on the moderate water solubility and adsorption. If the sludge were spread to land as biosolids, the PEC in soil would be 4 µg/kg soil.

At the end of their useful lives, screen printed articles are expected to be sent to landfill. Since the polymer will be in a cross-linked form, any degradation or mobility is expected to be slow.

9.1.2. Environment – effects assessment

As no ecotoxicity data were submitted, the effect of the polymer on organisms is unknown.

9.1.3. Environment – risk characterisation

Although no comparison can be made between the PEC and concentrations causing effects to organisms in the environment due to the lack of ecotoxicity data, the risk is expected to be low due to the low PEC and the polymer's instability in sunlight. Exposure to aquatic and terrestrial organisms will be reduced with UV radiation which causes the polymer to cross link into an inert solid.

9.2. Human health

9.2.1. Occupational health and safety – exposure assessment

Ink Manufacture

Workers involved in transferring the imported products from drums to the mix tank will have the highest exposure to the notified polymer. The mixing process is automated and enclosed; therefore, further exposure is unlikely unless manual intervention is required during the process.

Dermal exposure to spills or splashes may also occur if containers are overfilled, and during maintenance and cleaning of mixing tank and filling equipment. Local and exhaust ventilation are in place to minimise any atmospheric contaminants during ink manufacture. Workers will wear gloves and eye protection during the above operations. In addition, respiratory protection may also be required depending on the volatility of chemicals used in ink formulation.

Exposure to significant amounts of the notified polymer is limited because of the largely enclosed mixing and automated operations, and the use of engineering controls are likely to minimise exposure when handling the notified polymer. High levels of exposure prevention are required due to the presence of acrylate monomers in the formulated inks.

Ink Application

Exposure to the notified polymer during ink application will predominantly be dermal. Dermal exposure may occur during the preparation of ink prior to application. The majority of screen print operation is automated; therefore exposure is limited to minimal manual intervention, if any. After ink application, the printed substrate will subsequently pass through a UV cure oven where the ink is cured.

During ink application, exposure to the notified polymer is considered low due to the low concentration of the notified polymer in the formulated ink, and the enclosed and automated screen-printing operations. Once the ink has been applied to the substrate and cured, no further exposure is expected to occur.

9.2.2. Public health – exposure assessment

The formulated ink is intended for specific industrial applications and will not be available to the public. Members may make dermal contact with the substrate coated with the ink containing the notified polymer. However, public exposure is considered low given that the ink contains low levels of the notified polymer and once dried and cured, the notified polymer is firmly attached to the printed material and not available for exposure.

9.2.3. Human health - effects assessment

No toxicological data have been provided for the notified polymer. The notified polymer has a high molecular weight. However, it contains hydroxyethyl acrylate, as a residual monomer, at a concentration above the cut off level for classification as a hazardous substance (NOHSC, 1999). Based on the presence of hydroxyethyl acrylate, the notified polymer is classified as a hazardous substance according to the NOHSC *Approved Criteria for Classifying Hazardous Substances* (NOHSC, 2002) and warrants the risk phrases: Harmful in contact with skin (R21) and May cause sensitisation by skin contact (R43).

9.2.4. Occupational health and safety – risk characterisation

Overall, the risk of adverse effects arising from exposure to the notified polymer is low, due to the largely enclosed and automated operations in the manufacture of ink and ink application. Exposure to the notified polymer will be low due to measures taken to control exposure to the acrylate monomers in the ink formulations. However, due to possible effects upon skin contact, dermal exposure should be avoided when handling the imported product containing the notified

polymer and the inks manufactured from it.

The limited contact to the notified polymer during ink manufacture and screen printing operations, the presence of engineering controls and the use or recommended personal protective equipment would ensure that occupational risk posed by the notified polymer is low when used as specified in the notification.

9.2.5. Public health – risk characterisation

Public exposure to the notified polymer will arise from dermal contact with materials printed with inks containing the notified polymer. Once the ink is dried and cured, the notified polymer is firmly attached to the printed material and no further exposure is expected. Consequently, the risk from public exposure to the notified polymer through all phases of its life cycle is considered to be low.

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

10.1. Hazard classification

Based on the presence of hydroxyethyl acrylate at >0.5% as a residual monomer, the notified polymer is classified as hazardous under the NOHSC *Approved Criteria for Classifying Hazardous Substances*. The classification and labelling details are:

R21 - Harmful in contact with skin; and

R43 - May cause sensitisation by skin contact.

10.2. Environmental risk assessment

Although the PEC/PNEC ratio could not be calculated, the notified polymer is not considered to pose a risk to the environment based on its reported use pattern and expected fate in the environment.

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 No Significant Concern to public health when used in the manufacture of ink for screen printing applications.

11. MATERIAL SAFETY DATA SHEET

11.1. Material Safety Data Sheet

The MSDS of the products containing 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, 2003). 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 products containing the notified polymer provided by the notifier was in accordance with the NOHSC *National Code of Practice for the Labelling of Workplace Substances* (NOHSC, 1994). The accuracy of the information on the label remains the responsibility of the applicant.

12. RECOMMENDATIONS

REGULATORY CONTROLS
Hazard Classification and Labelling

- The NOHSC Chemicals Standards Sub-committee should consider the following health hazard classification for the notified polymer:

  – R21 - Harmful in contact with skin; and
  – R43 - May cause sensitisation by skin contact.

CONTROL MEASURES
Occupational Health and Safety

- Employers should implement the following engineering controls to minimise occupational exposure to the notified polymer:
  – Exhaust ventilation during transfer from drums to mix tank, mixing, filling into containers and screen printing operations.
  – Enclosed and automated ink manufacture and screen printing operations.

- Employers should implement the following safe work practices to minimise occupational exposure during handling of the notified polymer:
  – During transfer operations and cleaning equipment, avoid spills and splashing.

- 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 clothing which protects the body, arms and legs;
  – Safety glasses; and
  – Respiratory protection, as required.

  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.

Disposal

- The notified polymer should be disposed of by a licensed waste contractor in accordance with federal, State and local environmental control regulations.
- Empty containers should be recycled or disposed of through an approved waste management facility.

Emergency procedures

- Spills/release of the notified polymer should be contained and prevented from entering drains, streams or any water body. The spilled material should be collected with sand, vermiculite or other non-combustible absorbent material and place in clean and suitable containers for disposal.

- For large spills or if sewers or waterways have been contaminated, contact local Emergency Services.

12.1. 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

ETC Laboratories (2003). Photoglaze E1691 (Report No: ETC-03-909-13396.0) Rochester, NY ETC Laboratories (Unpublished report submitted by Lord Chemical Products (Australia) Pty Ltd).

Lord Corporation Analytical Chemistry (2003) Analytical Chemistry Report – Photoglaze E1691 (Reference No: SA9803.05). Eirie, PA, Lord Corporation Analytical Chemistry (Unpublished report submitted by Lord Chemical Products (Australia) Pty Ltd).

National Occupational Health and Safety Commission (1994) National Code of Practice for the Labelling of Workplace Substances [NOHSC:2012(1994)]. Australian Government Publishing Service, Canberra.

National Occupational Health and Safety Commission (1999) List of Designated Hazardous Substances [NOHSC:10005(1999)]. Australian Government Publishing Service, Canberra.

National Occupational Health and Safety Commission (2002) Approved Criteria for Classifying Hazardous Substances [NOHSC:1008(2002)]. Australian Government Publishing Service, Canberra.

National Occupational Health and Safety Commission (2003) National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC:2011(2003)]. Australian Government Publishing Service, Canberra.