

File No: NA/493

Date: May 1997

**NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION  
AND ASSESSMENT SCHEME**

**FULL PUBLIC REPORT**

**Polyester Resin NT-7**

This Assessment has been compiled in accordance with the provisions of *the Industrial Chemicals (Notification and Assessment) Act* 1989 (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 Worksafe Australia which also conducts the occupational health & safety assessment. The assessment of environmental hazard is conducted by the Department of the Environment, Sport, and Territories and the assessment of public health is conducted by the Department of Health and Family Services.

For the purposes of subsection 78(1) of the Act, copies of this full public report may be inspected by the public at the Library, Worksafe Australia, 92-94 Parramatta Road, Camperdown NSW 2050, between the following hours:

Monday - Wednesday	8.30 am - 5.00 pm
Thursday	8.30 am - 8.00 pm
Friday	8.30 am - 5.00 pm

For Enquiries please contact the Administration Coordinator at:

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

**Postal Address:** GPO Box 58, Sydney 2001, AUSTRALIA

**Telephone:** (61) (02) 9577-9466 **FAX** (61) (02) 9577-9465

Director  
Chemicals Notification and Assessment

**FULL PUBLIC REPORT****Polyester Resin NT-7****1. APPLICANT**

Canon Australia Pty. Ltd. of 1 Thomas Holt Drive NORTH RYDE NSW 2113 has submitted a limited notification statement in support of their application for an assessment certificate for Polyester Resin NT-7.

**2. IDENTITY OF THE CHEMICAL**

Polyester Resin NT-7 is not considered to be hazardous based on the nature of the chemical and the data provided. Therefore the chemical name, CAS number, molecular and structural formulae, molecular weight, spectral data and details of the polymer composition have been exempted from publication in the Full Public Report and the Summary Report.

**Other Names:** polyester resin, ST 012

**Trade Name:** NT-7

**Number-Average  
Molecular Weight (NAMW):** > 1 000

**Maximum Percentage of Low  
Molecular Weight Species**

**Molecular Weight < 500:** not specified

**Molecular Weight < 1 000:** < 5%

**Method of Detection  
and Determination:** infrared (IR) and gel permeation chromatography (GPC)

**3. PHYSICAL AND CHEMICAL PROPERTIES**

**Appearance at 20°C  
and 101.3 kPa:** pale yellow powder, slight characteristic odour

**Melting Point:** 93.5 - 104.5°C

<b>Specific Gravity:</b>	1.2061 at 25.5 ± 0.5°C
<b>Vapour Pressure:</b>	6.7 x 10 <sup>-7</sup> kPa at 25°C
<b>Water Solubility:</b>	< 0.535 mg/L at 20 ± 0.5°C
<b>Partition Co-efficient (n-octanol/water):</b>	not determined
<b>Hydrolysis as a Function of pH:</b>	not determined
<b>Adsorption/Desorption:</b>	not determined
<b>Dissociation Constant:</b>	not determined
<b>Flash Point:</b>	not determined
<b>Flammability Limits:</b>	not highly flammable
<b>Autoignition Temperature:</b>	not below melting point
<b>Explosive Properties:</b>	not explosive
<b>Reactivity/Stability:</b>	non-oxidising

### **Comments on Physico-Chemical Properties**

Tests were performed according to EEC/OECD test guidelines at facilities complying with OECD Principles of Good Laboratory Practice.

The water solubility of the polymer was determined by column elution and analysed by spectrophotometry.

Hydrolysis, partition coefficient, adsorption/desorption and dissociation constant have not been determined due to the low solubility of the polymer. This is acceptable for the following reasons:

Polyester resins are subject to hydrolysis of ester linkages only when they are water soluble. The low water solubility of the notified polymer would mean that its hydrolysis potential under the range of environmental pH values would be low.

On the basis of the polymer's low water solubility it is likely to adsorb to, or be associated with, soil/sediment and organic matter and be immobile in soil.

The polymer contains a small amount of free carboxylic acid functionalities, expected to have typical acidity.

#### 4. PURITY OF THE CHEMICAL

<b>Degree of Purity:</b>	99.5%
<b>Toxic or Hazardous Impurities:</b>	contains a compound which has an exposure standard of time-weighted average (TWA) of 0.1 mg/m <sup>3</sup> listed in Worksafe Australia's <i>Exposure Standards for Atmospheric Contaminants in the Occupational Environment</i> (1); the exposure standard is based on the toxicity of this group of compounds
<b>Non-hazardous Impurities:</b>	none of the non-hazardous impurities are listed on Worksafe Australia's <i>List of Designated Hazardous Substances</i> (2), Toxline (3) or in Sax and Lewis (4) as having hazardous properties.
<b>Maximum Content of Residual Monomers:</b>	< 1% (see non-hazardous impurities)
<b>Additives/Adjuvants:</b>	none

#### 5. USE, VOLUME AND FORMULATION

The notified polymer will not be manufactured in Australia.

The notified polymer is an ingredient of a formulated toner (5-10%) for use in electrophoto-copying machines or electrophoto-graphic printers. The toner will not be formulated in Australia. The toner will be mainly used by machines in office environments.

It will be imported into Australia as part of a pre-manufactured toner product in sealed plastic bottles containing 350 g of toner (< 35 g of notified polymer) and cartridges containing 300 grams of toner (< 30 g of notified polymer).

Annual import volumes for the notified polymer will range between 1 and 10 tonnes in each of the first five years.

#### 6. OCCUPATIONAL EXPOSURE

There will be no occupational exposure to the notified chemical in Australia during formulation or manufacture as it is imported as a component of the ready to use toner. Any worker exposure in Australia will be to the formulation which contains only 5 to 10% of the notified polymer.

The toner cartridges and bottles are designed so that no release of the toner will occur until the shutter or seal tape is removed. To refill the toner in photocopying

machines, the operator fits the toner bottle to the machine and opens the shutter. The contents are then transferred into the toner store. To change the toner cartridge of printers, the seal tape is removed and then the cartridge is placed into the machine. During copying, the toner will be transferred on to the paper, and heat-cured.

The particle size range of the notified polymer has a high percentage of what is considered as inspirable according to the International Organisation for Standardisation and the American Conference of Governmental Industrial Hygienists (1). The respirable fraction will be negligible (< 1.0%) according to the Standards Australia definition (1).

## **7. PUBLIC EXPOSURE**

Exposure of the public to the notified chemical will be possible when printed sheets are handled or when toner cartridges are changed. The notified chemical is melted and bonded to the printed paper during the printing process resulting in its immobilisation, and it has a low water (< 1 ppm) and octanol solubility, so it is unlikely to be bioavailable. Toner cartridges are inserted into printers and copiers sealed, with the seal being removed after insertion. Although contact with toner will be possible during the exchange operation the level of exposure under normal circumstances will be low.

In the event of a transport accident dispersion of the toner will be limited due to the packaging of the product in end use containers which will act to contain the extent of a spill. Spilt toner can be recovered by sweeping or vacuuming and disposed of according to local regulations.

## **8. ENVIRONMENTAL EXPOSURE**

### **Release**

The notified polymer, as a component of a pre-formulated toner, will be imported in small, sealed plastic bottles and cartridges. These bottles are designed to prevent release of the toner until the removal of the shutter or sealing tape. Under normal use (ie photocopying and printing) the toner is transferred onto a sheet of paper where it is firmly fixed to the surface by heat. Thus the polymer will be fixed into the cured toner and release to the environment will be negligible. Waste paper containing the toner (and thus the notified polymer) will eventually be sent to landfill, recycled or incinerated.

Release of the notified polymer will also occur through the disposal of bottles and cartridges containing residues of the toner. The expected volume of residue remaining in bottles and cartridges will be about 10 g and 30 g, respectively. However, as the toner contains less than 10% of the notified polymer, the quantity of polymer released in this fashion would be less than 1.0 g and 3.0 g respectively. The spent toner bottles and cartridges will be disposed of as normal office waste,

which in turn will go to landfill. This represents a maximum of 762 kg of the notified polymer per year (assuming an annual import of 10 tonnes of the polymer, with twice as many cartridges imported as bottles and empty bottles and cartridges disposed to landfill). The notifier has indicated that toner cartridges would be collected and shipped abroad for recycling. This would reduce the quantity of the notified polymer disposed of to landfill annually to 95 kg (bottles only). The disposal of cartridges (not recycled) and bottles would be widespread across Australia.

Environmental release during transport due to accidental spillage will be limited due to the toner being supplied in discrete, small volume, plastic containers and cartridges.

Environmental exposure to the notified substance could occur when paper containing the polymer is disposed of. As such, release to the environment may occur during paper recycling and this is explored in the sections below.

### **Fate**

The polymer will most likely share the fate of its paper substrate, and be disposed of to landfill, recycled or incinerated. Small quantities, such as residual toner in empty containers, will also be disposed of to landfill. Polymer disposed of to landfill is unlikely to leach or contaminate surface water because of its low water solubility and expected high partition coefficient.

Paper recycling is a growing industry in Australia. Waste paper is repulped using a variety of alkalis, dispersing agents, wetting agents, water emulsifiable organic solvents and bleaching agents. These chemicals enhance the fibre separation, ink detachment from the fibres and pulp brightness and hence the whiteness of the paper. After pulping, the contaminants and the ink are separated from the fibres by pumping the stock through various heat washing, screening, cleaning, flotation and dispersion stages. The notifier has provided no data on the likely behaviour of the polymer during the recycling process. The hydrolysis of ester linkages under alkaline conditions will be minimal due to the low solubility of the polymer. The polymer therefore is likely to survive the paper recycling conditions, either remaining bound to the pulp or becoming associated with the sludge. In the latter case, the polymer will arrive in landfill where it can be expected to remain intact, or be destroyed through incineration.

Incineration of paper and combustion of the notified polymer in the presence of excess air will result in products of oxides of carbon and water.

## 9. EVALUATION OF TOXICOLOGICAL DATA

No toxicology data were provided, which is acceptable for polymers of NAMW greater than 1 000 according to the Act. The submission refers to toxicity results for a similar polyester resin; the primary reports were not sighted and the results have not been verified. The results were as follows:

- acute oral toxicity, rat, LD<sub>50</sub> > 5 000 mg/kg
- non irritant in rabbit eye irritation study
- non irritant in rabbit skin irritation study
- not a mutagen in a *Salmonella typhimurium* reverse mutation assay

## 10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

No ecotoxicology data were provided, which is acceptable for polymers of NAMW greater than 1 000 according to the Act.

Biological membranes are not permeable to polymers of very large molecular size and therefore bioaccumulation of the notified polymer is not expected (5,6).

## 11. ASSESSMENT OF ENVIRONMENTAL HAZARD

The majority of notified polymer should not enter the environment until it is incorporated into a polymer matrix when the toner is heat-cured and fixed to paper.

Disposal of the waste paper containing the toner is normally through landfill, incineration or recycling. In landfill the toner (and thus notified polymer) should remain fixed to the paper substrate and remain immobile. Incineration products of the notified polymer should not produce an environmental hazard. After the recycling process, the toner will either remain bound to the pulp or become associated with sludge. In the latter case, the final destination is likely to be landfill where the toner can be expected to persist but remain immobile and bound to the sludge.

Accidental spillage of the polymer, either during replacement of cartridges or during transport, should result in powder wastes being sent to either landfill or incineration facilities. Spent cartridges (not sent for recycling) and bottles containing residues of toner are likely to be sent to landfill. As a worst case, a maximum of 1.0 tonne of the notified polymer could be sent to landfill at maximum import quantities, assuming only cartridges are imported. However, the notifier has indicated that there is a printer-cartridge recycling programme in Australia in which the used cartridges, once collected, are sent overseas for recycling and re-use. The notifier has also indicated they expect to import toner bottles and cartridges in a 1:2 ratio. Used toner bottles contain considerably less residue than the used cartridges. Hence, the actual volume of toner disposed of and thus notified polymer, to landfill, will be significantly less. The disposal of cartridges and bottles would be widespread across Australia.

Environmental exposure and the overall environmental hazard through the chemical's importation should be negligible.

## **12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS**

The notified polymer is a polyester resin of high molecular weight with less than 0.5% of low molecular weight impurities and less than 5% of polymers with a NAMW less than 1 000. No toxicology is required for compounds of this type, however summary data has been provided in a Material Safety Data Sheet (MSDS), based on polyester resins of similar composition. The toxicity data indicates that polymers of this type have a low oral toxicity and are not either eye or skin irritants and are non-mutagenic in reverse mutation assays. The finished toner however may be a slight physical irritant to the eyes and upper respiratory tract. The notified polymer contains a single hazardous impurity, the polymerisation catalyst, at less than 0.5% by weight. As this corrosive component will be at less than 0.05% in the imported product and will be bound in the resin and immobilised during the printing process, the hazard from this compound is likely to be low. On the basis of data provided by the notifier including summary information on a similar polyester resin the notified polymer would not be classified as hazardous according to the criteria of Worksafe Australia (7).

Occupational exposure may potentially occur during replacement of toner in photocopy machines. The use of tape sealed cartridges and bottles with shutters will limit exposure. A higher level of exposure may occur during maintenance of photocopying equipment however it is very unlikely that the relevant exposure standard (10 mg/m<sup>3</sup>) will ever be attained. The particle size distribution of the notified polymer indicates that in any event only a very small proportion would be respirable. There is very low risk associated with occupational exposure to the notified polymer. In the event of significant release of toner from a cartridge or bottle it would be appropriate to use respiratory and eye protection when cleaning up. This is due to the possibility of eye and respiratory irritation through significant exposure to the imported formulation.

Public exposure to Polyester Resin NT-7 and its impurities will occur primarily through contact with printed documents where they are bound to the paper. The notified polymer represents a low risk to public health.

## **13. RECOMMENDATIONS**

To minimise occupational exposure to Polyester Resin NT-7 the following guidelines and precautions should be observed:

- Work areas around printers should be well ventilated and good work practices should be implemented to avoid the generation of dusts; such as taking care to avoid contact with the toner adhering to the plastic tape which



seals the cartridge and if contact occurs removing toner immediately by washing.

- Spillage of toner products should be avoided and good personnel hygiene should be practiced to minimise the potential for ingestion.
- A copy of the MSDS and/or information about the toners containing Polyester Resin NT-7 should be easily accessible to employees.
- if ventilation and work practices are insufficient to reduce exposure to the toner formulation containing Polyester Resin NT-7, to a safe level, as may occur during copier maintenance or due to accidental spillage of the toner formulation then personal protective devices which conform to and are used in accordance with Australian Standards (AS) and Australian Standard/New Zealand Standard for eye protection (AS 1336, AS/NZS 1337) (8,9) should be used. The appropriate respiratory device should be selected and used in accordance to (AS/NZS) 1715 (10) and should comply with AS/NZS 1716 (11);

#### **14. MATERIAL SAFETY DATA SHEET**

The MSDS for the toner containing the notified chemical was provided in a format similar to that specified by the *National Code of Practice for the Preparation of Material Safety Data Sheets* (12).

This MSDS was provided by the applicant as part of the notification statement. It is reproduced here as a matter of public record. The accuracy of this information remains the responsibility of the applicant.

#### **15. REQUIREMENTS FOR SECONDARY NOTIFICATION**

Under the Act, secondary notification of the notified chemical 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**

1. National Occupational Health and Safety Commission 1995, 'Adopted National Exposure Standards for Atmospheric Contaminants in the Occupational Environment', [NOHSC:1003(1995)], in *Exposure Standards for Atmospheric Contaminants in the Occupational Environment: Guidance Note and National Exposure Standards*, Australian Government Publishing Service Publ., Canberra.
2. National Occupational Health and Safety Commission 1994, *List of Designated Hazardous Substances* [NOHSC:10005(1994)], Australian Government Publishing Service Publ., Canberra.

3. Toxline Silver Platter 1995, *Toxline SilverPlatter CD-ROM database, January 1994-December 1995*, Silver Platter International N.V.
4. Sax, N. I. & Lewis, R. J. 1989, *Dangerous Properties of Industrial Materials*, Van Nostrand Reinhold, New York.
5. Anliker, R., Moser, P. & Poppinger, D. 1988, "Bioaccumulation of dyestuffs and organic pigments in fish. Relationships to hydrophobicity and steric factors". *Chemosphere* 17(8):1631-1644.
6. Gobas, F. A. P. C., Opperhuizen, A. & Hutzinger, O. 1986 "Bioconcentration of hydrophobic chemicals in fish: relationship with membrane permeation". *Environmental Toxicology and Chemistry* 5:637-646.
7. National Occupational Health and Safety Commission 1994, *Approved Criteria for Classifying Hazardous Substances* [NOHSC:1008(1994)], Australian Government Publishing Service, Canberra.
8. Standards Australia 1994, *Australian Standard 1336-1994, Eye protection in the Industrial Environment*, Standards Association of Australia Publ., Sydney.
9. Standards Australia/Standards New Zealand 1992, *Australian/New Zealand Standard 1337-1992, Eye Protectors for Industrial Applications*, Standards Association of Australia Publ., Sydney, Standards Association of New Zealand Publ, Wellington.
10. Standards Australia/Standards New Zealand 1994, *Australian/New Zealand Standard 1715-1994, Selection, Use and Maintenance of Respiratory Protective Devices*, Standards Association of Australia Publ., Sydney, Standards Association of New Zealand Publ, Wellington.
11. Standards Australia/Standards New Zealand 1994, *Australian/New Zealand Standard 1716-1994, Respiratory Protective Devices*, Standards Association of Australia Publ., Sydney, Standards Association of New Zealand Publ, Wellington.
12. National Occupational Health and Safety Commission 1994, *National Code of Practice for the Preparation of Material Safety Data Sheets* [NOHSC:2011(1994)], Australian Government Publishing Service, Canberra.