File No: NA/513

Date: July 1997

NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

Tuftone HB-580

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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

Tuftone HB-580

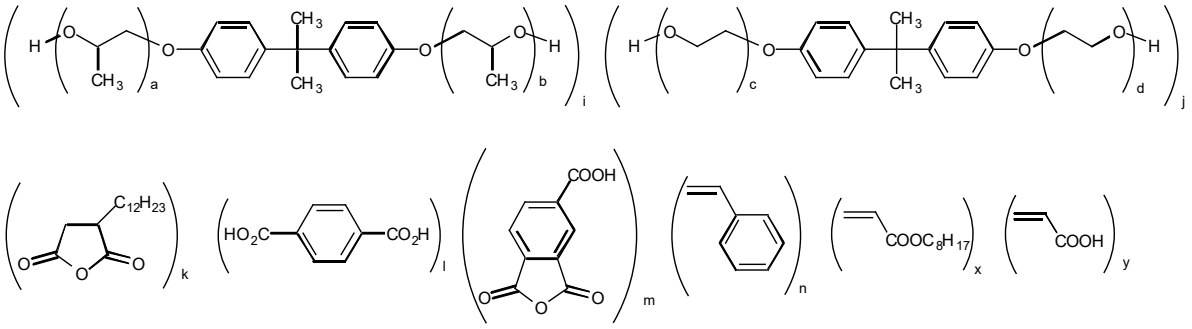
1. APPLICANT

Brother Industries (Aust) Pty Ltd of 7 Khartoum Road NORTH RYDE NSW 2113 has submitted a limited notification statement in support of their application for an assessment certificate for 1,4-benzenedicarboxylic acid, polymer with 1,3-dihydro-1,3-dioxo-5-isobenzofurancarboxylic acid, dihydro-3-(tetrapropenyl)-2,5-furandione, ethenylbenzene, 2-ethylhexyl 2-propenoate and α,α'-[(1-methylethylidene)-di-4,1-phenylene]bis[ω-hydroxypoly(oxy-1,2-ethanediyl)], α,α'-[(1-methylethylidene)di-4,1-phenylene]bis[ω-hydroxypoly[oxy(methyl-1,2-ethanediyl)]] and 2-propenoic acid, graft, bis(1-methyl-1-phenylethyl) peroxide-initiated; hereafter referred to as Tuftone HB-580. The notifier has made no claims for exempt information relating to Tuftone HB-580, and the assessment report is published here in its entirety.

2. IDENTITY OF THE CHEMICAL

Chemical Name:	1,4-benzenedicarboxylic acid, polymer with 1,3-dihydro-1,3-dioxo-5-isobenzofurancarboxylic acid, dihydro-3-(tetrapropenyl)-2,5-furandione, ethenylbenzene, 2-ethylhexyl 2-propenoate and α,α'-[(1-methylethylidene)-di-4,1-phenylene]bis[ω-hydroxypoly(oxy-1,2-ethanediyl)], α,α'-[(1-methylethylidene)di-4,1-phenylene]bis[ω-hydroxypoly[oxy(methyl-1,2-ethanediyl)]] and 2-propenoic acid, graft, bis(1-methyl-1-phenylethyl) peroxide-initiated
Chemical Abstracts Service (CAS) Registry No.:	149367-99-7
Other Names:	polyester/styrene-acrylic grafted resin
Trade Name:	Tuftone HB-580

Molecular and Structural Formula:



$\bar{a}$, $\bar{b}$, $\bar{c}$, $\bar{d}$ = 1~1.5

Number-Average Molecular Weight (NAMW): 2 850

Weight-Average Molecular Weight 4 002

Maximum Percentage of Low Molecular Weight Species

Molecular Weight < 500: 4.03%

Molecular Weight < 1 000: 9.36%

Weight Percentage of Ingredients:

Name	*CAS Number*	*% Weight*
α,α'-((1-methylethylidene) di-4,1-phenylene) bis (ω-hydroxy-poly(oxy(methyl-1,2-ethandiyl)))	37353-75-6	20-60
α,α'-((1-methylethylidene)di-4,1-phenylene) bis (ω-hydroxypoly(oxy-1,2-ethanediyl))	32492-61-8	0.5-25
1,4-benzenedicarboxylic acid	100-21-0	5-25
1,3-dihydro-1,3-dioxo-5-isobenzofurancarboxylic acid	552-30-7	0.5-15
dihydro-3-(tetrapropenyl)-2,5-furandione	26544-38-7	0.5-15
2-propenoic acid 2-ethylhexyl ester	103-11-7	1-10
ethenylbenzene (styrene)	100-42-5	10-40
2-propenoic acid	79-10-7	0.1-10
dibutyltin oxide (catalyst)	818-08-6	0.1-0.5
dicumyl peroxide	80-43-3	0.1-10

Method of Detection and Determination: infrared and gel permeation chromatography

Spectral Data: characteristic peaks in the infrared spectrum include: 691,826, 1 111, 1 171, 1 239, 1 157,

1 507, 1 599, 1 726, 2 929 cm^{-1}

3. PHYSICAL AND CHEMICAL PROPERTIES

Appearance at 20°C and 101.3 kPa:	pale yellow solid
Melting Point:	88.0-155.0°C
Specific Gravity:	1.12
Vapour Pressure:	1.7 x 10^{-10} kPa
Water Solubility:	< 1 mg/L
Partition Co-efficient (n-octanol/water):	not determined (see comments below)
Hydrolysis as a Function of pH:	not determined (see comments below)
Adsorption/Desorption:	not determined (see comments below)
Dissociation Constant:	not determined (see comments below)
Flash Point:	not determined
Flammability Limits:	not extremely or highly flammable
Autoignition Temperature:	no self-ignition below melting temperature
Explosive Properties:	not explosive
Reactivity/Stability:	not oxidising

Comments on Physico-Chemical Properties

Tests were performed according to EEC/OECD test guidelines (1, 2) at facilities complying with OECD Principles of Good Laboratory Practice.

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:

- Hydrolysis of the ester and ether linkages of the polymer would not be expected under environmental conditions;
- on the basis of the polymer's low water solubility it is likely have a high partition coefficient and to adsorb to, or be associated with, soil/sediment and organic

matter and be immobile in soil; and

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

4. PURITY OF THE CHEMICAL

Degree of Purity: typical concentration 92%; range: 90-100%

Toxic or Hazardous Impurities: none

Non-hazardous Impurities (Residual Monomers):

Name	*CAS Number*	*Weight*
α,α'-((1-methylethylidene) di-4,1-phenylene) bis (ω-hydroxy-poly(oxy(methyl-1,2-ethandiyl)))	37353-75-6	typical concentration: 7.1% range: 1-10%

Additives/Adjuvants: none

5. USE, VOLUME AND FORMULATION

The notified polymer will not be manufactured in Australia. It will be imported as a component (27-28%) of Toner N1, in 100 g cartridges, which will be used in printers.

Estimated import volumes are as follows:

Year	*1*	*2*	*3*	*4*	*5*
Import Volume (tonnes)	0.9	1.6	1.8	1.8	1.8

6. OCCUPATIONAL EXPOSURE

The notified polymer will be imported and stored by the notifier prior to sale and transportation to customer sites. Transport and storage workers are unlikely to be exposed to the notified polymer under normal circumstances.

Minimal worker exposure to the notified polymer is expected, as it will be imported as a component of printer toner, and will be contained within cartridges which will not be opened under normal circumstances.

Printer service personnel may be dermally exposed to minimal amounts of toner dust while cleaning the inside and exterior of printer units. The notifier has estimated that each service worker would spend approximately 16 hours per year working on machines that use toner containing the notified polymer. Exposure by inhalation

may also occur, although the amount of dust around printers is expected to be minimal, and the notified chemical makes up less than 28% of the toner product.

Office workers may also come into contact with small amounts of toner containing the notified polymer when printer cartridges need replacing (approximately once every 6 months). Dermal exposure would once again be the main route of exposure. Minimal inhalation exposure may occur if low levels of toner are present around operating printing equipment.

There will be frequent and widespread worker contact with paper printed with the toners containing the notified polymer. The notified polymer will be fixed to the paper as part of the toner product and will therefore not be bioavailable at this stage.

7. PUBLIC EXPOSURE

The notified polymer will not be sold directly to the public and will only be available for use in tightly sealed toner cartridges. The notified polymer will enter the public domain only through printed paper, in which form it is fused and fixed, therefore direct public exposure should not occur.

8. ENVIRONMENTAL EXPOSURE

Release

The notified polymer, as a component of a pre-formulated toner, will be imported in cartridges. Under normal use 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 cartridges containing residues of the toner. The expected volume of residue remaining in cartridges will be about 5 to 10 g. However, as the toner contains less than 28% of the notified polymer, the quantity of polymer released in this fashion would be less than 3 g per cartridge. This represents a maximum of 180 kg of the notified polymer per year (assuming an annual import of 1.8 tonnes of the polymer). The spent cartridges will be disposed to landfill. The disposal of cartridges would be widespread across Australia.

Environmental release during transport due to accidental spillage will be limited due to the toner being supplied in small volume 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, as residual toner in empty containers, will also be disposed of by 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 toxicological information was provided for the notified polymer, which is acceptable for polymers with a NAMW greater than 1 000, according to the Act.

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 (3, 4).

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

The majority of notified polymer should not enter the environment until it is incorporated into the heat-cured toner matrix 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 containing residues of toner are likely to be sent to landfill. As a worst case, a maximum of 180 kg of the notified polymer could be sent to landfill at maximum import quantities. The disposal of cartridges would be widespread across Australia.

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

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

No toxicology data on the polymer have been submitted. The Material Safety Data Sheet (MSDS) supplied for the toner containing Tuftone HB-50 states that the acute oral LD_{50} for this product is greater than 2 000 mg/kg in rats. This document also states that inhalation studies carried out on rats exposed to 'a typical toner' indicated mild to moderate lung fibrosis occurred in 92% of rats at 16 mg/m^3. No pulmonary change was observed at 1 mg/m^3, the latter being considered by the notifier as the 'most relevant level to potential human exposures'. The NAMW of the polymer is 2 850, which should minimise passage across biological membranes. The vapour pressure and water solubility of the notified polymer are very low.

The occupational health risk to transport and storage workers is considered to be negligible, as they will be only be exposed to the notified polymer in the event of an accident or damage to packaging.

Office workers are not expected to come into contact with the notified polymer under normal circumstances. Design of the toner cartridges is such that exposure to Tuftone HB-50 should be minimal. Minor dermal exposure may occur during changing of printer cartridges if a small quantity of toner is present around the printer. There may be a low level of toner dust in the immediate vicinity of printers when they are operating, although inhalation exposure to the notified polymer (which is at a concentration of < 28% within the toner) is expected to be negligible. Exposure to the notified polymer is not expected to occur once the toner is bound to paper. Based on expected low toxicity of the polymer and the expected very low exposures, the health risk posed to office workers is negligible.

Likewise, a low occupational health risk exists for repair workers, who may be dermally or inhalationally exposed to low concentrations of the notified polymer (possibly more frequently than office workers) when carrying out printer repair or maintenance.

Public exposure to the notified polymer is possible in the event of an accident during transport and storage. The likelihood of a substantial spill occurring is low, in view of

the packaging and the small amount of the notified polymer in each toner cartridge (less than 27-28 g). Public contact with the notified polymer may also occur through handling printed pages, but as this is in a fused, fixed form, and as the water solubility of the polymer is low, the potential for public exposure is negligible.

Based on the information provided and the intended use, the notified polymer does not appear to represent a significant hazard to public health.

13. RECOMMENDATIONS

To minimise occupational exposure to Tuftone HB-50 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;
- Spillage of toner products containing the notified polymer should be avoided and good personal hygiene should be practised to minimise the potential for ingestion;
- A copy of the MSDS and/or product information sheets for toners containing the notified polymer should be easily accessible to employees.

14. MATERIAL SAFETY DATA SHEET

The MSDS for the notified polymer was provided in accordance with the *National Code of Practice for the Preparation of Material Safety Data Sheets* (5).

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 polymer 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. European Economic Community (EEC) 1992, 'Methods for the Determination of Physico-Chemical Properties', in *EEC Directive 92/69, Annex V, Part A, EEC Publication No. L383*, EEC.

2. Organisation for Economic Co-operation and Development 1995-1996, *OECD Guidelines for the Testing of Chemicals on CD-Rom*, OECD, Paris.

3. Anliker, R., Moser, P. & Poppinger, D. 1988, 'Bioaccumulation of dyestuffs and organic pigments in fish. Relationships to hydrophobicity and steric factors', *Chemosphere*, vol. 17, no. 8, pp. 1631-1644.

4. Gobas, F.A.P.C., Opperhuizen, A. & Hutzinger, O. 1986, 'Bioconcentration of hydrophobic chemicals in fish: relationship with membrane permeation', *Environmental Toxicology and Chemistry*, vol. 5, pp. 637-646.

5. 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.