

File No: NA/687

May 1999

**NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION
AND ASSESSMENT SCHEME**

FULL PUBLIC REPORT

Tuftone HB-580 / Tuftone STR-333H / Tuftone HB-308

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

Postal Address: GPO Box 58, Sydney 2001, AUSTRALIA

Telephone: (61) (02) 9577-9514 FAX (61) (02) 9577-9465

Director
Chemicals Notification and Assessment

FULL PUBLIC REPORT**Tuftone HB-580 / Tuftone STR-333H / Tuftone HB-308****1. APPLICANT**

Kyocera Electronics Australia Pty Ltd of Unit 6, 112 Talavera Road, NORTH RYDE, NSW 2113 has submitted a limited notification statement in support of their application for an assessment certificate for the polymer in Tuftone HB-580 / Tuftone STR-333H / Tuftone HB-308.

2. IDENTITY OF THE CHEMICAL

The notifier has made no claims for any information to be exempted from the Full Public and Summary Reports.

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, 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-phenylethyl) peroxide-initiated

Chemical Abstracts Service (CAS) Registry No.: 149367-99-7

Other Names: Tuftone HB-580, Tuftone STR-333H, Tuftone HB-308

Trade Names: Tuftone HB-580, Tuftone STR-333H, Tuftone HB-308

Number-Average Molecular Weight (NAMW): 2 850

Weight-Average Molecular Weight: 40 020

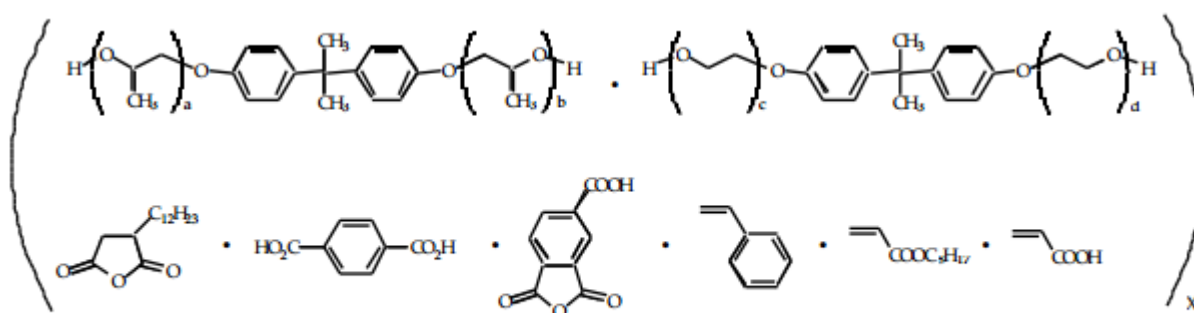
Maximum Percentage of Low Molecular Weight Species

Molecular Weight < 500: 4.03%
Molecular Weight < 1 000: 9.36%

Molecular Formula:

$(C_3H_6O)_a C_{15}H_{14}O_2 \cdot (C_2H_4O)_c C_{15}H_{16}O_2 \cdot C_{16}H_{26}O_3 \cdot C_8H_6O_4 \cdot C_9H_4O_5 \cdot C_8H_8 \cdot C_{11}H_{20}O_2 \cdot C_3H_4O_2$

Structural Formula:



$a, b, c, d = 1 \sim 1.5$

Weight Percentage of Ingredients:

<i>Chemical Name</i>	<i>CAS No.</i>	<i>Weight %</i>
1,4-benzenedicarboxylic acid (p-phthalic acid)	100-21-0	5-25
1,3-dihydro-1,3-dioxo-5-isobenzofurancarboxylic acid (4-carboxyphthalic anhydride)	552-30-7	0.5-15
dihydro-3-(tetrapropenyl)-2,5-furandione (tetrapropenyl succinic anhydride)	26544-38-7	0.5-15
ethenylbenzene (styrene)	100-42-5	10-40
2-ethylhexyl-2-propenoate (2-ethylhexyl acrylate)	103-11-7	1-10
α, α' -((1-methylethylidene) di-4,1-phenylene) bis hydroxypoly(oxy-1,2-ethanediyl)) (bisphenol A bis(polyethyleneglycol) ether)	ω -32492-61-8	0.5-25
α, α' -((1-methylethylidene) di-4,1-phenylene) bis hydroxypoly(oxy(methyl-1,2-ethanediyl)) (bisphenol A bis(polypropyleneglycol) ether)	ω -37353-75-6	20-60
2-propenoic acid	79-10-7	0.1-10

(acrylic acid)		
bis (1-methyl-1-phenylethyl) peroxide	80-43-3	0.1-10
(dicumyl peroxide)		
dibutyltin oxide	818-08-6	0.1-0.5

Method of Detection and Determination: data from gel permeation chromatography and infrared (IR) spectroscopy were provided for the notified polymer

Spectral Data: IR major peaks at 555, 691, 826, 1 111, 1 239, 1 457, 1 507, 1 600, 1 726 and 2 929 cm^{-1}

3. PHYSICAL AND CHEMICAL PROPERTIES

Appearance at 20°C and 101.3 kPa: pale yellow powder

Particle size: 9.2% by mass is smaller than 75 μm

Particle size range	% w/w
> 400	50.3
125-400	33.8
75-125	6.7
30-75	8.1
10-30	1.1
< 10	0

Melting Range: 88-155°C

Specific Gravity: 1.12

Vapour Pressure: 1.7×10^{-10} kPa at 25°C

Water Solubility: <1mg/L at 20°C

Partition Co-efficient (n-octanol/water): no data presented; see comments below

Hydrolysis as a Function of pH: no data presented; see comments below

Adsorption/Desorption: no data presented; see comments below

Dissociation Constant: no data presented; see comments below

Flash Point:	not applicable; chemical is a solid at room temperature
Flammability Limits:	the notified chemical is not regarded as flammable
Autoignition Temperature:	no self ignition below melting temperatures
Explosive Properties:	no explosive properties
Reactivity:	no oxidising properties

Comments on Physico-Chemical Properties

Tests were performed according to EEC/OECD test guidelines 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 water solubility of the polymer. These data gaps are accepted because hydrolysis of the ester and ether linkages of the polymer would not be expected under environmental conditions. As the polymer has low water solubility it is likely to have a high log P_{OW} and 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, that are expected to have typical acidity.

4. PURITY OF THE CHEMICAL

Degree of Purity: 97% w/w (95-100%)

Non-hazardous Impurities (> 1% by weight):

Chemical name: α,α' -((1-methylethylidene) di-4,1-phenylene) bis (ω -hydroxypoly(oxy(methyl-1,2-ethanediyl)))

Synonyms: bisphenol A bis(polypropyleneglycol) ether

Weight percentage: 3.1% (range 1-5%)

CAS No.: 37353-75-6

Comments: may cause skin and eye irritation (from Material Safety Data Sheet (MSDS))

Additives/Adjuvants: none

5. USE, VOLUME AND FORMULATION

The notified chemical is a polyester/styrene-acrylic grafted polymer and will be used in the printing industry as a binder resin in toner for electrophotography. It will be imported as a component (85% by weight) of the copier/printer toner, *Toner NI*, in 100 g cartridges. The amounts that will be imported over the next five years are as follows :

1999	1.9 tonnes
2000	2.6 tonnes
2001	2.7 tonnes
2002	2.7 tonnes
2003	2.7 tonnes .

All manufacturing, formulation and packaging of the toner will be performed prior to importation.

6. OCCUPATIONAL EXPOSURE

The notified polymer is a component (85%) of an imported toner product, which is also in powder form. Boxes of toner cartridges will be transported to customers in the printing industry. No reformulation or repackaging will take place. Hence, no exposure to the notified polymer in the toner, is expected during transportation and storage other than for accidental spillage.

Since the toner is imported ready to use, the notifier has not provided any information on the number and categories of workers or nature of work done subsequent to importation. Typically, occupational exposure to the toner would be experienced by copier/ printer service personnel and office or printing staff using the machines and replacing or inserting new toner cartridges. When in use, the toner is completely sealed in the developing unit of the printer. The notifier states that protective equipment is not necessary for persons exposed to the toner.

The notifier estimates that the amount of general airborne dust, including toner dust, around the printer would be approximately 0.02 mg/m³.

Inhalation and dermal exposure to the toner powder may occur during toner replacement, particularly in the event of a container leak or spill, however this is a rare event. Office workers would not normally wear protective equipment.

Exposure may occur upon handling printed matter with the toner applied. However, less than 50mg of toner is used per legal sheet of paper, and it becomes fixed once applied to the printed surface. These considerations indicate there would be no human exposure to the notified chemical during the handling of printed materials.

7. PUBLIC EXPOSURE

The toner powder containing the notified polymer will only be used by industrial printing firms; therefore, public contact will only occur from touching the fixed toner on paper. The notifier states that the toner is fused to the paper and, under normal conditions, release from the surface is unlikely to occur. Consequently, the potential for public exposure to the notified polymer during all phases of its life cycle is considered to be negligible.

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 notifier has indicated that the amount of residue left in the cartridges after use is between 1-5%. The expected volume of residue remaining in the cartridges will be about 1-5 g. However, as the toner contains approximately 30% of the notified polymer, the maximum quantity of polymer released in this fashion would be less than 0.03-1.6 g per cartridge. This represents a maximum of 43.2 kg of the notified polymer per year (assuming an annual import of 2.7 tonnes of the polymer). The spent cartridges will be disposed of to landfill. The disposal of cartridges would be widespread across Australia.

Environmental release during transport due to accidental spillage will be limited because the toner is supplied in small volume cartridges.

Environmental exposure to the notified substance could occur during disposal or recycling paper containing the polymer (see 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 spent 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, water emulsifiable organic solvents and dispersing, bleaching and wetting 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.

Biological membranes are not permeable to polymers of very large molecular size and therefore bioaccumulation of the notified polymer is not expected (Anliker *et al.*, 1988; Gobas *et al.*, 1986).

9. EVALUATION OF TOXICOLOGICAL DATA

No toxicological data were provided for the notified polymer. This is acceptable for polymers of number-average molecular weight (NAMW) of greater than 1000 daltons.

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

No ecotoxicological data were provided for the notified polymer. This is acceptable for polymers of number-average molecular weight (NAMW) of greater than 1000 daltons.

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 the 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 231 kg of the notified polymer could be sent to landfill at maximum import quantities. The disposal of cartridges would be widespread across Australia.

The notified polymer is not likely to present a hazard to the environment when it is stored, transported and used in the proposed manner. Environmental exposure and the overall environmental hazard through the chemical's introduction and use should be negligible.

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

There is no toxicological data available on the notified polymer. However the notifier has determined that neither the notified polymer, nor the toner, would be a hazardous substance, under the National Occupational Health and Safety Commission *Approved Criteria for Classifying Hazardous Substances* (NOHSC, 1994b). The notified polymer in powder form is comprised of particles larger than the respirable range (i.e. all particles are $>10\mu\text{m}$ in size). However, approximately 20-25% w/w of particles are within the inspirable range ($<180\mu\text{m}$) and may be lodged in the upper respiratory tract and may lead to respiratory irritation. The main residual monomer of the notified chemical may cause skin and eye irritation. However, as it is not a hazardous substance and is present in the polymer preparation at 3.1% it is unlikely to be a source of irritation in the imported toner product.

Occupational Health and Safety

The notifier states that toner powder containing the notified polymer will be used by industrial printing firms. Training on how to handle the process unit and toner cartridge (containing the notified polymer) will be given to all personnel concerned. To date there are no records of injuries, diseases or incidence related to workers exposed to the test substance.

Service personnel may be exposed to the notified polymer when cleaning printer/copier equipment and replacing the toner cartridges; however, as neither the notified polymer or the toner product is hazardous the risk of adverse health effects is low. Disposable gloves may be worn to prevent skin irritation and workers should avoid any the generation of dust when handling the toner.

Printing and office staff who replace toner cartridges may be exposed on occasions to the notified polymer. Upon application to the paper, the toner is fused to the surface and release is unlikely to occur. Therefore, the risk of adverse health effects to personnel is very low and no protective equipment is required. Nevertheless, any generation of dust should be avoided.

The notifier estimates that the general dust, including toner dust, in the vicinity of the copier/printer is 0.02 mg/m^3 . No justification for this value was provided, however it is noted that it falls below the NOHSC exposure standard for carbon black (3 mg/m^3 , time weighted average), a component in the toner product. Employers are responsible for ensuring the NOHSC exposure standard is not exceeded in the workplace. It is unlikely that atmospheric monitoring would be required in typical copier/printer locations.

Spilt residues should be swept up manually or using an industrial vacuum cleaner and placed within a waste container.

Given these considerations, the chemical will not pose a significant health risk in the occupational environment.

Workers handling printed paper are not at risk of adverse health effects because the polymer is fixed to the paper and not available for exposure or dermal uptake.

Public Health

Based on its use pattern, physico-chemical properties and low toxicity, the notified polymer will not pose a significant hazard to public health.

13. RECOMMENDATIONS

To minimise occupational exposure to the notified polymer, the following guidelines and precautions should be observed :

- Avoid generation of dust clouds when handling the toner;
- Service operators should wear disposable, rubber gloves when handling toner;
- Spillage of the notified chemical should be avoided. Spillages should be cleaned up promptly with absorbents which should be put into containers for disposal;
- Good personal hygiene should be practised to minimise the potential for ingestion;
- A copy of the appropriate MSDS should be easily accessible to employees .

The NOHSC exposure standard for carbon black should not be exceeded in the workplace.

14. MATERIAL SAFETY DATA SHEET

MSDS for the notified polymer (Tuftone HB-580) and a toner end use product containing the notified polymer were provided in a format consistent with the *National Code of Practice for the Preparation of Material Safety Data Sheets* (NOHSC, 1994c).

These MSDS were 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

Anliker R, Moser P and Poppinger D (1988) Bioaccumulation of dyestuffs and organic pigments in fish. Relationships to hydrophobicity and steric factors. *Chemosphere* **17(8)**, 1631-1644.

European Commission (1992) *Methods for the Determination of Physico-Chemical Properties, Part A, Commission Directive 92/69/EC*. Official Journal of the European Communities No. L383A.

Gobas FAPC, Opperhuizen A and Hutzinger O (1986) Bioconcentration of hydrophobic chemicals in fish: relationship with membrane permeation. *Environmental Toxicology and Chemistry* **5**, 637-646.

National Occupational Health and Safety Commission (1994a) *List of Designated Hazardous Substances* [NOHSC:10005(1994)]. Australian Government Publishing Service, Canberra.

National Occupational Health and Safety Commission (1994b) *Approved Criteria for Classifying Hazardous Substances* [NOHSC:1008(1994)]. Australian Government Publishing Service, Canberra.

National Occupational Health and Safety Commission (1994c) *National Code of Practice for the Preparation of Material Safety Data Sheets* [NOHSC:2011(1994)]. Australian Government Publishing Service, Canberra.

Organisation for Economic Co-operation and Development (1981) *OECD Guidelines for Testing of Chemicals*. OECD, Paris.