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May 2000

**NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION
AND ASSESSMENT SCHEME**

FULL PUBLIC REPORT

Polymer in BR-02

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Director
Chemicals Notification and Assessment

FULL PUBLIC REPORT**Polymer in BR-02****1. APPLICANT**

Delacamp Australia Pty Ltd of 77-81 Mark Street NORTH MELBOURNE VIC 3051 has submitted a Polymer of Low Concern notification statement in support of their application for an assessment certificate for 'Polymer in BR-02'.

2. IDENTITY OF THE CHEMICAL

The chemical name, CAS number, molecular and structural formulae, details of the polymer composition and residual monomer concentrations, and the manufacturer's name have been exempted from publication in the Full Public Report.

Marketing Name: TN-200 (toner product)
BR-02 (toner product)

Characterisation as a Synthetic Polymer of Low Concern

**Number-Average
Molecular Weight (NAMW):** 4 128

**Weight-Average
Molecular Weight:** 125 950

Polydispersity: 30.5

**Maximum Percentage of Low
Molecular Weight Species**

Molecular Weight < 500: 1.3%

Molecular Weight < 1 000: 5.5%

Polymer Stability: Stable at room temperature and under 200°C.

Reactivity: The carboxylic acid group has a FGEW 5 000.

Charge Density: Not charged.

**Method of Detection
and Determination:** IR, GPC.

Spectral Data: Spectra of IR and GPC were provided.

The polymer meets the criteria for assessment as a synthetic polymer of low concern under Regulation 4A of the *Industrial Chemicals (Notification and Assessment) Act 1989*.

3. PHYSICAL AND CHEMICAL PROPERTIES

Appearance and 101.3 kPa:	at 20°C	Slightly yellowish pellet.
Melting Point:		130°C
Specific Gravity:		1.25
Vapour Pressure:		Not determined.
Water Solubility:		Not soluble (see comments below).
Hydrolysis:		Not expected under normal conditions.
Flash Point:		>299°C
Flammability Limits:		Not determined.
Autoignition Temperature:		>250°C
Explosive Properties:		Not provided.
Reactivity/Stability:		See above.
Particle Size:		The mean particle size is 1 552 µm with 0.02% of the particles less than 100 µm.
		> 2 000 µm: 17.8%
		1 400-2 000 µm 53.3%
		1 000-1 400 µm 17.1%
		710-1 000 µm 7.22%
		500-710 µm 2.80%
		250-500 µm 1.41%
		180-250 µm 0.22%
		150-180 µm 0.07%
		125-150 µm 0.04%
		100-125 µm 0.02%
		< 100 µm 0.02%

Comments on Physico-Chemical Properties

No test reports were supplied for the physico-chemical data. A comprehensive laboratory study on water solubility was not done. However, a limited study indicated that the notified polymer was 99.999% insoluble in water at the limit of detection which was 10 mg/L. The notifier expects the polymer to be insoluble in polar solvents such as water, since the polymer contains non-polar constituents. The notifier has indicated that a literature search found that most common commercial grade polyesters are insoluble in water, and provided a report by Pauly (1989) indicating that solubility coefficients for polyesters in a range of permeants are available but solubility coefficients in water are not.

The polymer contains ester groups that could be expected to undergo hydrolysis under extreme pH. However, due to the low water solubility this is unlikely in the environmental pH range of between 4-9.

4. PURITY OF THE CHEMICAL

Degree of Purity: >99.7%

Additives/Adjuvants:

<i>Chemical Name</i>	<i>CAS No.</i>	<i>Weight %</i>
Paraffine wax	8002-74-2	<3
Organic pigment	8005-02-5	<5
Carbon black	1333-86-4	<8

5. USE, VOLUME AND FORMULATION

The notified polymer is a component in a toner product for printers and photocopiers.

The toner product, BR-02 containing greater than 84% of the notified polymer will be imported in leak-tight polyethylene bags, each containing 20 kg of toner. The bags are packed in cartons. The toner product will be repacked into cartridges and bottles at 90 g each in Australia.

Less than 10 tonnes of the notified polymer will be imported annually in the first 5 years.

<i>Year</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
BR-02 (tonne)	6	10	12	12	12
The polymer in BR-02 (tonne)	5	8.4	10	10	10

6. OCCUPATIONAL EXPOSURE

Transport and storage

Waterside, warehouse and transport workers are unlikely to be exposed to the notified polymer under normal circumstances. Exposure is only possible in the event of a spill.

Repackaging

Several workers (number not specified) will be involved in repackaging the toner product into cartridges and bottles, at one site in Australia. Workers will unpack the polyethylene bags and load the toner into a hopper. Filling the toner into cartridges and bottles is an automatic process. The equipment is cleaned daily with vacuum extraction unit connected to a waste bin and dry cloth.

Inhalation, dermal and ocular contamination to the toner may occur during repackaging as it is an open process. The mean particle size of the notified polymer is above the respirable and inspirable range. The distribution of particle sizes of the toner product was not provided, however it is described as a black powder. The Material Safety Data Sheet (MSDS) states that industrial controls such as local exhaust systems should be in place to keep airborne concentrations below the exposure limit. The MSDS also states that workers involved in the repackaging process will wear approved respirators, protective gloves, and safety glasses or chemical goggles.

Service personnel

Service personnel may come into dermal and respiratory contact with toner powder when cleaning and servicing printers or photocopiers. As the toner is contained within a cartridge or bottle, potential worker exposure via inhalation is not expected to be significant except in the event of a spill. In addition, it is recommended that all photocopiers, and printers be placed in well-ventilated areas.

Under most conditions, no personal protection is needed for service personnel. However, the MSDS includes recommendation for service workers to wear dust respirators when working in a dusty atmosphere, and chemical goggles when contact with the toners is likely.

Office workers

Office workers will add new toner cartridges to printers or photocopiers, or remove spent cartridges and replace them as instructed on product labels. Spent cartridges or bottles are expected to contain approximately 2 g of toner. Office workers may be exposed to toner dust by the dermal and inhalation routes if spillage occurs. Considering the design and packaging of the cartridge and bottle, worker exposure is not anticipated when the product is used in accordance with label instructions and in well ventilated areas.

Empty toner bottles and used cartridges will be placed in office waste bins.

Contact with paper printed with the toner containing the notified chemical is unlikely to result in dermal exposure, as the notified polymer will be fixed to the paper during the copying process.

7. PUBLIC EXPOSURE

There is a potential for public exposure to the notified polymer during exchange of cartridges in printers and photocopiers. In the printers, the notified polymer will become irreversibly bound to the copy paper and the potential for public exposure thereafter is negligible.

8. ENVIRONMENTAL EXPOSURE

Release

The toner containing the notified polymer will be repackaged into the cartridges/bottles using an automated filling machine. This machinery will be vacuumed out daily and the notifier estimates that <300 g/day of the toner will be lost in this way. The notifier has not quantified this figure on a per annum basis but it can be estimated that the repackaging may occur up to 300 days/annum which will result in a loss of approximately 90 kg/annum from machinery cleaning. The notifier has estimated that <5 g of the toner will remain as waste in the import bags after “emptying” and that <100 g may be lost per bag as spills during transfer, which will be vacuumed up. At an expected import volume of 12 tonnes of the toner and the import bags being 20 kg each, the number of bags to be imported will be 600/annum. The release from spills and bag residues will be approximately 63 kg/annum. This waste (63 kg toner or 52 kg notified polymer) and the waste from equipment cleaning (90 kg toner or 75 kg notified polymer) will likely be disposed of to landfill.

The toner cartridges are sealed prior to insertion into copier machines and therefore minimal environmental release is expected prior to use. When the toner is exhausted, the used cartridges are discarded to landfill. The notifier has estimated that approximately 2 g (2.2%) of toner will remain in the used cartridge, which equates to up to 264 kg of toner (219 kg of the notified polymer) annually, which is then disposed of to landfill.

Small amounts of toner may be spilt during maintenance. This material along with waste non-recycled paper will be discarded to landfill. In addition, polymer removed from recycled paper is likely to be incorporated with the waste sludge, which will then be discarded to landfill, or incinerated.

Although there is a possibility of release of this polymer during transport, the risk of adverse effects to the environment is considered to be low as the polymer is contained in individual, sealed cartridges or sealed polyethylene bags. Collection of spilt material will be disposed of to either landfill or incineration.

The waste toner generated with each copy is reused within the machine, so there is no waste toner collection container.

Fate

During recycling, waste paper is pulped and de-inked using a variety of dispersing and wetting agents, organic solvents and bleaches. After pulping, the contaminants and ink are separated from the fibres by pumping the stock through various heat washing, screening, cleaning, flotation and dispersion stages. During these processes there is the potential for hydrolysis of the polymer to occur. Polymer removed from the paper will most likely be incorporated with the sludge remaining from recycling. Sludge is likely to be discarded to landfill or incinerated. Combustion products are likely to be water and oxides of carbon and hydrogen.

The notifier has indicated that it is unlikely that used cartridges will be refilled or recycled, and they will most likely be disposed to landfill.

Once in landfill, leaching of the toner/polymer mix is unlikely to occur due to the expected insolubility of the substance. Hydrolysis is unlikely. Any polymer accidentally entering waterways would be expected to settle out onto sediments. The polymer is not expected to cross biological membranes, due to the low solubility and high molecular weight (Connell, 1989). Therefore the notified substance is not expected to bioaccumulate.

9. EVALUATION OF TOXICOLOGICAL DATA

No toxicological data were submitted.

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

No ecotoxicological data were submitted.

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

The low environmental exposure of the polymer as a result of normal use indicates that the overall environmental hazard should be low.

The repackaging process will result in a total waste release of approximately 127 kg/annum of the notified polymer (153 kg/annum of the toner) to be disposed of to landfill. Equipment cleaning will result in 75 kg/annum of this waste polymer and spills and residues remaining in the “empty” import bags will account for the other 52 kg/annum.

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. Polymer remaining in spent cartridges (up to 220 kg/annum) may also be incinerated or sent to landfill. Movement of the polymer by leaching from landfill sites is not expected.

Environmental exposure to the notified substance could occur when paper containing the polymer is recycled or disposed of. The polymer would remain either bound to waste paper, or to sludge that results from recycling processes and may be sent to landfill or incinerated.

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

No toxicological data was submitted on the notified polymer. The notified polymer is unlikely to across biological membranes due to its negligible water solubility and high number average molecular weight. The mean particle size of the notified polymer is 1552 μm with 0.02% of the particles less than 100 μm , indicating a very low proportion of particles in the respirable or inspirable range. On the basis of the submitted data, the notified polymer would not be classified as hazardous in accordance with the NOHSC *Approved Criteria for Classifying Hazardous Substances* (National Occupational Health and Safety Commission, 1999b).

The notifier provided a copy of the MSDS for the toner product, BR-02. BR-02 contains paraffin wax and carbon black which are on the NOHSC *List of Designated Hazardous Sustances* (National Occupational Health and Safety Commission, 1999a) and have NOHSC Exposure Standards (National Occupational Health and Safety Commission, 1995). The acute oral toxicity for BR-02 is expected to be low and the product is non-irritating to the skin, although the dust may be an eye and respiratory irritant. In a chronic inhalation study using a typical toner (duration not stated), rats showed mild to moderate lung fibrosis in 92% at 16 mg/m^3 , 22% at 4 mg/m^3 but no lung changes were observed at 1 mg/m^3 . The product is not mutagenic.

Occupational Health & Safety

Waterside, warehouse and transport workers will be only be exposed to the notified polymer in the toner in the event of an accident or damage to packaging. The occupational health risk to these workers is negligible, given the low toxicity hazard.

Packaging workers could be exposed to the notified polymer via dermal, ocular and inhalation routes when they open the package, load hopper and clean the filling machines. Particles of the toner product could be respiratory and eye irritants. Industrial controls such as local exhaust systems are used to keep airborne concentrations below the exposure limit. Workers wear respirators, protective gloves, and safety glasses or chemical goggles to reduce the potential for exposure. These industrial controls and personal protective equipment are considered to be sufficient to minimise the health risk to repackaging workers.

Trained service personnel will clean and service photocopiers or printers, and may be exposed to split toner. Toner particles are contained within the bottles or cartridge. Spent bottles or cartridges are expected to retain approximately 2 g toner, therefore about 1.7 g notified chemical. Placing machines in well-ventilated areas will reduce respiratory exposure. Considering the low exposure and anticipated low toxicity, the risk of health effects for workers during service activities is minimal, therefore no specific protective equipment is recommended. However, when dust is present during the service these workers are required to wear protective dust respirators and chemical goggles.

Office workers will add toners or change toner cartridges as required. The toner, hence the notified chemical, is contained within the bottle or cartridge unit. New cartridges will be removed from packaging, shaken and inserted into the machine. For bottle toners, workers will take bottles from packaging, remove the lids and add the toner to toner containers of the photocopiers. There may be some exposure to any spilt toner, however the risk of health effects resulting from dermal and respiratory exposure during addition of toner or

replacement of cartridges is low. Contact with printed paper will not result in skin contamination, as the notified chemical will be fixed to the paper as part of the toner product. Overall, the potential risk to office workers is considered to be negligible.

Public Health

There is potential for public exposure to the notified polymer from spillage of the toner during exchange of cartridges in printers and photocopiers. However, given the very high NAMW and very low proportion of particles in the respirable range, the potential for dermal and inhalational exposure of the public to the notified polymer during use of the toner cartridges is considered to be very low.

13. RECOMMENDATIONS

To minimise occupational exposure to the polymer in BR-02, the following guidelines and precautions should be observed:

- Safety goggles should be selected and fitted in accordance with Australian Standard (AS) 1336 (Standards Australia, 1994) to comply with Australian/New Zealand Standard (AS/NZS) 1337 (Standards Australia/Standards New Zealand, 1992); industrial clothing should conform to the specifications detailed in AS 2919 (Standards Australia, 1987) and AS 3765.2 (Standards Australia, 1990); impermeable gloves or mittens should conform to AS 2161 (Standards Australia/Standards New Zealand, 1998); respirator should conform to AS/NZS 1715 (Standards Australia/Standards New Zealand, 1994a) and 1716 (Standards Australia/Standards New Zealand, 1994b);
- Good personal hygiene should be practised to minimise the potential for ingestion;
- A copy of the MSDS should be easily accessible to employees;
- Work areas around photocopiers, facsimile machines and laser printers should be well ventilated. Workers using the product should implement good work practices to avoid spills and the generation of dusts;
- Spillage of the notified chemical should be avoided. Spillages should be swept up and put into containers for disposal;

If products containing the notified chemical are hazardous to health in accordance with the NOHSC *Approved Criteria for Classifying Hazardous Substances* (National Occupational Health and Safety Commission, 1999b), workplace practices and control procedures consistent with State and Territory hazardous substances regulations must be in operation.

14. MATERIAL SAFETY DATA SHEET

The MSDS for BR-02 was provided in accordance with the *National Code of Practice for the Preparation of Material Safety Data Sheets* (National Occupational Health and Safety
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Commission, 1994).

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 may be required if any of the circumstances stipulated under subsection 64(2) of the Act arise. No other specific conditions are prescribed.

16. REFERENCES

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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, Canberra.

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

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Pauly S (1989). Permeability and Diffusion Data, in Brandrup J and Immergut E (eds). Polymer Handbook. John Wiley and Sons, 3rd edition.

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Standards Australia (1990) Australian Standard 3765.2-1990, Clothing for Protection against Hazardous Chemicals Part 2 Limited protection against specific chemicals. Sydney, Standards Association of Australia.

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Standards Australia/Standards New Zealand (1992) Australian/New Zealand Standard 1337-1992, Eye Protectors for Industrial Applications. Sydney/Wellington, Standards Association of Australia/Standards Association of New Zealand.

Standards Australia/Standards New Zealand (1994a) Australian/New Zealand Standard 1715-1994, Selection, Use and Maintenance of Respiratory Protective Devices. Sydney/Wellington, Standards Association of Australia/Standards Association of New Zealand.

Standards Australia/Standards New Zealand (1994b) Australian/New Zealand Standard 1716-1994, Respiratory Protective Devices. Sydney/Wellington, Standards Association of Australia/Standards Association of New Zealand.

Standards Australia/Standards New Zealand (1998) Australian/New Zealand Standard 2161.2-1998, Occupational protective gloves, Part 2: General requirements. Sydney, Standards Association of Australia.