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NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

Polymer SPF-1

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Director
Chemicals Notification and Assessment

FULL PUBLIC REPORT

Polymer SPF-1

1. APPLICANT

Fuji Xerox of 546 Gardeners Road MASCOT NSW 2020 (ACN 000 341 819) has submitted a limited notification statement in support of their application for an assessment certificate for Polymer SPF-1.

2. IDENTITY OF THE CHEMICAL

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: Fluorinated Acrylate polymer
Polymer LEB-4015
Fluorinated Acrylic copolymer

Number-Average
Molecular Weight: >1000

3. PHYSICAL AND CHEMICAL PROPERTIES

Unless stated otherwise, physico-chemical properties cited are for the end product containing the polymer and not for the isolated notified polymer.

Appearance at 20°C and 101.3 kPa: Light yellow solid with no discernible odour. The appearance of the final products is given as follows:

AColour 620/635/935/4040 DocuColor Magenta Developer	Dense red powder
AColour 620/635/935/4040 DocuColor Yellow Developer	Dense yellow powder
AColour 620/635/935/4040 DocuColor Black Developer	Dense black powder
AColour 620/635/935/4040 DocuColor Cyan Developer	Dense bluish powder

Boiling Point/Melting Point: Not determined.

Specific Gravity: Approximately 5 (Specific gravity of the notified polymer is 1.388)

Vapour Pressure:	Not determined. Expected to be negligible due to high molecular weight.
Water Solubility:	Insoluble (less than 0.005 g/L at 20°C) (see comments below).
Partition Co-efficient (n-octanol/water):	Not determined (see comments below).
Hydrolysis as a Function of pH:	The polymer contains ester groups that may undergo hydrolysis under certain temperature and pH conditions. Tests showed approximately 2% change in weight with varying pH.
Adsorption/Desorption:	Not determined, as the chemical is insoluble in water.
Dissociation Constant:	Not determined as no dissociable groups present.
Particle size:	Approximately 50-85 μm mean diameter.
Flash Point:	Not applicable.
Flammability Limits:	Not flammable.
Autoignition Temperature:	Not determined.
Explosive Properties:	The final product is not flammable under normal conditions of use but the generation of airborne developer dust may be potentially explosive in a confined space.
Reactivity/Stability:	The final product is stable.

3.1 Comments on Physico-Chemical Properties

The water solubility of the final product (containing the notified polymer) was determined according to OECD TG 105 using the flask method. The concentration of total organic carbon (TOC) in the aqueous solution was determined by Combustion-Infrared method and the solubility of the sample was calculated from the carbon content of the sample (Nagura, 14 July 1992).

The notified polymer contains ester groups, which may undergo hydrolysis. Hydrolysis as a function of pH was determined following the method of 'A flow scheme for safety evaluation of macromolecular compounds' annex to the Japanese Law Concerning the Examination and Regulation of Manufacture, etc., of Chemical Substances (Nagura, 27 July 1992). A sample of the notified polymer was dispersed in buffer solutions at pH 1.2, 4, 7 and 9. After two weeks, TOC concentrations of the solutions were determined. As this increased by < 2%, it was found that the notified polymer did not hydrolyse readily in the environmental pH range.

The n-octanol/water partition coefficient was not determined as the notified polymer is insoluble in water (Mensink, 1995).

The adsorption/desorption coefficient was not determined as the notified polymer is insoluble in water. The notifier expects the polymer to associate with soils and sediments.

4. PURITY OF THE CHEMICAL

Degree of Purity: >90%.

Hazardous Impurities within the notified polymer: Residual monomers and reactants were below their concentration cut-offs.

Hazardous Impurities within one of the final products (Black Developer):

Chemical name:	Carbon black
CAS No.:	1333-86-4
Weight percentage:	< 2.5
Toxic properties	NOHSC exposure standard; 3 mg/m^3 TWA

Additives/Adjuvants: None

5. USE, VOLUME AND FORMULATION

The notified polymer is an ingredient used to coat the surface of ferrite particles, which act as carriers in the colour developers of photocopiers. No manufacturing or reformulation will occur in Australia. The imported products contain up to 0.24% notified polymer. Approximately 70 kg/year of notified polymer will be imported in 650g aluminium-laminated packets, which will be packed in cartons (15 packets per carton).

6. OCCUPATIONAL EXPOSURE

The notified POLYMER SPF-1 will be imported as part of the finished product, AColour Developers. The cartons will be transported from the dockside to the Fuji Xerox warehouse, where they will be stored prior to being distributed to service outlets around Australia. It is anticipated that waterside workers, transport drivers and warehouse workers (5-10 workers, 2-3 hours/day, 10-15 days/year) would only be exposed to the material in the event of an accident.

Replacement of the developer involves removal of the old developer from the photocopier and loading of the new developer. This process is carried out by Customer Service Engineers only (50 workers, 5-20 minutes/day, 40-160 days/year). The procedure will not be carried out by the public and involves emptying the old developer from a reservoir into a tray or recovery bag, then refilling the reservoir directly from the container of the new developer. The old

developer is repackaged at the time of replacement and disposed of to landfill.

The replacement procedure for the developer may involve exposure of the developer to the air. The mean particle size is *ca.* 50-85 μm and is therefore within the inspirable range. As only the mean particulate size was given, some particles may also be within the respirable range. Skin contamination may occur when cleaning the photocopier. Inhalation exposure may occur if dust clouds are generated during replacement or maintenance.

As the notified polymer will reportedly not become dissociated from the carrier particles during developer replacement, exposure to the notified polymer during this procedure will be minimal. The Customer Service Engineers wear cotton gloves during the developer replacement procedure.

It is considered unlikely that waterside workers and transport drivers will be exposed to the notified polymer. A Material Safety Data Sheet (MSDS) will be available to users of the product.

7. PUBLIC EXPOSURE

Exposure of the public to the notified polymer will only occur in the event of an accident resulting in spillage, which should be minimised by packaging in 650 g aluminium packets. The notified polymer is a constituent of colour photocopier developers, which will be supplied to photocopier service outlets around Australia and replaced in photocopiers by customer service engineers. Therefore, direct exposure of the public to the notified polymer is considered minimal.

8. ENVIRONMENTAL EXPOSURE

8.1 Release

Environmental exposure to the notified polymer will result from the disposal of printed paper, discarded cartridges and recovered developer. There will also be some release resulting from spills during refilling of photocopier reservoirs.

Spills and leaks resulting from refilling of photocopier reservoirs and normal use will most likely be cleaned up using vacuum cleaners, with the residues disposed of to landfill. Spills are expected to account for ~2% of the import volume, ie 1.4 kg per annum.

Accidental spills that occur during transport and storage will be collected and disposed of to landfill. This is expected to account for 1% (0.7 kg) of the import volume.

Approximately 30-50% of the import quantity of the notified polymer (21-35 kg) will be disposed of to landfill as waste developer recovered from photocopiers.

Printed paper will be disposed of to landfill, incineration or paper recycling.

8.2 Fate

Some waste paper may be disposed of directly to landfill with the notified polymer strongly bound to the paper. It is anticipated that prolonged residence in an active landfill environment would eventually degrade the notified substance. The perfluorinated component of the polymer is likely to degrade to perfluorononanoic acid ($C_8F_{17}CO_2H$), which will probably persist in the environment (Key *et al.*, 1997). Incineration of waste paper will destroy the compound with the generation of water vapour, hydrogen fluoride and oxides of carbon.

Printed paper may also be recycled. The notifier has provided no data on the likely behaviour of the polymer during the paper recycling process. During such processes, waste paper is repulped using a variety of alkaline, dispersing and wetting agents, water emulsifiable organic solvents and bleaches. These agents enhance fibre separation, ink detachment from the fibres, pulp brightness and the whiteness of paper. De-inking wastes are expected to go to trade waste sewers. The residual polymer may partly hydrolyse during this process and/or partition to sediments, which would be disposed of to landfill or incineration.

It is expected that waste polymer disposed to landfill will persist in the environment and may bioaccumulate. Fluorinated hydrocarbons have been shown to be resistant to biodegradation under both aerobic and anaerobic conditions (Remde and Debus, 1996), and abiotic cleavage of C-F bonds is not expected unless assisted by UV radiation. Consequently, this portion of the new chemical is expected to persist in the environment. The notifier has suggested that the notified polymer will not be mobile. However, the notified polymer contains a perfluorinated component, which will possibly degrade to perfluorononanoic acid. The closely related perfluorooctanoic acid has low affinity for both oil and water (3M, 1997), suggesting that perfluorinated compounds in soils are unlikely to associate strongly with the organic component and may be mobile. However, it is noted the C_6-C_{10} perfluoroaliphatic group is claimed to provide optimum surface activity. In particular, the lower molecular weight fragments resulting from degradation of the perfluorinated acid are likely to be appreciably mobile in the soil compartment. The ultimate fate of these fragments would possibly be to the atmosphere where final mineralisation to carbon dioxide, water and hydrogen fluoride would take place through reactions with atmospheric ozone and further exposure to ultra violet radiation.

It should be noted that some fluorinated compounds have recently been detected at low levels in both humans and animals (3M Press Release, 2000), and although fluorinated compounds have little affinity for fat, there appears to be mechanisms operating in the environment that enable bioaccumulation of fluorinated compounds.

9. EVALUATION OF TOXICOLOGICAL DATA

No toxicology data were supplied for the notified polymer.

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

No ecotoxicology data were supplied for the notified polymer.

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

The majority of the notified polymer should not enter the environment until it is incorporated into a polymer matrix where the developer is cured and fixed to the paper. However, up to half of the notified polymer may be released to the environment in the form of waste developer recovered from photocopiers and accidental spills.

Disposal of waste paper containing the notified polymer is normally through landfill, incineration or recycling. In all three cases it is anticipated that the polymer will be destroyed either through the agency of a vigorous chemical environment or through slow biological or abiotic processes. However, it is likely that the perfluorinated component of the polymer will persist in the environment. Release of the notified polymer from printed paper should be widespread and diffuse.

Disposal of waste developer will be to landfill, where degradation should occur through slow biological or abiotic processes. The perfluorinated component of the polymer is likely to persist in the environment. It is not likely to be water-soluble, may not have a high affinity for the organic components of soils and may be mobile in soils. However, the relatively low usage rate and diffuse nature of disposal patterns would indicate very slow release at low concentration into the wider environment.

The notified polymer is not likely to present a hazard to the environment when it is stored, transported and used in a typical manner.

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

Hazard Assessment
No toxicological data were submitted for the notified polymer. The levels of hazardous impurities and unreacted monomers in the polymer are low. The NAMW is greater than 1000, indicating that it is unlikely to cross biological membranes, and no reactive functional groups are present. Based on this information, the notified polymer is unlikely to be a hazardous substance under the NOHSC Approved Criteria for Classifying Hazardous Substances (NOHSC 1999).

The carrier particles to which the polymer is bound have a mean particulate size of 50-85 μm. The MSDS supplied by the notifier indicates that products containing the notified polymer are unlikely to cause significant effects if swallowed and are not skin or eye irritants.

Occupational Health and Safety
Transport or storage of the developer containers is unlikely to result in worker exposure except in the event of accidental spillage. Customer service engineers will empty used developer into a tray or recovery bag, then refill the reservoir from the container of new developer. Service personnel are expected to be exposed occasionally to the notified polymer as the developer reservoir is re-filled and loaded directly into the photocopier. In addition, exposure to the developer containing the notified polymer may occur during machine cleaning and maintenance with risk of inhalation and dermal exposure possible.

Given its likely low toxicity and very low concentration in the developer, the notified

polymer will not pose a significant health risk in the occupational environment.

Workers handling printed paper are not at risk of adverse health effects as the polymer is fixed to the paper and not available for exposure or dermal uptake. The notified polymer is combined within a polymer matrix and is not expected to degrade or decompose under normal use conditions. There is not expected to be any natural loss of monomers, reactants, additives, or impurities from the polymer matrix when applied in a dry bound form to paper.

Disposable gloves should be worn to prevent skin irritation and workers should avoid any generation of dust when handling the developer. Spilt residues should be swept up manually or using a dust explosion-proof vacuum cleaner and placed within a waste container.

Public Health
As the notified polymer is intended for use by photocopier service engineers, there is negligible potential for public exposure to the notified polymer arising from its use as a component in photocopying developers. Based on the toxicity profile and use pattern, the notified polymer will not pose a significant hazard to public health when used in the proposed manner.

13. RECOMMENDATIONS

To minimise occupational exposure to Polymer SPF-1 the following guidelines and precautions should be observed:

- Avoid generation of dust clouds;
- Disposable gloves should be worn to prevent dermal exposure;
- Spillage of the notified polymer should be avoided. Spillage should be swept up manually or by vacuum cleaner and placed within a waste container;
- A copy of the MSDS should be easily accessible to employees.

If products containing the notified chemical are hazardous to health in accordance with the NOHSC *Approved Criteria for Classifying Hazardous Substances*, 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 the developers 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, 1994).

This 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 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

3M Press Release; "3M Phasing Out Some of its Specialty Materials" 16 May 2000.

3M Product Listing: "3M™ Fluorad™ Fluorochemical Acid FC-26" http://www.3m.com/perfchem/prodinfo/fluoroch/FC26/FC26_1.html September 1997.

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

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