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**NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME
(NICNAS)**

FULL PUBLIC REPORT

Fluorosurfactant #1 in HP inkjet inks

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**Director
NICNAS**

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FULL PUBLIC REPORT

Fluorosurfactant #1 in HP inkjet inks

1. APPLICANT AND NOTIFICATION DETAILS

APPLICANT(S)

Hewlett Packard (ABN: 74 004 394 763)
3 Richardson Place
North Ryde NSW 2113

NOTIFICATION CATEGORY

Polymer of Low Concern

EXEMPT INFORMATION (SECTION 75 OF THE ACT)

Data items and details claimed exempt from publication:

Chemical Name, Other Names, CAS Number, Molecular and Structural Formulae, Molecular Weight, Polymer Constituents, Residual Monomers/Impurities, Use Details, Import Volume, Concentration of Notified Polymer in Ink, Marketing Name of Ink.

VARIATION OF DATA REQUIREMENTS (SECTION 24 OF THE ACT)

No variation to the schedule of data requirements is claimed.

PREVIOUS NOTIFICATION IN AUSTRALIA BY APPLICANT(S)

None

NOTIFICATION IN OTHER COUNTRIES

None

2. IDENTITY OF CHEMICAL

MARKETING NAME(S)

Fluorosurfactant #1 in HP inkjet inks

MOLECULAR WEIGHT (MW)

Number Average Molecular Weight (Mn) >1000

REACTIVE FUNCTIONAL GROUPS

The notified polymer contains only low concern functional groups.

3. PLC CRITERIA JUSTIFICATION

<i>Criterion</i>	<i>Criterion met (yes/no/not applicable)</i>
Molecular Weight Requirements	Yes
Functional Group Equivalent Weight (FGEW) Requirements	Yes
Low Charge Density	Yes
Approved Elements Only	Yes
Stable Under Normal Conditions of Use	Yes
Not Water Absorbing	Yes
Not a Hazard Substance or Dangerous Good	Yes

The notified polymer meets the PLC criteria. Although the polymer contains a perfluorinated carbon chain, the perfluorinated carbon chain length is less than four.

4. PHYSICAL AND CHEMICAL PROPERTIES

Appearance at 20°C and 101.3 kPa
Melting Point/Glass Transition Temp

Clear light yellow viscous liquid.
 Melting and/or boiling point was not observed below the temperature at which reaction and/or decomposition occurs ($\approx 150^{\circ}\text{C}$).

Density

$>1000 \text{ kg/m}^3$ (for an ink product, temperature unspecified)

Water Solubility

$< 2 \times 10^{-1} \text{ g/L}$ at $20 \pm 0.5^{\circ}\text{C}$ (EEC A.6 OECD 105, Shake-Flask Method).

Partition Coefficient

$\log P_{\text{ow}} > 3.6$ at $20 \pm 0.5^{\circ}\text{C}$ (EEC A.8 OECD 107, Estimation of Octanol/Water Partitioning).

Estimated from the solubility of the test substance in n-octanol ($\geq 837 \text{ g/L}$) and water ($< 2 \times 10^{-1} \text{ g/L}$) at $20 \pm 0.5^{\circ}\text{C}$.

Flash Point

180°C (Pensky-Martens closed cup method).

Flammability

Not highly flammable

Reactivity

Stable under normal environmental conditions. Not reactive with water or air. Will react with isocyanates, epoxies and acid chlorides.

Degradation Products

None under normal conditions of use. Avoid temperatures above 200°C . Hazardous decomposition products include: oxides of carbon and nitrogen and hydrofluoric acid. Does not contain any groups that could be hydrolysed.

5. INTRODUCTION AND USE INFORMATION

MAXIMUM INTRODUCTION VOLUME OF NOTIFIED CHEMICAL (100%) OVER NEXT 5 YEARS

<i>Year</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>Tonnes</i>	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05

USE AND MODE OF INTRODUCTION AND DISPOSAL

Mode of Introduction

The notified polymer will be imported as a component of inkjet printing inks in pre-packed cartridges. The inks will contain a maximum of 1% notified polymer.

Reformulation/manufacture processes

No reformulation or repackaging of the imported product containing the notified polymer occurs in Australia.

Use

The notified polymer is a component of inkjet printing inks ($<1\%$) where it acts as a surface-active agent. Sealed ink cartridges containing the notified polymer will be used as necessary to replace spent cartridges in inkjet printers. Office workers and the public will use these printers for varied printing work. The ink cartridges containing the notified polymer are designed for a single use, and will not be refilled.

6. HUMAN HEALTH IMPLICATIONS

6.1. Exposure Assessment

OCCUPATIONAL EXPOSURE

Transport and storage

Waterside, warehouse and transport workers are unlikely to be exposed to the notified polymer except if the packaging and cartridge were breached.

Printing and changing of cartridges (eg Office, imaging and printing service workers)

The notified polymer will be contained in sealed ink cartridges containing 130 ml of ink (<1% notified polymer concentration). These cartridges are sealed, and worker exposure to the ink should be minimised by following the replacement procedures recommended by the manufacturer. Exposure should be limited to accidental dermal exposure. Due to the design of the cartridges and the low concentration of the notified polymer in the ink, exposure to the notified polymer should be low.

Dermal exposure during use of the printer could occur if printed pages were touched before the ink dried, or if ink-stained parts of the printer were touched. Such exposure is expected to be low and will be avoided by workers. Once dried, the notified polymer will be bound to the paper matrix and is not expected to be bioavailable.

Printer maintenance workers

Printer maintenance workers may be intermittently exposed to the notified polymer during repair maintenance and cleaning of the printers. Exposure is controlled through the design of the cartridges and the printing machines. Printer maintenance personnel often wear cotton disposable gloves to minimise incidental exposure.

PUBLIC EXPOSURE

The notified polymer will be used in inks designed for home use by consumers and in printing kiosks in shopping malls. During these uses, the possible exposure scenarios are similar to those for office or imaging workers. However, it is expected that the public will be using printers less often, and will therefore experience a lower overall exposure to the notified polymer than will workers.

6.2. Toxicological Hazard Characterisation

The notified polymer meets the PLC criteria and can therefore be considered to be of low hazard. This is supported by toxicological endpoints observed in testing conducted on a product containing up to 85% notified polymer.

The following toxicological studies have been conducted on a product containing up to 85% notified polymer.

<i>Endpoint</i>	<i>Result</i>	<i>Classified?</i>	<i>Effects Observed?</i>	<i>Test Guideline</i>
1. Rat, acute oral	LD50 > 2000 mg/kg bw	no	yes	OECD TG 423
4. Rabbit, skin irritation	slightly irritating	no	yes	OECD TG 404
5. Rabbit, eye irritation	slightly irritating	no	yes	OECD TG 405
6. Skin sensitisation - LLNA.	no evidence of sensitisation.	no	yes	OECD TG 429 (LLNA)
8. Genotoxicity - bacterial reverse mutation	mutagenic	no	yes	OECD TG 471
10. Genotoxicity - in vivo mouse micronucleus test	non genotoxic	no	yes	OECD TG 474

Description of observed toxicological effects:

Rat, acute oral

Hunched posture and/or piloerection was noted among the animals on day 1.

Rabbit, skin irritation

Exposure to the notified polymer resulted in very slight erythema and very slight oedema in the treated skin-areas of the 3 rabbits. The skin irritation had resolved within 48 hours after exposure in two animals and within 72 hours in the remaining animal.

Rabbit, eye irritation

Instillation of the notified polymer resulted in irritation of the conjunctivae, which consisted of redness and discharge. The irritation had completely resolved within 48 hours after instillation in one animal and within 72 hours in the other 2 animals.

Skin sensitisation (LLNA)

Result for sensitisation was negative: the SI values calculated for animals treated with 25, 50 and 100% test substance (84% notified polymer) were 1.6, 2.2 and 2.6, respectively. The S.I. value for test substance concentration of 50% of 2.2 was an average of two group scores at this concentration 3.6 (group I) and 0.9 (group II). The group I SI result of 3.6 was considered to be related to a single high data point outlier in the test group and a single low solvent control value. The data showed a dose-response relationship however there was no indication that the test substance could elicit a $SI \geq 3$ when tested up to 100%. The test substance is not considered a sensitiser.

Genotoxicity – bacterial reverse mutation

The notified chemical was mutagenic to bacterial strains TA98 and TA100 under the conditions of the test. The consistent reduction of revertants at the top dose level indicates toxicity and supports the mutagenic view ie. induced mutants were killed although the increases are below those normally accepted.

Genotoxicity – in vivo mouse micronucleus test

No statistically or biologically significant increase in the frequency of the detected micronuclei at any preparation interval or dose level in comparison with the vehicle control was observed. The mean values of micronuclei observed after treatment with the notified polymer were below or near to the value of the control group. Positive controls confirmed the sensitivity of the test system. The decrease in the number of PCEs in some animals is indicative that the test substance reached the bone marrow. In addition the systemic effects observed (hunched posture, lethargy and rough coat) indicated that the test substance reached the circulation and the target organ. The notified chemical was not clastogenic in this in vivo micronucleus assay under the conditions of the test.

6.3. Human Health Risk Assessment

OCCUPATIONAL HEALTH AND SAFETY

The primary route of exposure of workers to the notified polymer is likely to be dermal, during the use or maintenance of inkjet printers and/or handling of inkjet cartridges. Skin contact is likely to be avoided by workers to avoid staining of skin. The notified polymer is will be imported as a component of inkjet ink at low levels (<1%) in small inkjet cartridges, and is therefore unlikely to cause significant levels of exposure by any route.

The notified polymer is therefore considered to present a low risk to the health of workers, based on its low toxicity, low concentration in inkjet inks and low potential for exposure.

PUBLIC HEALTH

The public's potential for exposure to the notified polymer during the handling of inkjet ink cartridges is similar to that of workers. Therefore, the notified polymer is likely to present a low risk to public health, based on its low toxicity, low concentration in inkjet inks and low potential for exposure.

7. ENVIRONMENTAL IMPLICATIONS

7.1. Exposure Assessment

ENVIRONMENTAL RELEASE

The notified polymer will not be manufactured or reformulated in Australia. The notified polymer will be imported as a component of inkjet printing inks in pre-packed cartridges. Thus there will be no environmental release associated with this process in Australia.

Release of the ink solution to the environment is not expected under normal use because the cartridges are designed to prevent leakage. If leakage or accidental spills occur when changing cartridges for new cartridges, the ink will be contained with absorbent material which will likely be disposed of in a landfill.

Empty cartridges will be recycled at Hewlett Packard recycling in Australia. The cartridges will be crushed and the various parts recycled. Ink residues, estimated at <10% of the ink, will be separated from the cartridge and be incinerated. Empty cartridges will also be disposed of with normal office waste and eventually sent to landfill.

In the end use process it would be expected that the notified polymer will be bound to the paper, with the fate of the notified polymer dictated by paper disposal trends. The three main routes of paper disposal are landfill, incineration and recycling. Recent literature suggests that current paper recycling rates in Australia are 70-92% (Australian Environmental Review, 2001). Consequently, most of the paper containing the notified polymer could be recycled. Where recycling does not occur the notified chemical will be disposed of in landfills where it is expected to remain bound to the treated paper.

Paper recycling is carried out in paper mills, where it is likely that at least primary sedimentation occurs, and with some facilities also having biological treatment facilities. Therefore, in these facilities it is expected the notified chemical to partially partition into sludge under the usual waste treatment pH, and eventually be disposed of in landfill with other waste sludge. However, due to the expected water solubility, some amounts will stay in the water column. It is anticipated that prolonged residence in an active landfill will eventually degrade the notified chemical contained in sludge or in papers disposed of directly through normal garbage.

Following its use in Australia, it is assumed that 20% of notified polymer will eventually be released into the aquatic environment as a result of the paper recycling process. A calculated worst-case scenario daily PEC in the sewer effluent is 0.007 µg/L. In calculating the PEC, the following were assumed: (1) usage of the maximum import volume of 50 kg is evenly distributed over a 365 day period; (2) usage is nationwide, with a population of 20 million contributing 200 L of water per person per day to the sewer, (3) there is no adsorption or degradation in the sewer prior to release.

Based on the respective dilution factors of 1 and 10 for rural areas and coastal discharges of effluents, the PECs of the notified chemical in rural areas and coastal water may approximate 0.007 and 0.0007 µg/L, respectively.

ENVIRONMENTAL FATE

The notified polymer is considered to be not readily biodegradable based on the modified Sturm test (OECD test guideline 301 B). It is relatively water soluble (0.1 g/L) and has a log Pow of >3.6 and thus depending on the treatment type is likely to stay in the water column (primary treatment) or partition to sludge (secondary treatment) during the paper recycling process. A majority of the notified polymer after end use will be disposed of to landfill and eventually degrade through biotic and abiotic processes. In the landfill, the perfluorinated side chain eventually may be released as perfluoro propionic acid or similar products which will be persistent.

7.2. Environmental Hazard Characterisation

No ecotoxicological data were submitted. PLCs without significant ionic functionality are of low concern to the aquatic environment.

7.3. Environmental Risk Assessment

Given the diffuse and widespread use of the ink product and the low volume usage, the concentration of the notified polymer in the aquatic compartment is likely to be very low.

It is expected that any waste generated during use will be disposed of by incineration or to landfill. In landfill the notified chemical contained in sludge or in papers will undergo in-situ degradation. Incineration of the waste paper will destroy the notified polymer generating water vapour, carbon dioxide and hydrogen fluoride. Therefore, the short term environmental risk from the reported use pattern of the notified polymer is likely to be low. However, the perfluorinated side eventually might be released as perfluoro propionic acid or similar products and added to the pool of volatile and persistent chemicals in the environment. Note, however, the very small quantity to be imported.

8. CONCLUSIONS

8.1. Level of Concern for Occupational Health and Safety

There is Low Concern to occupational health and safety under the conditions of the occupational settings described.

8.2. Level of Concern for Public Health

There is No Significant Concern to public health when used in the proposed manner.

8.3. Level of Concern for the Environment

The polymer is not considered to pose a risk to the environment based on its reported use pattern.

9. MATERIAL SAFETY DATA SHEET

9.1. Material Safety Data Sheet

The notifier has provided MSDS as part of the notification statement. The accuracy of the information on the MSDS remains the responsibility of the applicant.

10. RECOMMENDATIONS

CONTROL MEASURES

Occupational Health and Safety

- No specific engineering controls, work practices or personal protective equipment are required for the safe use of the notified polymer itself, however, these should be selected on the basis of all ingredients in the formulation.
- Guidance in selection of personal protective equipment can be obtained from Australian, Australian/New Zealand or other approved standards.
- Service personnel should wear cotton or disposable gloves and ensure adequate ventilation is present when removing spent printer cartridges containing the notified polymer and during routine maintenance and repairs.
- A copy of the MSDS should be easily accessible to employees.
- If products and mixtures containing the notified polymer are classified as hazardous to health in accordance with the NOHSC *Approved Criteria for Classifying Hazardous Substances*, workplace practices and control procedures consistent with provisions of State and Territory hazardous substances legislation must be in operation.

Disposal

- The notified polymer should be disposed of by incineration or landfill.

Emergency procedures

- No special precautions necessary (cartridges).

10.1. Secondary Notification

The Director of Chemicals Notification and Assessment must be notified in writing within 28 days by the notifier, other importer or manufacturer:

- (1) Under subsection 64(1) of the Act; if
- the notified polymer is introduced in a chemical form that does not meet the PLC criteria.
 - other uses are proposed.
 - further information becomes available regarding transformations and degradation of the notified polymer including any adverse health and environmental effects of the breakdown products. This information is to be provided to NICNAS as soon as practicable in order to determine if additional recommendations, if relevant, are required.

or

- (2) Under subsection 64(2) of the Act:
- if any of the circumstances listed in the subsection arise.

The Director will then decide whether secondary notification is required.