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**NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION
AND ASSESSMENT SCHEME**

FULL PUBLIC REPORT

Diacron FC-316

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Director
Chemicals Notification and Assessment

FULL PUBLIC REPORT**Diacron FC-316****1. APPLICANT**

Katun (Australia) Pty Ltd of 46-48 Howard Street, Suite 1, North Melbourne, Victoria 3051 has submitted a Synthetic Polymer of Low Concern notification statement in support of their application for an assessment certificate for Diacron FC-316.

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. The notifier has provided an Infra-Red spectrum and GPC data. The amount of low molecular weight components and the spread of distribution could not be confirmed from the information provided.

Characterisation as a Synthetic Polymer of Low Concern

Number-Average Molecular Weight (NAMW):	Greater than 1000
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Maximum Percentage of Low Molecular Weight Species	
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Molecular Weight < 500:	< 0.2 %.
Molecular Weight < 1 000:	< 2.1 %

Polymer Stability	Stable under normal conditions of use.
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Reactivity	Does not contain any reactive functional groups that can be expected to undergo further reaction under normal conditions.
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Charge Density	not cationic
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Method of Detection and Determination:	Gel permeation chromatography and infra-red (IR) spectroscopy.
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The polymer meets the criteria for assessment as a synthetic polymer of low concern under revised transitional arrangements currently in place.

3. PHYSICAL AND CHEMICAL PROPERTIES

The following properties are given for the notified polymer, unless stated otherwise.

Appearance at 20°C and 101.3 kPa:	Notified polymer: solid yellow beads with polyester odour. Toner product: black fine powder
Particle size:	Toner product particle size and distribution is: median 11.9 µm with the following distributions: <5 µm (0.9 %) <6 µm (2.8 %) <10 µm (27.2 %) 10-20 µm (~66.5 %) >20 µm (2.5 %) >32 µm (0 %)
Melting Point:	> 135 °C
Specific Gravity:	1250 kg/m ³
Water Solubility:	~ insoluble at 20 °C.
Dissociation Constant:	Will not readily dissociate and become cationic or anionic in the pH range of 4 to 9 (inclusive)
Flammability Limits:	Not flammable under conditions of use.
Autoignition Temperature:	> 500 °C
Explosive Properties:	The dust of the polymer can present an explosive hazard if mixed with air at sufficient concentrations and in the presence of an ignition source.
Reactivity/Stability:	Contains carboxylic acid and hydroxyl groups which are designated functional groups of "low concern". Polymer is unreactive under normal conditions.

Comments on Physico-Chemical Properties

A comprehensive laboratory study on water solubility was not conducted. However, a limited study indicates that the notified polymer is 99.999 % insoluble in water at the limit of detection (10 mg/L). The polymer is expected to be insoluble in polar solvents such as water, since it contains apolar constituents. A literature search has indicated that most common commercial grade polyesters are insoluble in water. A report by Pauly (1989) provided by the notifier states that solubility coefficients for polyesters in a range of permeants are available, but not solubility coefficients in water.

The notified polymer does not contain any reactive functional groups that are intended to or can reasonably be expected to undergo further reaction under normal conditions. The terminal groups of the polymer are either carboxylic acid or hydroxyl groups and under normal conditions, are unreactive. However, when heated to decomposition, toxic vapours, including oxides of carbon, dicarboxylic acids, diols and polycarboxylic acids gases may evolve. Vapours/gases can be flammable and explosive. Incompatible materials to be avoided are strong oxidisers, catalysts, strong acids and certain peroxides.

4. PURITY OF THE CHEMICAL

Degree of Purity:	99.5 % (as provided by MSDS)
Hazardous Impurities:	All impurities are below the concentration cut-off
Maximum Content of Residual Monomers:	0.5 %
Additives/Adjuvants:	None.

5. USE, VOLUME AND FORMULATION

The notified polymer is a component (up to 90%) of toner for use in conventional photocopiers. It is used as a binder resin to fix the toner on a sheet of paper.

The notified polymer will be imported in toner cartridges, containing 185 g of toner, and will not be reformulated in Australia. The notified polymer will be imported at a projected rate of less than 10 tonnes per year up to year 5.

6. OCCUPATIONAL EXPOSURE

The notified polymer will be imported as part of a finished toner cartridge product. The cartridges will be transported from the dockside to the customer site where they will be stored prior to being distributed to service outlets around Australia. The formulated toner product containing the notified chemical is in the form of a fine black powder. It has a mean particulate size of 11.9 μm , with a substantial fraction (30 %) at less than 10 μm (*i.e.* within the respirable range).

Transport and Storage

The product containing the notified polymer will be fully imported and transported from the dockside to the customer site. The cartons will be stored before being distributed by road to service outlets around Australia. It is anticipated that waterside workers, transport drivers and warehouse workers would only be exposed to the material in the event of an accident.

Service Personnel

Due to the physical form and fine particle size of this finished toner product, inhalational and dermal exposure may occur when using the toner. Exposure to toner containing the notified

chemical may occur during machine cleaning and maintenance by machine service personnel and whilst clearing paper feed problems. Inhalational exposure may occur if dust clouds are generated during maintenance or spillage. Service personnel may wear cotton protective gloves.

Office Workers

Customer operators will load toner into a photocopier by hand in accordance with instructions specific to the photocopier (5-10 minutes/operation, as needed). Typically, the depleted toner cartridge is removed from the photocopier and the new sealed toner cartridge is inserted into the photocopier. Provided the instructions are followed, there should be minimal contact with the toner, however, skin contamination and inhalational exposure may occur if spillage results during the loading operation. Printing staff using printers and copiers and office workers would not normally wear protective equipment.

Workers may handle printed matter with the toner applied. However, less than 50 mg of toner is used per sheet of paper, and it becomes heat fixed once applied to the printed surface. These considerations indicate that there would be no exposure to the notified polymer during the handling of printed materials.

7. PUBLIC EXPOSURE

The notified polymer will be imported, as a component of printer toner, in sealed paper (80%) with plastic end (20%) cartridges ready for use. The cartridges will contain *ca.* 800 g toner. Therefore since no reformulation, repacking, or refilling of cartridges will be performed in Australia, public exposure to the notified polymer is expected to be limited to the distribution of the sealed cartridges and disposal of the waste toner generated by the printer when in-use.

In the printer, the notified polymer is carried in the toner from the cartridge to the drum, where it is transferred by means of an electrical discharge to the paper. It is anticipated that the notified polymer will become fixed by melting and thus be essentially irreversibly bound to the copy paper.

The notifier estimates that *ca.* 3.6 g of the notified polymer will remain in the toner cartridge after use. The empty cartridges remain closed and are either returned to the distributor for recycling or disposed of by landfill in accordance with relevant local regulations. No public exposure is expected to occur during transport of the sealed cartridges either before or after use.

8. ENVIRONMENTAL EXPOSURE

Release

The toner cartridges are fully 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 *ca.* 3.6 g of toner (*ca.* 2.0 %) will remain in the used cartridge, which is then disposed of to landfill, which equates to < 200 kg of raw notified polymer annually going to landfill in used cartridges.

The toner cartridge has two compartments: one to hold the unused toner and the other to collect the used/waste toner. Waste toner is scraped off the photoconductor in the copier and deposited in the second compartment of the cartridge. The notifier has estimated that up to 45 g (*ca.* 24 %) of waste toner is accumulated in this compartment. This equates up to 2.5 tonne annually of used toner going to landfill in the cartridges.

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

Although there is a possibility of accidental polymer release during transport, it is considered that the risk of the adverse effects to the environment are low as the polymer is contained in individual, sealed cartridges. Collected spilt material will be disposed of to landfill or by incineration.

Fate

During paper recycling, the 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 and discarded to landfill or incinerated. Combustion products are likely to be water and oxides of carbon and hydrogen.

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 toxicology data has been submitted on the notified polymer and the supplied MSDS does not give any specific information relating to its toxicity.

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

No ecotoxicological data were provided.

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.

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 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

Hazard Assessment

No toxicological testing of the notified polymer has been undertaken. As the notified polymer is water insoluble and has a molecular weight greater than 1 000, it is unlikely to be biologically active within the human system. The notified polymer also contains lower molecular weight species ($< 2.1\%$ < 1000 and $< 0.2\%$ < 500). Several hazardous impurities are present, however these are below the concentration cut-off.

This information suggests that the notified polymer is of low toxicity and not likely to be a hazardous substance under the *Approved Criteria for Classifying Hazardous Substances* [NOHSC:1008(1999)].

The median particle size distribution of the manufactured toner is $11.9\ \mu\text{m}$ with 27.2% of particles less than $10\ \mu\text{m}$, 2.8 % less than $6\ \mu\text{m}$ and 0.9 % less than $5\ \mu\text{m}$ in diameter, or one-third of the particles are placed in the respirable range. Inhalation of the toner dust is likely to result in respiratory irritation.

The toner product contains the notified polymer at up to 90 %. The MSDS for the toner product lists a number of potential health effects due to the physical nature of the particles. Eye exposure may cause mechanical eye irritation including pain, tearing, and redness accompanied by a stinging sensation. Skin exposure may cause irritation in individuals with heightened skin sensitivity. It is unlikely that skin absorption will occur. Exposure to dust may cause slight respiratory tract irritation and dust cloud generation should be avoided.

Occupational Health and Safety

Transport and storage of the toner cartridges is unlikely to result in worker exposure except in the event of accidental spillage. No exposure is expected during or after normal printing operations since the toner is irreversibly impregnated on to the paper immediately upon application.

Service personnel and office workers may be exposed to the notified chemical when cleaning printer/copier equipment and/or replacing copier toner. Adverse effects resulting from exposure are likely to be limited to mechanical or physical irritation to the upper respiratory tract or eyes. In a small number of individuals with heightened skin sensitivity, some individuals may experience mild, transient skin irritation due to the presence of one of the residual monomers ($< 0.5\%$ by weight, *ca.* 3 % in total) in the notified polymer. As 30 % of the toner product is respirable ($< 10\ \mu\text{m}$), it represents a potential inhalational hazard.

Given the infrequent nature of servicing printer/copier equipment and the sealed packaging

nature of the cartridges, the risk of substantial exposure and adverse health effects is expected to be low. However, disposable gloves should be worn to prevent skin irritation and workers should avoid any generation of dust when handling the toner.

As the notified polymer is heat fixed to the printed or copied paper, there is negligible risk to workers handling printed material.

The toner can be considered a nuisance dust and employers are responsible for maintaining atmospheric levels of toner dust below the NOHSC exposure standard of 10 mg/m³ (8 hr TWA, NOHSC 1995). There is a NOHSC exposure standard for carbon black, a component in the imported product. Employers are responsible for ensuring that the exposure standard (3 mg/m³, TWA), is not exceeded in the workplace. Any generation of dust should be avoided, however it is unlikely that the airborne concentration of toner dust in the workplace would warrant exposure monitoring and specific ventilation.

Public Health

There is the potential for public exposure to the notified polymer during exchange of used cartridges in printers and photocopiers. The high NAMW of the polymer suggests that if dermal contact does occur then percutaneous absorption is unlikely. Accidental inhalation of toner dust is likely to result in respiratory irritation; however, during normal conditions of use, the potential for public exposure to the notified polymer during all phases of its life cycle is considered to be low. Based on this information, it is considered that the notified polymer will not pose an extensive hazard to public health when used in the proposed manner.

13. RECOMMENDATIONS

To minimise occupational exposure to Diacron FC-316, the following guidelines and precautions should be observed:

- Avoid generation of dust clouds when handling the toner;
- All sources of ignition should be extinguished to prevent potential explosion from this fine dust. Spillage of the toner should be avoided. Where spills occur, they should be vacuumed or collected into suitable containers and disposed of at landfill in accordance with State regulations. If necessary, residues may be washed away with cold water;
- Service operators should wear disposable gloves when handling toner;
- Good personal hygiene should be practised to minimise the potential for ingestion;
- A copy of the appropriate MSDS should be easily accessible to employees.

14. MATERIAL SAFETY DATA SHEET

The MSDS for the notified chemical was provided in accordance with the *National Code of Practice for the Preparation of Material Safety Data Sheets* (NOHSC 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 will be required if the polymer characteristics cease to satisfy the criteria under which it has been accepted as a Synthetic Polymer of Low Concern. Secondary notification of the notified polymer 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

Connell DW, 1989. "General characteristics of organic compounds which exhibit bioaccumulation". In Connell DW, (Ed) *Bioaccumulation of Xenobiotic Compounds*. CRC Press, Boca Raton, USA.

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

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

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