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**NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION
AND ASSESSMENT SCHEME**

FULL PUBLIC REPORT

Lexmark Copolyester Polymer 561

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For enquiries please contact the Administration Section at:

Street Address: 334-336 ILLAWARA ROAD MARRICKVILLE NSW 2204, AUSTRALIA
Postal Address: GPO Box 58, SYDNEY NSW 2001, AUSTRALIA
Telephone: (61) (02) 8577 8800 FAX (61) (02) 8577 8888

Director
Chemicals Notification and Assessment

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FULL PUBLIC REPORT**Lexmark Copolyester Polymer 561****1. APPLICANT**

Lexmark International (Australia) Pty Ltd of 12A Rodborough Road FRENCHS FOREST NSW 2086 (ABN 86 050 148 466) has submitted a notification statement in support of their application for an assessment certificate for the synthetic polymer of low concern (PLC) Lexmark Copolyester Polymer 561.

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.

Marketing names: Lexmark Copolyester Polymer 561

3. POLYMER COMPOSITION AND PURITY

Details of the polymer composition have been exempted from publication in the Full Public Report.

4. PLC JUSTIFICATION

The notified polymer meets the PLC criteria.

5. PHYSICAL AND CHEMICAL PROPERTIES

Property	Result	Comments
Appearance	Solid yellow beads with a characteristic polyester odor	
Melting point	110°C	Softening point
Density	1250 kg/m ³	
Water solubility	Not determined	The notifier indicates that the water

		solubility of the notified polymer is likely to be less than 10 mg/L. The notifier indicates that similar polyester polymers have shown little or no evidence of solubility in water. This is supported by Pauly et al. who states that solubility coefficients are not available for polyesters in water.
Particle size	<i>Median:</i> Approximately 400 μm < 0.3% less than 100 μm	<i>Median:</i> 9 μm for black toner and 11 μm for coloured toner <i>Less than 5μm:</i> <2% for black toner and <1% for coloured toner <i>Greater than 12.7 μm:</i> <2% both for black toner and coloured toner
Flammability	Not flammable	
Autoignition temperature	> 300°C	
Explosive properties	Not explosive	
Stability/reactivity		
Hydrolysis as function of pH	Not determined	The notified polymer contains ester linkages which are unlikely to undergo significant hydrolysis in the environmental pH range of 4 to 9 due to its low solubility in water.
Partition coefficient	Not determined	The hydrophobic nature of the polymer is indicative of partitioning into the organic phase.
Adsorption/desorption	Not determined	The notified polymer is expected to be immobile in soil due to its low expected water solubility.
Dissociation constant	Not determined	The notified polymer contains no functional groups that may be expected gain or lose a proton in the environmental pH range of 4 to 9.

6. USE, VOLUME AND FORMULATION

Use:

The notified polymer is a component of toner ($\leq 10\%$ notified polymer) used in business and home printers.

Manufacture/Import volume:

Less than 100 tonnes of the notified polymer will be imported for each of the first five years. The exact import volume is exempt from publication.

Formulation details:

The notified polymer will not be manufactured in Australia but will be imported in finished printer cartridges. Reformulation of the toner containing the notified polymer will not take place in Australia.

7. OCCUPATIONAL EXPOSURE

The toner containing the notified polymer will be contained in sealed cartridges. No reformulation or repackaging will take place, therefore no exposure to the toner and hence to the notified polymer, is expected during transportation and storage.

Occupational exposure to the notified polymer in Australia will primarily concern two main worker categories. These are printer service personnel and office staff using printers. The notifier did not provide details on the number of workers in each category, the number of printers imported per year or estimated duration of exposure per change.

Duties of the service personnel will include cleaning the inside of the machine, servicing the machine and replacement of toner cartridges. Both inhalation and dermal exposure to the toner powder may occur during these activities. No protective equipment has been specified for service personnel, with the MSDS stating that none was required.

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

Exposure may occur upon handling printed material. However, the toner would not be separately available for exposure or dermal uptake as it is fully impregnated on to the printed surface during application.

8. PUBLIC EXPOSURE

Public exposure through importation, transportation or storage is negligible. There is no processing or re-packaging within Australia. The notified polymer is a component in black-and-white and colour printer toner. The toner is contained within sealed cartridges which are not normally opened. There is potential for minor exposure to the polymer during changing of the cartridges. Toner on the printed page is bound firmly to the paper and exposure via dermal contact with the printed paper is negligible. Based on this information, the potential for public exposure to the notified polymer is expected to be very low.

9. ENVIRONMENTAL EXPOSURE

9.1. Release

Release of the toner to the environment is not expected under normal use as the cartridge is designed to prevent leakage. However, if leakage does occur, the toner will be collected and presumably disposed of in landfill. Environmental exposure will result from the disposal of printed paper and discarded cartridges as well as the possibility of accidental leakage of the cartridges during use. The printer cartridges will be replaced by the consumer and disposed in domestic landfill. Residues contained in the empty cartridges are expected to remain within these containers, although release could occur from deterioration of the cartridge. The notifier indicates that approximately 4 g of the notified polymer will remain in the used printer cartridge. The total import volume of the notified polymer will ultimately be disposed of in either landfill or be incinerated.

9.2. 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 polymer. Incineration of waste paper will destroy the polymer with the generation of water vapour and oxides of carbon.

In addition to landfill, some of the printed paper will enter 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, toner detachment from the fibres, pulp brightness and the whiteness of paper. These wastes are expected to go to trade waste sewers. Trade sources estimate the washing process will recover 30-60% of the total amount of the toner and therefore at least 30% of the notified polymer in the recycled paper will be disposed of with sludge in landfill.

The substance is not expected to bioaccumulate due to its low water solubility and high molecular weight (Connell 1990).

10. EVALUATION OF HEALTH EFFECTS DATA

No toxicological data were provided in the submission. The notifier states that similar polymers have low acute toxicities ($LD_{50} > 5000$ mg/kg). The toner may produce slight mechanical or physical irritation if inhaled. The high molecular weight indicates that the polymer is unlikely to cross biological membranes.

11. EVALUATION OF ENVIRONMENTAL EFFECTS DATA

No ecotoxicological data were provided.

12. ENVIRONMENTAL RISK ASSESSMENT

The notified polymer will enter environmental compartments indirectly by disposal of waste paper (for recycling, to landfill or for incineration) and by direct release from discarded

printer cartridges at landfill sites. Based on the import volume, method of packaging and low concentration of the notified polymer in printer toner, release of the notified polymer to the environment is expected to be low but widespread. Waste from the recycling process includes sludge which is dried and disposed of to landfill, and very little of the notified polymer is expected to partition to the supernatant water which is released to the sewer.

Abiotic or slow biotic processes would be largely responsible for the degradation of the notified polymer. As a consequence of its low water solubility, the notified polymer is likely to be immobilised through adsorption onto soil particles and sediments.

Bioaccumulation of the notified polymer is not expected due to its low water solubility and large molecular weight which will inhibit passage through cell membranes.

On the basis of the available information, the overall environmental hazard of the notified polymer is expected to be low.

13. HEALTH AND SAFETY RISK ASSESSMENT

13.1. Hazard assessment

No toxicological data were provided for the notified polymer. However, the overall toxicity of the notified polymer is expected to be low as it is not highly reactive and, having a high molecular weight, would not readily cross biological membranes. Therefore the polymer is unlikely to be a hazardous substance in accordance with the NOHSC *Approved Criteria for Classifying Hazardous Substances* (NOHSC, 1999).

The toner containing the notified polymer has a uniformly small particle size, with the majority of the particles being in the respirable size range (< 10 µm).

13.2. Occupational health and safety

The main exposure will be to service personnel while cleaning and servicing the printers or spent cartridge. The design of the toner cartridges is such that exposure to the notified polymer should be minimal, and therefore replacement of toner cartridges should not lead to significant exposure. Minor dermal or inhalation exposure may occur if a small quantity of toner is spilt while changing cartridges. The cartridge label and instruction sheet in the carton contain instructions on how to insert a new cartridge. Cotton or disposable gloves should be worn if contact with toner material is likely.

Office workers are not expected to come into contact with the notified polymer under normal circumstances. Infrequent dermal exposure of end users to the toner containing the notified polymer may occur when changing toner cartridges or clearing paper jams, but the high molecular weight of the notified polymer indicates that dermal absorption would be minimal. There may be a low level of toner dust in the immediate vicinity of printers when they are operating, although inhalation exposure to the notified polymer is not expected to pose a significant toxicological hazard. Work areas around the laser printers should be well ventilated to ensure that the concentration of airborne toner particles is as low as possible. Exposure to the notified polymer is not expected to occur once the toner is bound to paper.

Based on the low toxicological hazard presented by the polymer and the expected very low exposures, the health risk posed to office workers by the notified polymer is low.

Waterside, warehouse and transport workers will be only exposed to the notified polymer in the event of an accident or damage to packaging. The occupational health risk to these workers is negligible, considering the small quantities of notified polymer in individual cartridges and the low hazard it presents.

13.3. Public health

There will not be significant public exposure to the notified polymer as it is present in the toner product at low concentrations and is contained within cartridges which are not normally opened. The public may be exposed to small amounts of the notified polymer via dermal contact during changing of the printing cartridges. Contact with printed paper is unlikely to lead to dermal exposure, as the notified polymer is firmly bound to the paper. The notified polymer is unlikely to cross biological membranes, due to its high molecular weight, but could cause slight mechanical irritation if inhaled. Therefore, the risk to the public from the use of toner containing the notified polymer is assessed as very low.

14. MSDS AND LABEL ASSESSMENT

14.1. MSDS

The MSDS of the notified polymer and the toners [containing the polymer](#) provided by the notifier were in accordance with the NOHSC *National Code of Practice for the Preparation of Material Safety Data Sheets* (NOHSC, 1994a). The MSDS for the polymer is published here as part of the assessment report. The accuracy of the information on the MSDS remains the responsibility of the applicant.

14.2. Label

The labels for the [notified polymer and the toners containing the polymer](#) provided by the notifier were in accordance with the NOHSC *National Code of Practice for the Labelling of Workplace Substances* (NOHSC, 1994b). The accuracy of the information on the label remains the responsibility of the applicant.

15. RECOMMENDATIONS

Control Measures

Occupational Health and Safety

No specific control measures are necessary for the notified polymer, however, in the interests of good occupational health and safety practice, the following guidelines are recommended for handling toners containing the notified polymer.

- Employers should implement the following engineering controls to minimise occupational exposure to the toner:
 - Work areas around printers should be well ventilated.

- Employers should implement the following safe work practices to minimise occupational exposure during handling of the toner cartridge:
 - Avoid spills and the formation of dust.
 - Spillages should be swept up promptly and put in containers for disposal.
- Employers should ensure that the following personal protective equipment is used by workers to minimise occupational exposure to the toner:
 - Cotton or disposable gloves should be worn if direct contact is possible.
- 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.

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.
- (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.

16. REFERENCES

Connell, DW (1990). General Characteristics of Organic Compounds Which Exhibit Bioaccumulation. In: *Bioaccumulation of Xenobiotic Compounds*, pp. 47-57. CRC Press, Boca Raton, USA.

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

National Occupational Health and Safety Commission (1994b) National Code of Practice for the Labelling of Workplace Substances [NOHSC:2012(1994)]. Australian Government Publishing Service, Canberra.

National Occupational Health and Safety Commission (1999) *Approved Criteria for Classifying Hazardous Substances* [NOHSC:1008(1994)]. Australian Government Publishing Service, Canberra.

Pauly et al., Polymer Handbook; J. Brandup, E. Immergut, John Wiley and Sons, 3rd Ed., pVI-448.