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

FULL PUBLIC REPORT

2-Propenoic acid, polymer with butyl 2-propenoate, ethenylbenzene and (1-methylethenyl)benzene

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Street Address: 334 - 336 Illawarra Road MARRICKVILLE NSW 2204, AUSTRALIA.
Postal Address: GPO Box 58, SYDNEY NSW 2001, AUSTRALIA.
TEL: + 61 2 8577 8800
FAX + 61 2 8577 8888
Website: www.nicnas.gov.au

**Director
Chemicals Notification and Assessment**

FULL PUBLIC REPORT**2-Propenoic acid, polymer with butyl 2-propenoate, ethenylbenzene and (1-methylethenyl)benzene****1. APPLICANT AND NOTIFICATION DETAILS**

APPLICANT(S)
S.C. Johnson & Son Pty Ltd
160 Epping Road
LANE COVE NSW 2066

EXEMPT INFORMATION (SECTION 75 OF THE ACT)
No details are claimed exempt from publication.

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
United States 1984; Canada 1999; Korea 2002.

2. IDENTITY OF CHEMICAL

CHEMICAL NAME
2-Propenoic acid, polymer with butyl 2-propenoate, ethenylbenzene and (1-methylethenyl)benzene

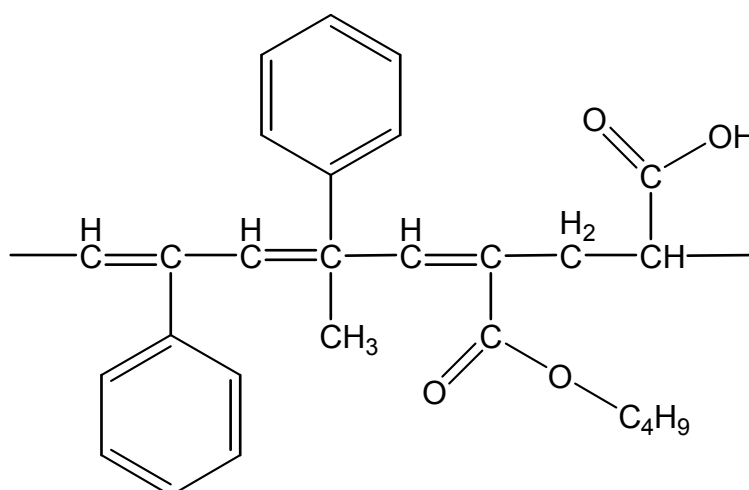
OTHER NAME
Polymer of Styrene with alphamethyl styrene, butyl acrylate and acrylic acid

MARKETING NAME(S)
B-51

CAS NUMBER
77045-85-3

MOLECULAR FORMULA
(C₈H₈.C₉H₁₀.C₇H₁₂O₂.C₃H₄O₂)_x

STRUCTURAL FORMULA



MOLECULAR WEIGHT (MW)

Number Average Molecular Weight (Mn)	2500
Weight Average Molecular Weight (Mw)	6200
Polydispersity Index (Mw/Mn)	2.48
% of Low MW Species < 1000	8.5
% of Low MW Species < 500	5.4

3. COMPOSITION

POLYMER CONSTITUENTS

<i>Chemical Name</i>	<i>CAS No.</i>	<i>Weight % starting</i>	<i>Weight % residual</i>
Styrene	100-42-5	30	0.08
Butyl Acrylate	141-32-2	24	0.05
Alphamethyl styrene	98-83-9	20	0.2
Acrylic acid	79-10-7	25	0.05
Ditertiarybutyl peroxide (initiator)	11-05-4	1	0

PLC CRITERIA JUSTIFICATION

Molecular Weight	The notified polymer satisfies the molecular weight criteria.
Reactive Functional Groups	The notified polymer has no groups of high or moderate concern.
Charge Density	The notified polymer has low charge density.
Elemental Criteria	The notified polymer contains only approved elements.
Degradability	The notified polymer is not biodegradable.
Water Absorbing	The notified polymer is not a water-absorbing polymer.
Residual Monomers	All residual monomers are below the relevant cut-off.
Hazard Category	The notified polymer is not classified as a hazardous substance.

The notified polymer meets the PLC criteria.

4. 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>	<50	<50	<50	<50	<50

USE
Component of floor finish

6. PHYSICAL AND CHEMICAL PROPERTIES

Appearance at 20°C and 101.3 kPa	White solid flakes or pellets
Melting Point/Glass Transition Temp	Does not melt
Density	1030 kg/m ³
Water Solubility	≤ 3 mg/L at 20°C. The water solubility of the notified polymer was assessed at pH 2, 7 and 9. At each pH the ground notified polymer in water was prepared at both 1 g/L and 10 g/L. The suspension were stirred at ambient temperature for 24 h and then filtered. The filtrate was then analysed for TOC (Johnson Polymer 2002). The maximum water solubility value was obtained at pH 9. The values obtained for water solubility classify the polymer as being slightly soluble (Mensink 1995).
Particle Size	Not applicable
Degradation Products	None expected
Loss of monomers, other reactants, additives impurities	Not expected
Hydrolysis as a Function of pH	The notified polymer contains ester linkages that could be expected to undergo hydrolysis under extreme pH conditions. However, in the environmental pH range of 4 to 9, significant hydrolysis is unlikely to occur.
Partition Coefficient (n-octanol/water)	As a consequence of the notified polymer's low water solubility it is expected to have a high partition coefficient value which indicative of partitioning into the organic phase.
Adsorption/Desorption	As a consequence of its low water solubility, the notified polymer is expected to associate with soil and sediment and be immobile in both aquatic and terrestrial compartments.

7. HUMAN HEALTH IMPLICATIONS

7.1 Toxicology

7.1.1. Toxicological Investigations

The following toxicological studies were submitted:

<i>Endpoint</i>	<i>Assessment Conclusion</i>
Rat, acute oral limit test	LD50 > 5000 mg/kg bw/day – low toxicity
Rabbit, primary skin irritation	slightly irritating
Rabbit, primary eye irritation	slightly-irritating

All results were indicative of low hazard.

7.1.2. Human Health Hazard Assessment

The notified polymer meets the PLC criteria and can therefore be considered to be of low hazard. Powder or dust of the notified polymer may cause irritation to the eyes, and to the respiratory tract if inhaled. Prolonged or repeated skin contact may cause dermatitis.

7.2 Occupational Health

7.2.1 Occupational Exposure

- The notified polymer is imported in 205L drums as solid flakes. Exposure to the notified polymer during importation and transport to the reformulation site is not expected except in the unlikely event of accidental spillage.
- The notified polymer is reformulated with other ingredients to give a floor-coating product. Workers involved in this reformulation may be exposed to the solid flakes of notified polymer and dusts generated during its addition to the process vessel. Workers may also be exposed to the notified polymer at 5-11% as it exists in the final floor coating formulation via splashes and drips during the addition of mixing of the formulation.
- The final formulation is transferred to the production line for packaging by dedicated pipeline. Due to automated nature of this process, worker exposure is not anticipated.
- Workers involved in the retail sale of the floor cleaning products would only be exposed to the notified chemical in small volumes of the 5-11% solution in the event of rupturing of consumer packaging.
- Professional cleaners and other workers using the products containing the notified polymer may be dermally exposed to approximately 5.5g of the notified polymer per square metre of floor cleaned.

7.2.2 Exposure Assessment

Workers may be exposed to dust particles during the addition of the polymer to the process vessel. Dermal exposure to the pellets/powder may also occur. However, exposure to significant amounts of the notified polymer is limited because of the engineering controls and personal protective equipment worn by workers. After application and once dried, the coating containing the notified polymer is cured into an inert matrix and is hence unavailable to exposure.

Intermittent, widespread use with direct handling is expected to occur among professional cleaners. The labelling of the product advises to avoid contact with skin and eyes.

7.3 Public Health

7.3.1 Public Exposure

- There is potential for widespread intermittent use of products containing the notified polymer by consumers.
- Members of the public may also be dermally exposed to the polymer as it exists as a protective film on floor surfaces following application

7.3.2 Exposure Assessment

Cleaning products containing the notified polymer are for sale to the general public. Members of the public will make dermal contact and possibly accidental ocular contact with products containing the notified polymer. However, exposure will be low because the notified polymer is present at low concentrations and used intermittently by the average consumer.

After application and once dried, the coating containing the notified polymer is cured into an inert matrix and is hence unavailable to exposure.

8. ENVIRONMENTAL IMPLICATIONS

8.1 Ecotoxicology

8.1.1 Ecotoxicological Investigations

No toxicological data were submitted. However, the notifier has provided information (Guiney *et al* 1998) in which the toxicity of a structural analogue (a styrene-acrylate polymer MW 4500–9000) of the notified polymer was determined. The test substance exhibited the following toxicities:

Fish (Fathead minnow)	290 mg/L (NOEC)
Daphnia (<i>Ceriodaphnia dubia</i>)	310 mg/L (NOEC)
Algae (<i>Selenastrum capricornutum</i>)	170 mg/L (NOEC)

Furthermore, the test substance was found to be non-toxic to the sediment dwelling organism, *Chironomus riparius* (NOEC of 911 mg/L), earthworms (NOEC of 1100 mg/L) and does not inhibit sludge respiration.

The PNEC was calculated by taking the NOEC value of the most sensitive species, in this case algae, and dividing this value by an appropriate assessment safety factor. Using a worst case scenario safety factor of 100(OECD), the PNEC is 1.7 mg/L.

The paper concluded that polymers of this type present very low risk to aquatic organisms (both benthic and pelagic).

8.1.2 Environmental Hazard Assessment

The notified polymer can be considered to be of low hazard based on its reported use pattern.

8.2 Environmental Contamination

8.2.1 Environmental Exposure

The notified polymer will be used in floor care products. The products containing the notified polymer will be applied to lino, tiles etc. using a sponge and removed by ammonia based cleaners. The resulting waste wash water will typically be disposed of to sewer. As such, this will result in the eventual release of the entire import volume to the environment. Product containers and any residual polymer they may contain will be disposed of in landfill.

8.2.2 Exposure Assessment

The notified polymer is insoluble in water and as such is unlikely to be mobile in either aquatic or terrestrial compartments. When released to sewer and in landfill, the notified polymer is expected to rapidly associate with soil and sediment and slowly degraded through the abiotic and biotic processes.

Based on a worst case annual release of 50000 kg to sewer and not removed during sewage treatment processes, the daily release on a nationwide basis to receiving waters is estimated to be 137 kg/day. Assuming a national population of 19,500,000 and that each person contributes an average 200 L/day to overall sewage flows, the predicted concentration in sewage effluent on a nationwide basis is estimated as 0.035 mg/L.

Amount entering sewer annually	50000 kg
Population of Australia	19.5 million
Amount of water used per person per day	200 L
Number of days in a year	365
Estimated PEC	0.035 mg/L (0.035 ppm)

Removal processes such as adsorption to sludge would reduce this value further. The notifier has provided a literature reference (Jop *et al* 1997) in which the authors concluded similar polymer to the notified substance demonstrated a high degree of sorption to sewage sludge, reaching a maximum in 2 h or less. Furthermore, while there was no evidence of significant biodegradation, the presence of small amounts of radiolabeled CO₂ suggested the polymer has the potential for biodegradation.

Due to its high molecular weight (>1000 MW), the notified polymer is not expected to bioaccumulate.

9. RISK ASSESSMENT

9.1. Environment

The majority of the notified polymer will be used in floor care products. As such, most will eventually be released into domestic sewage systems as a consequence of product removal from floors. The compound has a low water solubility (< 3 mg/L) and is expected to have a high partition coefficient, all indicating that the material would be immobile in both aquatic and terrestrial compartments. As a consequence, the notified polymer is expected to associate with soil and sediment and slowly degrade to water and oxides of carbon through the processes described above.

Due to its high molecular weight (>1000 MW), the notified polymer is not expected to bioaccumulate.

The PEC/PNEC ratio for the aquatic environment, assuming nationwide use, is 0.02. This value is significantly less than 1, indicating no immediate concern to the aquatic compartment.

9.2 Occupational health and safety

The OHS risk presented by the notified polymer is expected to be low due to its overall low toxicity, engineering controls and low concentration in floor care products. However, due to the slight risk of skin and eye irritation and respiratory inhalation if in dust form, skin and eye/face protection are required when handling the notified polymer during formulation of the floor care product.

9.3 Public health

Members of the public using the formulated floor coatings may be exposed to the notified chemical. The notified polymer is however present at up to 11%, is of low hazard and high molecular weight, therefore, the risk to the public from exposure to the notified polymer during use of the floor cleaning products is considered low.

Following application, the notified polymer is bound within a matrix and will not be bioavailable.

10. CONCLUSIONS – ASSESSMENT LEVEL OF CONCERN FOR THE ENVIRONMENT AND HUMANS

10.2. Environmental risk assessment

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

pattern.

10.3. Human health risk assessment

10.3.1. Occupational health and safety

There is low concern to occupational health and safety under the conditions of the occupational settings described.

10.3.2. Public health

There is negligible concern to public health when used in the intended manner.

11. MATERIAL SAFETY DATA SHEET

11.1. Material Safety Data Sheet

The notifier has provided MSDS in accordance with the schedule item B 12 of the *ICNA Act*. The accuracy of the information on the MSDS remains the responsibility of the applicant.

12. RECOMMENDATIONS

CONTROL MEASURES

Occupational Health and Safety

- Avoid skin and eye contact and wear dust mask if dusts are generated.
 - Guidance in selection of personal protective equipment can be obtained from Australian, Australian/New Zealand or other approved standards.
- 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.

Environment

Disposal

- The notified polymer should be disposed of in sewer or landfill.

Emergency procedures

- Spills/release of the notified polymer should be swept up and placed into a container prior to disposal in landfill.

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.

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.

No additional secondary notification conditions are stipulated.

13. BIBLIOGRAPHY

Johnson Polymer (2002) Polymer Characterisation Group, Final Analysis Report AR# 139012 (unpublished report submitted by S. C. Johnson and Son Pty Ltd).

Jop K. M., Guiney P. D., Christensen K. P., Silberhorn E. M., Environmental Fate Assessment of Two Synthetic Polycarboxylate Polymers, *Ecotoxicology and Environmental Safety*, **37**, 229, (1997).

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