File No: LTD/1648

December 2014

NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME (NICNAS)

PUBLIC REPORT

2-Propen-1-ol, 2-methyl-3-(4-methylphenyl)-, (2E)-

This Assessment has been compiled in accordance with the provisions of the *Industrial Chemicals (Notification and Assessment) Act 1989* (Cwlth) (the Act) and Regulations. This legislation is an Act of the Commonwealth of Australia. The National Industrial Chemicals Notification and Assessment Scheme (NICNAS) is administered by the Department of Health and Ageing, and conducts the risk assessment for public health and occupational health and safety. The assessment of environmental risk is conducted by the Department of Sustainability, Environment, Water, Population and Communities.

For the purposes of subsection 78(1) of the Act, this Public Report may be inspected at our NICNAS office by appointment only at Level 7, 260 Elizabeth Street, Surry Hills NSW 2010.

This Public Report is also available for viewing and downloading from the NICNAS website or available on request, free of charge, by contacting NICNAS. For requests and enquiries please contact the NICNAS Administration Coordinator at:

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Director
NICNAS

TABLE OF CONTENTS

SUMMARY

The following details will be published in the NICNAS *Chemical Gazette:*

ASSESSMENT REFERENCE	APPLICANT(S)	CHEMICAL OR TRADE NAME	HAZARDOUS CHEMICAL	INTRODUCTION VOLUME	USE
LTD/1648	Firmenich Limited	2-Propen-1-ol, 2-methyl-3-(4-methylphenyl)-, (2E)-	Yes	≤ 1 tonne per annum	Fragrance ingredient

CONCLUSIONS AND REGULATORY OBLIGATIONS

Hazard classification
Based on the available information, the notified chemical is recommended for hazard classification according to the *Globally Harmonised System for the Classification and Labelling of Chemicals (GHS),* as adopted for industrial chemicals in Australia. The recommended hazard classification is presented in the table below.

Hazard classification	*Hazard statement*
Acute toxicity (Category 4)	H302 – Harmful if swallowed
Skin sensitisation (Category 1)	H317 – May cause an allergic skin reaction

Based on the available information, the notified chemical is recommended for hazard classification according to the *Approved Criteria for Classifying Hazardous Substances* (NOHSC, 2004) with the following risk phrase:

R22 Harmful if swallowed
R43 May cause sensitisation by skin contact

The environmental hazard classification according to the *Globally Harmonised System for the Classification and Labelling of Chemicals* (GHS) is presented below. Environmental classification under the GHS is not mandated in Australia and carries no legal status but is presented for information purposes.

Hazard classification	*Hazard statement*
Acute aquatic toxicity (Category 2)	H401 – Toxic to aquatic life

Human health risk assessment
Under the conditions of the occupational settings described, provided that control measures are in place to minimise worker exposure, including the use of automated processes, ventilation systems and PPE (coveralls, impervious gloves, eye protection), the notified chemical is not considered to pose an unreasonable risk to the health of workers.

Based on the available information, when used at ≤ 0.17% in deodorants, ≤ 0.32% in fine fragrances, ≤ 0.5% in body lotion, ≤ 0.44% in other leave-on cosmetic products and ≤ 1% in rinse-off cosmetic products and household products, the notified chemical is not considered to pose an unreasonable risk to public health.

Environmental risk assessment
On the basis of the PEC/PNEC ratio and the assessed use pattern, the notified chemical is not considered to pose an unreasonable risk to the environment.

Recommendations

REGULATORY CONTROLS
Hazard Classification and Labelling

- The notified chemical should be classified as follows:

  - Acute toxicity (Category 4): H302 – Harmful if swallowed
  - Skin sensitisation (Category 1): H317 – May cause an allergic skin reaction

- The above should be used for products/mixtures containing the notified chemical, if applicable, based on the concentration of the notified chemical present and the intended use/exposure scenario.

- The Delegate (and/or the Advisory Committee on Chemicals Scheduling) should consider the notified chemical for listing on the SUSMP.

Health Surveillance

- As the notified chemical is a skin sensitiser, employers should carry out health surveillance for any worker who has been identified in the workplace risk assessment as having a significant risk of skin sensitisation.

CONTROL MEASURES
Occupational Health and Safety

- A person conducting a business or undertaking at a workplace should implement the following isolation and engineering controls to minimise occupational exposure to the notified chemical during reformulation processes:
  - Enclosed, automated processes, where possible
  - Ventilation system including local exhaust ventilation

- A person conducting a business or undertaking at a workplace should implement the following safe work practices to minimise occupational exposure during handling of the notified chemical during reformulation processes:
  - Avoid contact with skin and eyes

- A person conducting a business or undertaking at a workplace should ensure that the following personal protective equipment is used by workers to minimise occupational exposure to the notified chemical during reformulation processes:
  - Coveralls, impervious gloves, eye protection

  Guidance in selection of personal protective equipment can be obtained from Australian, Australian/New Zealand or other approved standards.

- A copy of the (M)SDS should be easily accessible to employees.

- If products and mixtures containing the notified chemical are classified as hazardous to health in accordance with the *Globally Harmonised System for the Classification and Labelling of Chemicals (GHS)*, as adopted for industrial chemicals in Australia, workplace practices and control procedures consistent with provisions of State and Territory hazardous substances legislation should be in operation.

Public Health

- The following measures should be taken to minimise public exposure to the notified chemical:
  - The notified chemical should only be used at ≤ 0.17% in deodorants, ≤ 0.32% in fine fragrances, ≤ 0.5% in body lotion, ≤ 0.44% in other leave-on cosmetic products and ≤ 1% in rinse-off cosmetic products and household products.

Disposal

- Where reuse or recycling are not appropriate, dispose of the notified chemical in an environmentally sound manner in accordance with relevant Commonwealth, state, territory and local government legislation.

Storage

- The handling and storage of the notified chemical should be in accordance with the Safe Work Australia Code of Practice for *Managing Risks of Hazardous Chemicals in the Workplace* (SWA, 2012) or relevant State or Territory Code of Practice.

Emergency procedures

- Spills or accidental release of the notified chemical should be handled by physical containment, collection and subsequent safe disposal.

Regulatory Obligations

Secondary Notification
This risk assessment is based on the information available at the time of notification. The Director may call for the reassessment of the chemical under secondary notification provisions based on changes in certain circumstances. Under Section 64 of the *Industrial Chemicals (Notification and Assessment) Act (1989)* the notifier, as well as any other importer or manufacturer of the notified chemical, have post-assessment regulatory obligations to notify NICNAS when any of these circumstances change. These obligations apply even when the notified chemical is listed on the Australian Inventory of Chemical Substances (AICS).

Therefore, the Director of NICNAS must be notified in writing within 28 days by the notifier, other importer or manufacturer:

(1) Under Section 64(1) of the Act; if
- the importation volume exceeds one tonne per annum notified chemical;
- the concentration of the notified chemical exceeds or is intended to exceed 0.17% in deodorants, 0.32% in fine fragrances, 0.5% in body lotion, 0.44% in other leave-on cosmetic products and 1% in rinse-off cosmetic products and household products;

or

(2) Under Section 64(2) of the Act; if
- the function or use of the chemical has changed from a fragrance ingredient, or is likely to change significantly;
- the chemical has begun to be manufactured in Australia;
- additional information has become available to the person as to an adverse effect of the chemical on occupational health and safety, public health, or the environment.

The Director will then decide whether a reassessment (i.e. a secondary notification and assessment) is required.

(Material) Safety Data Sheet
The (M)SDS of the notified chemical provided by the notifier was reviewed by NICNAS. The accuracy of the information on the (M)SDS remains the responsibility of the applicant.

ASSESSMENT DETAILS

1. APPLICANT AND NOTIFICATION DETAILS

APPLICANT(S)
Firmenich Limited (ABN: 86 002 964 794)
73 Kenneth Road
Balgowlah NSW 2093

NOTIFICATION CATEGORY
Limited-small volume: Chemical other than polymer (1 tonne or less per year).

EXEMPT INFORMATION (SECTION 75 OF THE ACT)
Data items and details claimed exempt from publication: other names, analytical data, degree of purity,

impurities, additives/adjuvants and use details.

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

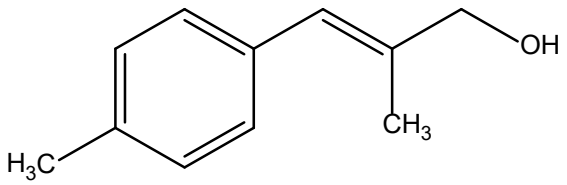
MARKETING NAME(S)
2-Propen-1-ol, 2-methyl-3-(4-methylphenyl)-, (2E)-

CAS NUMBER
56138-10-4

CHEMICAL NAME
2-Propen-1-ol, 2-methyl-3-(4-methylphenyl)-, (2E)-

MOLECULAR FORMULA
$C_{11}H_{14}O$

STRUCTURAL FORMULA



MOLECULAR WEIGHT
162 Da

ANALYTICAL DATA
Reference NMR, IR, GC/MS and UV spectra were provided.

3. COMPOSITION

DEGREE OF PURITY > 90%

4. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE AT 20 °C AND 101.3 kPa: white waxy solid (colourless liquid at > 23 °C)

Property	Value	Data Source/Justification
Freezing Point	22.6 °C	Measured
Boiling Point	275.5 °C at 96.0 kPa	Measured
Density	1,010 kg/m^3 at 20 °C	Measured
Vapour Pressure	2.8×10^{-5} kPa at 20 °C 5.4×10^{-5} kPa at 25 °C	Measured
Water Solubility	0.581 g/L at 20 °C	Measured
Hydrolysis as a Function of pH	Not determined	Contains no hydrolysable functionality
Partition Coefficient (n-octanol/water)	log Pow = 2.39 at 20 °C	Measured
Adsorption/Desorption	log K_{oc} = 2.30 at 35 °C	Measured
Dissociation Constant	Not determined	Contains no dissociable functionality
Flash Point	139 ± 2 °C at 101.3 kPa	Measured

Autoignition Temperature	> 139 °C based on the flash point	Not expected to autoignite under normal conditions
Explosive Properties	Predicted negative	Contains no functional groups that would imply explosive properties.
Oxidising Properties	Predicted negative	Contains no functional groups that would imply oxidative properties.

DISCUSSION OF PROPERTIES
For full details of tests on physical and chemical properties, refer to Appendix A.

Reactivity
The notified chemical is expected to be stable under normal conditions of use.

Physical hazard classification
Based on the submitted physico-chemical data depicted in the above table, the notified chemical is not recommended for hazard classification according to the *Globally Harmonised System for the Classification and Labelling of Chemicals (GHS),* as adopted for industrial chemicals in Australia.

5. INTRODUCTION AND USE INFORMATION

MODE OF INTRODUCTION OF NOTIFIED CHEMICAL (100%) OVER NEXT 5 YEARS
The notified chemical will be imported into Australia as a component of compounded fragrances.

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

Year	*1*	*2*	*3*	*4*	*5*
Tonnes	< 1	< 1	< 1	< 1	< 1

PORT OF ENTRY
Sydney, by wharf

IDENTITY OF RECIPIENTS
Firmenich Ltd

TRANSPORTATION AND PACKAGING
The fragrance preparations containing the notified chemical (at ≤ 10% concentration) will be imported in tightly closed lacquered drums, typically of 180 kg size, but also 100, 50, 25, 10 or 5 kg. The drums will be transported by road from the wharf of entry to the Firmenich Ltd warehouse for storage and then distributed to reformulation sites. The end-use products will be packaged in containers suitable for retail sale.

USE
The notified chemical is intended to be used as a component of fragrances for a variety of cosmetic and household products (proposed usage concentrations: ≤ 1% in fragrances, rinse-off cosmetic products and household cleaning products and ≤ 0.5% in leave-on cosmetic products).

OPERATION DESCRIPTION
The procedures for incorporating the imported fragrance preparations (containing ≤ 10% notified chemical) into end-use products will likely vary depending on the nature of the cosmetic and/or household products formulated, and may involve both automated and manual transfer steps. However, in general, it is expected that the reformulation processes will involve blending operations that will be highly automated and occur in a fully enclosed environment, followed by automated filling of the reformulated products into containers of various sizes.

The finished products containing the notified chemical (at ≤ 1% concentration) may be used by consumers and professionals such as hairdressers, workers in beauty salons or cleaners. Depending on the nature of the product, these could be applied in a number of ways, such as by hand, using an applicator or sprayed.

6. HUMAN HEALTH IMPLICATIONS

6.1. Exposure Assessment

6.1.1. Occupational Exposure

CATEGORY OF WORKERS

Category of Worker	*Exposure Duration (hours/day)*	*Exposure Frequency (days/year)*
Transport workers	1	6
Mixer	4	2
Drum Handling	4	2
Drum Cleaning	4	2
Maintenance	4	2
Quality Control	1	1
Packaging	4	2
Salon Workers	Unspecified	Unspecified
Cleaners	Unspecified	Unspecified

EXPOSURE DETAILS

Transport and storage workers may come into contact with the notified chemical, as a component of the imported fragrance preparations (≤ 10% concentration) or end-use products (≤ 1% concentration), only in the event of an accidental rupture of containers.

During reformulation, dermal, ocular and inhalation exposure of workers to the notified chemical (at ≤ 10% concentration) may occur during weighing and transfer stages, blending, quality control analysis and cleaning and maintenance of equipment. Exposure is expected to be minimised through the use of mechanical ventilation and/or enclosed systems and through the use of personal protective equipment (PPE), such as coveralls, safety glasses and impervious gloves.

Exposure to the notified chemical in end-use products (at ≤ 1% concentration) may occur in professions where the services provided involve the application of cosmetic and personal care products to clients (e.g. hair dressers, workers in beauty salons) or in the cleaning industry. Such professionals may use some PPE to minimise repeated exposure, and good hygiene practices are expected to be in place. If PPE is used, exposure of such workers is expected to be of a similar or lesser extent than that experienced by consumers using products containing the notified chemical.

6.1.2. Public Exposure

There will be widespread and repeated exposure of the public to the notified chemical (at ≤ 1% concentration) through the use of the household products and the rinse-off and leave-on cosmetic products. The principal route of exposure will be dermal, while ocular and inhalation exposure is also possible, particularly if products are applied by spray.

A combined internal dose of 1.84 mg/kg bw/day was estimated using data on typical use patterns of cosmetic and household cleaning product categories in which the notified chemical may be used (SCCS, 2010; Cadby *et al.*, 2002; SDA, 2005; specific use details of the notified chemical are considered as exempt information). This estimation assumed a worst case scenario and is for a person who is a simultaneous user of a selection of cosmetic and household products that may contain the notified chemical.

6.2. Human Health Effects Assessment

The results from toxicological investigations conducted on the notified chemical are summarised in the following table. For full details of the studies, refer to Appendix B.

Endpoint	*Result and Assessment Conclusion*
Rat, acute oral toxicity	LD50 = 300-2000 mg/kg bw; harmful
Rat, acute dermal toxicity	LD50 > 2000 mg/kg bw; low toxicity
Rabbit, skin irritation	slightly irritating
Rabbit, eye irritation	slightly irritating

Mouse, skin sensitisation – Local lymph node assay	evidence of sensitisation
Human, skin sensitisation – RIPT (1%)	no evidence of sensitisation
Rat, repeat dose oral gavage toxicity - 28 days	NOAEL ≥ 600 mg/kg bw/day
Mutagenicity – bacterial reverse mutation	non mutagenic
Genotoxicity – *in vitro* mammalian chromosome aberration	non genotoxic

Toxicokinetics, metabolism and distribution.
Based on the water solubility (0.581 g/L at 20 °C), partition coefficient (log P_{ow} = 2.39 at 20 °C) and the low molecular weight (< 500 Da) of the notified chemical, passive diffusion across the gastrointestinal (GI) tract and dermal absorption are expected to occur. The notified chemical may also be absorbed across the respiratory tract.

Acute toxicity
The notified chemical was found to be harmful in an acute oral toxicity study in rats. Two females in the 2,000 mg/kg bw treatment group were found dead on day 1 following dosing. For animals in the 300 mg/kg bw group, there were no mortalities; however, all animals showed hunched posture and one animal showed piloerection on day 1 following treatment. For the animals in the 2,000 mg/kg bw group, signs of toxicity included lethargy, flat and/or hunched posture, piloerection, slow breathing, uncoordinated movements, dark eye and/or watery discharge from the eyes, which were noted in all animals between days 1 and 6 following treatment. One animal also showed scales and scabs on the snout during the observation period (days 2-15 following treatment).

The notified chemical was found to have low acute dermal toxicity in a study in rats.

No acute inhalation toxicity data were provided for the notified chemical.

Irritation
The notified chemical was found to be slightly irritating to the skin of rabbits, with very slight erythema and oedema noted at the treated sites of all rabbits (treated sites returned to normal within 7 days). The notified chemical was also found to be slightly irritating to the eyes of rabbits, with minimal to moderate effects on the cornea and conjunctivae noted in the treated eyes of all animals. All treated eyes appeared normal within 7 days. The effects (scores and/or reversibility) in these studies did not warrant classification of the chemical as a skin or eye irritant.

Sensitisation
The notified chemical was found to be a skin sensitiser in mice (Local Lymph Node Assay; stimulation indices of 5.0, 10.7 and 13.0 at 10, 25 and 50%, respectively). The EC_3 value was calculated to be 5.2%.

The notified chemical (at 1% concentration) was determined by the study authors to not be a skin sensitiser in a human repeat insult patch test. Faint, minimal erythema was noted in 1 subject at challenge, 24 hours post-patch removal, with no reaction evident thereafter.

Repeated dose toxicity
The No Observed (Adverse) Effect Level (NO(A)EL) was established by the study authors as ≥ 600 mg/kg bw/day in a 28 day repeated dose toxicity study by oral gavage in rats (dosage levels: 30, 150 and 600 mg/kg/bw/day), based on the absence of adverse effects at the highest dose tested. While multiple laboratory findings (haematology/clinical chemistry) and effects in the organs were reported for treated animals, in-general, the effects were not considered by the study authors to be adverse and/or toxicologically significant.

Mutagenicity/genotoxicity
The notified chemical was not mutagenic in a bacterial reverse mutation study and was not clastogenic in an *in vitro* mammalian chromosome aberration test.

Health hazard classification
Based on the available information, the notified chemical is recommended for hazard classification according to the *Globally Harmonised System for the Classification and Labelling of Chemicals (GHS),* as adopted for industrial chemicals in Australia. The recommended hazard classification is presented in the following table.

Hazard classification	***Hazard statement***
Acute toxicity (Category 4)	H302 – Harmful if swallowed

Skin sensitisation (Category 1)	H317 – May cause an allergic skin reaction

Based on the available information, the notified chemical is recommended for hazard classification according to the *Approved Criteria for Classifying Hazardous Substances* (NOHSC, 2004), with the following risk phrase(s):

R22 Harmful if swallowed
R43 May cause sensitisation by skin contact

6.3. Human Health Risk Characterisation

6.3.1. Occupational Health and Safety

Reformulation

Exposure of workers to the notified chemical (at ≤ 10% concentration) may occur during blending operations. While the notified chemical is considered to be harmful to human health via the oral route, ingestion is unlikely under the occupational settings described. The notified chemical is considered to be a skin sensitiser and it is slightly irritating to skin and eyes. In addition, harmful effects following inhalation exposure to the notified chemical cannot be ruled out. Therefore, caution should be exercised when handling the notified chemical during reformulation processes.

Therefore, provided that control measures are in place to minimise worker exposure, including the use of automated processes and PPE, the risk to the health of workers from use of the notified chemical is not considered to be unreasonable.

End-use

Cleaners and beauty care professionals will handle the notified chemical at ≤ 1% concentration, similar to public use. Therefore, the risk to workers who regularly use products containing the notified chemical is expected to be of a similar or lesser extent than that experienced by members of the public who use such products on a regular basis. For details of the public health risk assessment see Section 6.3.2.

6.3.2. Public Health

Repeated-dose toxicity

Members of the public may experience repeated exposure to the notified chemical (at ≤ 1% concentration) through the use of the cosmetic and household products.

The repeat dose toxicity potential was estimated by calculation of the margin of exposure (MoE) of the notified chemical using the worst case exposure scenario from use of multiple products of 1.84 mg/kg bw/day (see Section 6.1.2) and the NOAEL of 600 mg/kg bw/day, which was established in a 28-day repeated dose toxicity study on the notified chemical. A MoE value ≥ 100 is considered acceptable to account for intra- and inter-species differences. Using the abovementioned NOAEL, a MoE of 326 was estimated, which is considered to be acceptable.

Skin sensitisation

Methods for the quantitative risk assessment for dermal sensitisation have been proposed and been the subject of significant discussion (see for example, Api *et al.*, 2008 and RIVM, 2010). As is shown in the table below, the Consumer Exposure Level (CEL) from use of the notified chemical in a number of different cosmetic products may be estimated (SCCS, 2010). When tested at 1% concentration in a human repeat insult patch study [0.3 mL applied to 25 mm Hill Top Chamber patch (2.54 cm^2 assumed)], the notified chemical was determined by the study authors to not be a skin sensitiser. Although this study has been used for the purposes of quantitative risk assessment of the notified chemical, the availability of additional information on the sensitisation potential of the notified chemical (i.e., the LLNA study) was taken into account when determining the safety assessment factors that should be applied. Thus, consideration of the study details and application of appropriate safety factors, allowed the derivation of an Acceptable Exposure Level (AEL) of 11.93 $\mu g/cm^2$. In this instance, the factors employed included an interspecies factor (1), intraspecies factor (10), a matrix factor (3.16), a use and time factor (3.16) and a database factor (1), giving an overall safety factor of ~100.

Product type	Proposed maximum usage concentration (%)	CEL chemical ($\mu g/cm^2$)	AEL chemical ($\mu g/cm^2$)	Proposed usage concentration supported?	Recommended usage concentration (%)
Deodorant spray	0.5	35.75	11.93	No	≤ 0.17
Fine fragrances	1	37.50	11.93	No	≤ 0.32

Body lotion	0.5	2.50	11.93	Yes	≤ 0.5*
Other leave-on cosmetics (assumed: face cream)	0.5	13.63	11.93	No	≤ 0.44
Rinse-off cosmetics (assumed: hand wash soap)	1	2.33	11.93	Yes	≤ 1*

As the CEL > AEL, the risk to the public of the induction of sensitisation that is associated with the use of the notified chemical in deodorants (at ≤ 0.5%), fine fragrances (at ≤ 1%) and other leave-on cosmetic products (excluding body lotion; using face cream as a worst case example; at ≤ 0.5%) is considered to be unreasonable. Reducing the concentration of the notified chemical in deodorants to ≤ 0.17%, fine fragrances to ≤ 0.32% and other leave-on cosmetic products to ≤ 0.44% allows recalculation of the consumer exposure to acceptable levels. Regarding use in body lotion at ≤ 0.5% and rinse-off cosmetic products at ≤ 1% (using hand wash soap as a worst case example), as the AEL > CEL, the risk to the public of the induction of sensitisation is not considered to be unreasonable. Based on the significantly lower expected exposure level for household products (≤ 1% notified chemical), by inference, the risk of induction of sensitisation associated with the use of these products is also not considered to be unreasonable. It is acknowledged that consumers may be exposed to multiple products containing the notified chemical, and a quantitative assessment based on the aggregate exposure has not been conducted.

Therefore, based on the information available, the risk to the public associated with the use of the notified chemical at ≤ 0.17% in deodorants, ≤ 0.32% in fine fragrances, ≤ 0.5% in body lotion, ≤ 0.44% in other leave-on cosmetic products and ≤ 1% in rinse-off cosmetic products and household products, is not considered to be unreasonable.

7. ENVIRONMENTAL IMPLICATIONS

7.1. Environmental Exposure & Fate Assessment

7.1.1. Environmental Exposure

RELEASE OF CHEMICAL AT SITE

The notified chemical will be imported as a component of fragrance preparations for local reformulation into a variety of consumer products (cosmetics, household products, fine fragrances). Release during reformulation in Australia is expected to arise from spills (0.1%), formulation equipment cleaning (no release estimate as cleaning water will be recycled) and residues in import containers (0.1%). Accidental spills during transport or reformulation are expected to be collected with inert material and disposed of to landfill. Import containers will either be recycled or disposed of through an approved waste management facility. Therefore, up to 0.2% of the import volume is estimated to be released to landfill as a result of reformulation in Australia.

RELEASE OF CHEMICAL FROM USE

The notified chemical is expected to be released to sewers in domestic situations across Australia as a result of its use in cosmetic products, which are washed off the hair and skin of consumers, or from use in other household products.

RELEASE OF CHEMICAL FROM DISPOSAL

It is estimated that a maximum of 1% of the consumer products containing the notified chemical will remain in end-use containers. These are likely to be disposed of through domestic garbage disposal and enter landfill or be recycled.

7.1.2. Environmental Fate

Details of environmental fate data can be found in Appendix C. The majority of the notified chemical is expected to be released to sewer. An estimated 68% of the notified chemical is predicted to be removed during sewage treatment plant (STP) processes (SimpleTreat; European Commission, 2003), with 67% removal by degradation and 1% removed through partitioning to sludge, before discharge to surface waters on a nationwide basis. The notified chemical is expected to be hydrolytically stable under the environmental conditions as it does not contain hydrolysable functionality. The notified chemical is not readily biodegradable according to the

OECD test guidelines but it can be considered to be rapidly degradable. The notified chemical is not likely to bioaccumulate based on its n-octanol/water partition coefficient (log Pow = 2.39) and low predicted bioconcentration factor (log BCF = 1.35; BCFBAF v3.01, US EPA 2011). In surface waters, the notified chemical is expected to disperse and degrade to form water and oxides of carbon.

The notified chemical is considered to be moderately volatile and a portion is expected to volatilise to air during use. The half-life of the notified chemical in air is calculated to be ≤ 1.35 h based on reactions with hydroxyl radicals (AOPWIN v1.92, US EPA 2011). Therefore, in the event of release to atmosphere, the notified chemical is not expected to persist in the atmospheric compartment.

A proportion of the notified chemical may be applied to land when treated sewage effluent is used for irrigation or when sewage sludge is used for soil remediation, or disposed of to landfill. Despite having moderate water solubility, notified chemical residues in landfill, soil and sludge are expected to have medium mobility in soil based on its predicted soil adsorption coefficient (log Koc = 2.3), and are expected to degrade to form water and oxides of carbon.

7.1.3. Predicted Environmental Concentration (PEC)

The following predicted environmental concentrations (PEC) have been calculated assuming that all of the imported quantity of notified chemical will be released to sewer. Of this, an estimated 68% is predicted to be removed during sewage treatment plant (STP) processes (SimpleTreat, European Commission, 2003) before discharge to surface waters on a nationwide basis.

Predicted Environmental Concentration (PEC) for the Aquatic Compartment		
Total Annual Import/Manufactured Volume	1,000	kg/year
Proportion expected to be released to sewer	100%	
Annual quantity of chemical released to sewer	1,000	kg/year
Days per year where release occurs	365	days/year
Daily chemical release:	2.74	kg/day
Water use	200	L/person/day
Population of Australia (Millions)	22.613	million
Removal within STP	68%	
Daily effluent production:	4,523	ML
Dilution Factor - River	1	
Dilution Factor - Ocean	10	
PEC - River:	0.19	µg/L
PEC - Ocean:	0.019	µg/L

STP effluent re-use for irrigation occurs throughout Australia. The agricultural irrigation application rate is assumed to be 1000 L/m^2/year (10 ML/ha/year). The notified chemical in this volume is assumed to infiltrate and accumulate in the top 10 cm of soil (density 1500 kg/m^3). Using these assumptions, irrigation with a concentration of 0.194 µg/L may potentially result in a soil concentration of approximately 1.29 µg/kg. Assuming accumulation of the notified chemical in soil for 5 and 10 years under repeated irrigation, the concentration of notified chemical in the applied soil in 5 and 10 years may be approximately 6.45 µg/kg and 12.9 µg/kg, respectively.

7.2. Environmental Effects Assessment

The results from ecotoxicological investigations conducted on the notified chemical are summarised in the table below. Details of these studies can be found in Appendix C.

Endpoint	*Result*	*Assessment Conclusion*
Acute toxicity		
Fish Toxicity (96 h)	LC50 = 15.9 mg/L	Harmful to fish
Daphnia Toxicity (48 h)	EC50 = 2.2 mg/L	Toxic to aquatic invertebrates
Algal Toxicity (72 h)	E_rC50 = 12 mg/L	Harmful to algae
Inhibition of Bacterial Respiration (3 h)	EC50 = 140 mg/L	Not expected to be inhibitory to microbial activity

Based on the measured acute toxicity to aquatic organisms, under the Globally Harmonised System of Classification and Labelling of Chemicals (GHS; United Nations, 2009), the notified chemical is harmful to fish and algae, and toxic to aquatic invertebrates. Therefore, the notified chemical is formally classified under the GHS as 'Acute Category 2: Toxic to aquatic life'. Based on its acute toxicity and rapid degradability, the notified chemical is not classified for long term toxicity.

7.2.1. Predicted No-Effect Concentration

The predicted no-effect concentration (PNEC) for the notified chemical has been calculated from the measured toxicity to *Daphnia* on an acute basis. An assessment factor of 100 was used as three study reports are available.

Predicted No-Effect Concentration (PNEC) for the Aquatic Compartment		
EC50 (*Daphnia*)	2.2	mg/L
Assessment Factor	100	
PNEC:	22	µg/L

7.3. Environmental Risk Assessment

Risk Assessment	PEC µg/L	PNEC µg/L	Q
Q - River	0.19	22	0.009
Q - Ocean	0.019	22	< 0.001

The risk quotient for discharge of treated effluents containing the notified chemical to the aquatic environment indicates that the notified chemical is unlikely to reach ecotoxicologically significant concentrations, based on its annual importation quantity and the partial removal of the chemical from waste water by degradation, volatilisation and sorption to sewage sludge. The notified chemical has a low potential for bioaccumulation and is unlikely to persist in surface waters, soil or the air. Therefore, on the basis of the PEC/PNEC ratio, maximum annual importation volume and assessed use pattern in cosmetic and household cleaning products, the notified chemical is not expected to pose an unreasonable risk to the environment.

APPENDIX A: PHYSICAL AND CHEMICAL PROPERTIES

Melting Point/Freezing Point 22.6 ± 0.5 °C

Method	OECD TG 102 Melting Point/Melting Range. EC Council Regulation No 440/2008 A.1 Melting/Freezing Temperature.
Remarks	Determined by cooling a test tube containing the test substance (initial temperature ~ 42 °C) using a dry ice/isopropanol bath.
Test Facility	Firmenich (2010)

Boiling Point 275.5 ± 2 °C at 96.0 kPa

Method	OECD TG 103 Boiling Point. EC Council Regulation No 440/2008 A.2 Boiling Temperature.
Remarks	Determined according to the Siwoloboff method.
Test Facility	Firmenich (2010)

Density 1010 kg/m^3 at 20 ± 0.5 °C

Method	OECD TG 109 Density of Liquids and Solids. EC Council Regulation No 440/2008 A.3 Relative Density.
Remarks	Determined using the oscillating density meter method.
Test Facility	Firmenich (2010)

Vapour Pressure 2.8×10^{-5} kPa at 20 °C
5.4×10^{-5} kPa at 25 °C

Method	OECD TG 104 Vapour Pressure.
Remarks	Determined by the isothermal thermogravimetric effusion method. The weight losses of the test substance were obtained with a temperature program of above the melting temperature of the test substance (no significant weight loss of the test substance was observed below the melting temperature of the test substance). The study authors note that the vapour pressure of the test substance, which was extrapolated to 20 and 25 °C, could be slightly overestimated.
Test Facility	NOTOX B.V. (2012a)

Water Solubility 0.581 g/L at 20 °C

Method	OECD TG 105 Water Solubility.
Remarks	Flask Method. Concentrations were determined by HPLC analysis.
Test Facility	Firmenich (2010)

Partition Coefficient (n-octanol/water) log Pow = 2.39 at 20 °C

Method	OECD TG 117 Partition Coefficient (n-octanol/water).
Remarks	HPLC Method
Test Facility	Firmenich (2010)

Adsorption/Desorption – screening test log K_{oc} = 2.30 at 35 °C

Method	OECD TG 121 Estimation of the Adsorption Coefficient (K_{oc}) on Soil and Sewage Sludge using High Performance Liquid Chromatography (HPLC).
Remarks	The test was performed according to guidelines with no significant deviations.
Test Facility	NOTOX B.V. (2012b)

Flash Point 139 ± 2 °C at 101.325 kPa

Method	EC Council Regulation No 440/2008 A.9 Flash Point.
Remarks	Determined using a closed cup equilibrium method.
Test Facility	Firmenich (2010)

APPENDIX B: TOXICOLOGICAL INVESTIGATIONS

B.1. Acute toxicity – oral

TEST SUBSTANCE	Notified chemical
METHOD	OECD TG 423 Acute Oral Toxicity – Acute Toxic Class Method. EC Council Regulation No 440/2008 B.1 tris Acute Oral Toxicity – Acute Toxic Class Method.
Species/Strain	Rat/Wistar
Vehicle	Polyethylene glycol 400
Remarks - Method	No significant protocol deviations.

RESULTS

Group	*Number and Sex of Animals*	*Dose mg/kg bw*	*Mortality*
1	3 F	2,000	0/3
2	3 F	2,000	2/3
3	3 F	300	0/3
4	3 F	300	0/3

LD50	Between 300 and 2,000 mg/kg bw
Remarks - Results	The mortalities occurred within a single day of doing.
Signs of Toxicity	For the animals in the 300 mg/kg bw group, all animals showed hunched posture and one animal showed piloerection on day 1 following treatment. For the animals in the 2,000 mg/kg bw group, lethargy, flat and/or hunched posture, piloerection, slow breathing, uncoordinated movements, dark eye and/or watery discharge from the eyes were noted in all animals between days 1 and 6 following treatment. One animal showed scales and scabs on the snout during the observation period (days 2-15 following treatment).
Effects in Organs	None

CONCLUSION	The notified chemical is harmful via the oral route.
TEST FACILITY	NOTOX B.V. (2012c)

B.2. Acute toxicity – dermal

TEST SUBSTANCE	Notified chemical
METHOD	OECD TG 402 Acute Dermal Toxicity. EC Council Regulation No 440/2008 B.3 Acute Toxicity (Dermal).
Species/Strain	Rat/Wistar
Vehicle	None
Type of dressing	Occlusive
Remarks - Method	No significant protocol deviations.

RESULTS

Number and Sex of Animals	*Dose mg/kg bw*	*Mortality*
5 per sex	2,000	0/10

LD50	> 2,000 mg/kg bw
Signs of Toxicity	Chromodacryorrhoea was noted in 2 females on day 1.

	Focal erythema (days 2 and 3; 1 female) and scales (between days 4 and 7; 1 male/1 female) were observed on the treated skin areas.
Effects in Organs	None
Remarks - Results	The body weight of a single female was reduced after 1 week, but recovered in the second week, post treatment.

CONCLUSION The notified chemical is of low toxicity via the dermal route.

TEST FACILITY NOTOX B.V. (2012d)

B.3. Irritation – skin

TEST SUBSTANCE Notified chemical

METHOD OECD TG 404 Acute Dermal Irritation/Corrosion.
EC Council Regulation No 440/2008 B.4 Acute Toxicity (Skin Irritation).

Species/Strain	Rabbit/New Zealand White
Number of Animals	3 M
Vehicle	None
Observation Period	7 days
Type of Dressing	Semi-occlusive
Remarks - Method	No significant protocol deviations.
	A single rabbit was initially treated with the test substance. After two weeks, the remaining rabbits were treated.

RESULTS

Lesion	*Mean Score* Animal No.*			*Maximum Value*	*Maximum Duration of Any Effect*	*Maximum Value at End of Observation Period*
	1	2	3			
Erythema/Eschar	1	1	1	1	< 7 days	0
Oedema	0	0.3	0.3	1	< 48 hours	0

*Calculated on the basis of the scores at 24, 48, and 72 hours for EACH animal.

Remarks - Results	Very slight erythema and very slight oedema were noted at the treated skin areas of all rabbits.

CONCLUSION The notified chemical is slightly irritating to the skin.

TEST FACILITY NOTOX B.V. (2012e)

B.4. Irritation – eye

TEST SUBSTANCE Notified chemical

METHOD OECD TG 405 Acute Eye Irritation/Corrosion.
EC Council Regulation No 440/2008 B.5 Acute Toxicity (Eye Irritation).

Species/Strain	Rabbit/New Zealand White
Number of Animals	3 M
Observation Period	7 days
Remarks - Method	No significant protocol deviations.
	A single rabbit was initially administered the test substance. After one week, the remaining rabbits were treated.
	Following the 24-hour observation, a 2% fluorescein solution was instilled into both eyes of each animal.

RESULTS

Lesion	*Mean Score[1] Animal No.*			*Maximum Value*	*Maximum Duration of Any Effect*	*Maximum Value at End of Observation Period*
	1	2	3			
Conjunctiva: redness	2	2	2	2	< 7 days	0
Conjunctiva: chemosis	0.7	1	1.3	2	< 7 days	0
Conjunctiva: discharge	0.3	1	1	1	< 7 days	0
Corneal opacity	0	0	0	0[2]	< 7 days	0
Iridial inflammation	0	0	0	0	-	0

[1]Calculated on the basis of the scores at 24, 48, and 72 hours for EACH animal.
[2]Slight dulling of the normal lustre of the cornea and effects on 25-35% of the cornea (based on staining following fluorescein treatment) were noted.

Remarks - Results

Minimal to moderate effects on the cornea and conjunctivae were noted in the treated eyes of all animals, with all eyes appearing normal within 7 days. The study authors noted that the corneal injury consisted of opacity and epithelial damage (maximum 35% of the corneal area), with a slight dulling of the normal lustre observed in all animals at 24, 48 and/or 72 hours after instillation.

CONCLUSION

The notified chemical is slightly irritating to the eye.

TEST FACILITY

NOTOX B.V. (2012f)

B.5. Skin sensitisation – mouse local lymph node assay (LLNA)

TEST SUBSTANCE

Notified chemical

METHOD

OECD TG 429 Skin Sensitisation: Local Lymph Node Assay
EC Council Regulation No 440/2008 B.42 Skin Sensitisation (Local Lymph Node Assay)

Species/Strain: Mouse/female CBA/J
Vehicle: Acetone/olive oil (4:1 v/v)
Remarks - Method: No significant protocol deviations. A pre-screen test (at 25-100% concentration) was conducted in order to select the highest test substance concentration to be used in the main study.

A concurrent positive control study was not run, but had been conducted previously in the test laboratory using α-hexylcinnamaldehyde (HCA).

RESULTS

Concentration (% w/w)	*Proliferative response (DPM/animal)*	*Stimulation Index (Test/Control Ratio)*
Test Substance		
0 (vehicle control)	233	1.0
10	1174	5.0
25	2485	10.7
50	3039	13.0

Remarks - Results

All animals showed variations in ear thickness measurements of < 25% from day 1 pre-dose values during the observation period.

No signs of systemic toxicity were noted.

The auricular lymph nodes of 2 animals treated with 50% test substance were noted to have appeared larger in size when compared to other (control) animals. No macroscopic abnormalities of the surrounding area were noted in any of the animals. For a single animal treated at 50% concentration, the radioactivity count (DPM/animal; 12031) was

considered an outlier and was not used.

The results show that the test substance elicited stimulation indices > 3. Based on these results, the EC_3 value was estimated to be 5.2%.

CONCLUSION — There was evidence of induction of a lymphocyte proliferative response indicative of skin sensitisation to the notified chemical.

TEST FACILITY — NOTOX B.V. (2012g)

B.6. Skin sensitisation – human volunteers

TEST SUBSTANCE — Notified chemical (1% in vehicle)

METHOD — Repeated insult patch test with challenge

Study Design	Induction Procedure: Patches containing 0.3 mL test substance were applied 3 times per week (Monday, Wednesday and Friday) for a total of 9 applications. Patches were removed by the applicants after 24 h and graded after an additional 24 h (or 48 h for patches applied on Friday). Rest Period: ~2 weeks Challenge Procedure: A patch was applied to a naïve site. Patches were removed by a technician after 24 h. Sites were graded at patch removal and 24, 48 and 72 h post-patch removal.
Study Group	84 F, 36 M; age range 18-70 years
Vehicle	Not specified
Remarks - Method	Occluded. The test substance was applied to a 25 mm Hill Top Chamber patch and allowed to volatilise for 15-40 minutes.

RESULTS

Remarks - Results: 116/120 subjects completed the study. The 4 subjects reportedly discontinued due to personal reasons (1-5 induction observations recorded).

No adverse responses were noted during the induction phase. Faint, minimal erythema was noted in 1 subject at challenge, 24 hours post-patch removal, with no reaction evident thereafter.

CONCLUSION — The test substance was non-sensitising under the conditions of the test.

TEST FACILITY — HRL (2014)

B.7. Repeat dose toxicity

TEST SUBSTANCE — Notified chemical

METHOD — OECD TG 407 Repeated Dose 28-day Oral Toxicity Study in Rodents.

Species/Strain	Rats/Wistar
Route of Administration	Oral – gavage
Exposure Information	Total exposure days: 28 days Dose regimen: 7 days per week
Vehicle	Propylene glycol
Remarks - Method	No significant protocol deviations.

The selection of dosage levels was based on the results of a 5-day repeated dose toxicity study, in which rats (3 females/group) were treated with the test substance at 500 or 1000 mg/kg bw/day.

RESULTS

Group	*Number and Sex of Animals*	*Dose mg/kg bw/day*	*Mortality*
control	5 per sex	0	1/10
low dose	5 per sex	30	0/10
mid dose	5 per sex	150	0/10
high dose	5 per sex	600	0/10

Mortality and Time to Death

One control male rat was reported to have died during the blood sampling procedure and this was considered to be an accidental death.

Clinical Observations

Analysis of clinical appearance, functional observations, body weight and food consumption did not reveal any significant abnormalities between the treated and the control groups.

Laboratory Findings – Clinical Chemistry, Haematology, Urinalysis

For the animals treated at 600 mg/kg bw/day, haemoglobin and mean corpuscular haemoglobin concentration were statistically significantly decreased in females and the mean platelet count was statistically significantly increased in males. In addition, statistically significant increases in albumin (females), glucose (males) and potassium (males) levels and a statistically significant decrease in inorganic phosphate levels (females) were reported. However, the study authors noted that these levels were still within the normal range for the age and strain of rats and/or were not considered to be toxicologically significant based on the absence of a dose-response relationship. Isolated differences in other parameters were also noted between animals treated at 30 or 150 mg/kg bw/day and control animals.

Effects in Organs

Macroscopic findings at necropsy in animals treated at 600 mg/kg bw/day that were not present in control animals included an irregular surface of the forestomach (1/5 males), pelvic dilation of the kidneys (3/5 males; also noted in 1/5 males treated at 30 and 150 mg/kg bw/day), decreased size of the epididymides (2/5 males) or preputial glands (1/5 males) and red foci on the glandular mucosa of the stomach (1/5 males). Additional (isolated) findings in animals treated at 30 or 150 mg/kg bw/day that were not present in control animals included red discolouration of the thymus, mesenteric and mandibular lymph nodes in males and a watery-clear cyst on the kidneys or liver nodule in females. In general, the findings were not considered by the study authors to be toxicologically significant, as they were within the normal range for the age and strain of rats and/or based on the absence of a dose-response relationship.

Statistically significantly higher mean relative liver weight was noted in males treated at 600 mg/kg bw/day. Slightly higher mean relative liver weight and statistically significantly lower mean relative heart weight were also noted in females treated at 600 mg/kg bw/day. Based on the absence of any morphological correlations, these changes were considered by the study authors not to be of toxicological significance.

Microscopic examination of the stomach revealed diffuse slight to moderate hyperplasia and minimal to slight hyperkeratosis of the non-glandular stomach in all animals treated at 600 mg/kg bw/day, and at lower incidence in animals treated at 150 mg/kg bw/day (minimal hyperplasia was noted in 4/5 males and 2/5 females; minimal hyperkeratosis was noted in 1/5 males and 1/5 females). The treatment-related findings in the stomach were considered by the study authors to reflect the irritant properties of the test substance.

Other notable treatment-related histopathological findings included a slightly increased severity (up to a moderate degree) of splenic haematopoiesis and hyaline droplet formation in the kidneys in males treated at 600 mg/kg bw/day. These changes were not considered by the study authors to be adverse and/or of toxicological relevance.

CONCLUSION

The No Observed (Adverse) Effect Level (NO(A)EL) was established by the study authors as ≥ 600 mg/kg bw/day in this study, based on the absence of adverse effects at the highest dose tested.

TEST FACILITY NOTOX B.V. (2012h)

B.8. Genotoxicity – bacteria

TEST SUBSTANCE	Notified chemical
METHOD	OECD TG 471 Bacterial Reverse Mutation Test. Plate incorporation procedure
Species/Strain	*S. typhimurium*: TA1535, TA1537, TA98, TA100 *E. coli*: WP2uvrA
Metabolic Activation System	S9 fraction from phenobarbitone/β-naphthoflavone induced rat liver
Concentration Range in Main Test	Test 1, with and without metabolic activation: 0, 10, 33, 100, 333, 1000, 3330 and 5000 µg/plate Test 2, with and without metabolic activation: 0, 33, 100, 333, 1000, 2000, 3330 µg/plate
Vehicle	Dimethyl sulfoxide
Remarks - Method	No significant protocol deviations. No preliminary test was performed.

RESULTS

Metabolic Activation	*Test Substance Concentration (µg/plate) Resulting in:*		
	Cytotoxicity in Main Test	*Precipitation*	*Genotoxic Effect*
Absent			
Test 1	≥ 3300	> 5000	negative
Test 2	≥ 2000	> 3300	negative
Present			
Test 1	≥ 3300	> 5000	negative
Test 2	≥ 2000	> 3300	negative

Remarks - Results	No increase in the number of revertant colonies was observed, with or without metabolic activation. The test substance caused a visible reduction in the growth of the bacterial background lawn, with and without metabolic activation. The negative and positive controls gave satisfactory responses confirming the validity of the test system.
CONCLUSION	The notified chemical was not mutagenic to bacteria under the conditions of the test.
TEST FACILITY	NOTOX B.V. (2011)

B.9. Genotoxicity – in vitro

TEST SUBSTANCE	Notified chemical
METHOD	OECD TG 473 In vitro Mammalian Chromosome Aberration Test.
Species/Strain	Human
Cell Type/Cell Line	Lymphocytes
Metabolic Activation System	S9 fraction from phenobarbitone/β-naphthoflavone induced rat liver
Vehicle	Dimethyl sulfoxide
Remarks - Method	Preliminary toxicity studies were performed: 3 hour exposure, with and without metabolic activation at concentrations 0-1000 µg/mL and 24 and 48 hour exposure without metabolic activation at concentrations 0-1621 µg/mL. Precipitation and cell lysis were noted at ≥ 1000 µg/mL. Tests 1 (with and without metabolic activation) and 2a (without metabolic activation), as shown in the table below, represent repeat assays. The tests were repeated as appropriate cytotoxicity was not achieved using the

initially selected test substance concentrations.

Vehicle and positive controls (mitomycin C without metabolic activation and cyclophosphamide with metabolic activation) were used in parallel with the test substance.

Metabolic Activation	*Test Substance Concentration (µg/mL)*	*Exposure Period*	*Harvest Time*
Absent			
Test 1	100*, 450*, 460, 470*, 480, 490	3 h	24 h
Test 2a	10*, 30, 70*, 80*, 90, 100	24 h	24 h
Test 2b	3*, 10*, 50*, 70, 80, 90	48 h	48 h
Present			
Test 1	200*, 400*, 420, 440, 460, 480*	3 h	24 h
Test 2	400*, 450*, 475*, 500, 525, 550	3 h	48 h

*Cultures selected for metaphase analysis.

RESULTS

Metabolic Activation	*Test Substance Concentration (µg/mL) Resulting in:*			
	Cytotoxicity in Preliminary Test	*Cytotoxicity in Main Test*	*Precipitation*	*Genotoxic Effect*
Absent				
Test 1	≥ 1000	≥ 480	> 490	negative
Test 2a	≥ 100	≥ 90	> 100	negative
Test 2b	≥ 100	≥ 70	> 90	negative
Present				
Test 1	≥ 1000	≥ 480	> 480	negative
Test 2		≥ 500	> 550	negative

Remarks - Results

There were no toxicologically (or statistically) significant increases in the number of cells with aberrations, with or without metabolic activation. The study authors also note that there were no effects on the number of polyploid cells and cells with endoreduplicated chromosomes, with or without metabolic activation.

The positive and vehicle controls gave satisfactory responses confirming the validity of the test system.

CONCLUSION

The notified chemical was not clastogenic to human lymphocytes treated in vitro under the conditions of the test.

TEST FACILITY

NOTOX B.V. (2012i)

APPENDIX C: ENVIRONMENTAL FATE AND ECOTOXICOLOGICAL INVESTIGATIONS

C.1. Environmental Fate

C.1.1. Ready biodegradability

TEST SUBSTANCE	Notified chemical
METHOD	OECD TG 301 F Ready Biodegradability: Manometric Respirometry Test.
Inoculum	Activated sewage sludge
Exposure Period	28 days
Auxiliary Solvent	None
Analytical Monitoring	Biochemical Oxygen Demand (BOD)
Remarks - Method	The test was conducted according to the guidelines with no significant deviations.

RESULTS

Test substance		*Sodium benzoate*	
Day	*% Degradation*	*Day*	*% Degradation*
12	10.6*	1	41
22	52.7*	11	86
28	65.3*	28	91

*Average % degradation

Remarks - Results	All relevant test validity criteria were met. The notified chemical failed to meet the 10-day degradation window for classification as readily biodegradable. A toxicity test confirmed the test substance is not toxic to sewage sludge as 76% degradation was achieved after 28 days.
CONCLUSION	The notified chemical cannot be considered readily biodegradable according to the guidelines as it failed the 10-day window. However, the notified chemical is considered rapidly degradable.
TEST FACILITY	Firmenich (2011)

C.2. Ecotoxicological Investigations

C.2.1. Acute toxicity to fish

TEST SUBSTANCE	Notified chemical
METHOD	OECD TG 203 Fish, Acute Toxicity Test – Semi-Static
Species	*Brachydanio rerio* (Zebra Fish)
Exposure Period	96 hours
Auxiliary Solvent	None
Water Hardness	141 mg $CaCO_3$/L
Analytical Monitoring	HPLC
Remarks – Method	The test was conducted according to the guidelines with no significant deviations.

RESULTS

Concentration mg/L	*Number of Fish*	*Mortality*				
		3 h	*24 h*	*48 h*	*72 h*	*96 h*
0	21	0	0	0	0	0
5.34	21	0	0	0	0	0
8.54	21	0	0	0	0	0
13.7	21	0	0	0	0	0

21.9	21	0	21	21	21	21
35.0	21	21	21	21	21	21

LC50	15.9 mg/L at 96 hours.
Remarks – Results	All relevant test validity criteria were met. The LC50 was calculated using the geometric mean.

CONCLUSION The notified chemical is harmful to fish.

TEST FACILITY Guangdong (2012)

C.2.2. Acute toxicity to aquatic invertebrates

TEST SUBSTANCE Notified chemical

METHOD OECD TG 202 *Daphnia* sp. Acute Immobilisation Test - Static

Species	*Daphnia magna*
Exposure Period	48 hours
Auxiliary Solvent	None
Water Hardness	180 mg $CaCO_3$/L
Analytical Monitoring	HPLC
Remarks - Method	The test was conducted according to the guidelines with no significant deviations. A combined limit/range-finding test was conducted to determine the final test concentrations.

RESULTS

Concentration mg/L	*Number of D. magna*	*Number Immobilised*	
		24 h	*48 h*
0	4 × 5	0	0
0.90	4 × 5	0	0
1.5	4 × 5	0	5
2.9	4 × 5	0	12
5.0	4 × 5	11	20
9.3	4 × 5	16	20

EC50	2.2 mg/L at 48 hours
Remarks - Results	All relevant test validity criteria were met. The EC50 was calculated using the geometric mean.

CONCLUSION The notified chemical is toxic to aquatic invertebrates.

TEST FACILITY NOTOX B.V. (2012j)

C.2.3. Algal growth inhibition test

TEST SUBSTANCE Notified Chemical

METHOD OECD TG 201 Alga, Growth Inhibition Test.

Species	*Pseudokirchneriella subcapitata* (Green Algae)
Exposure Period	72 hours
Concentration Range	0, 0.32, 1.0, 3.2, 10 and 32 mg/L
Auxiliary Solvent	None
Water Hardness	24 mg $CaCO_3$/L
Analytical Monitoring	HPLC
Remarks - Method	The test was conducted according to the guidelines with no significant deviations. A combined limit/range-finding test was conducted to determine the final test concentrations.

RESULTS

Biomass		*Growth*	
E_yC50 *mg/L at 72 h*	*NOE_yC* *mg/L*	*E_rC50* *mg/L at 72 h*	*NOE_rC* *mg/L*
4.1	0.40	12	0.40

Remarks - Results: All relevant test validity criteria were met. The endpoint values were calculated using the geometric mean.

CONCLUSION: The notified chemical is harmful to algae.

TEST FACILITY: NOTOX B.V. (2012k)

C.2.4. Inhibition of microbial activity

TEST SUBSTANCE: Notified Chemical

METHOD
- Inoculum: Activated sludge
- Exposure Period: 3 hours
- Concentration Range: Nominal: 0, 1.0, 3.2, 10, 32, 100, 320 mg/L
- Remarks – Method: The test was conducted according to the guidelines with no significant deviations. A combined limit/range-finding test was conducted to determine the final test concentrations.

RESULTS
- EC50: 140 mg/L
- NOEC: 32 mg/L
- Remarks – Results: All relevant test validity criteria were met. The endpoint values were calculated using the geometric mean.

CONCLUSION: The notified chemical is not expected to inhibit microbial activity.

TEST FACILITY: NOTOX B.V. (2012l)

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