EST. SIMMS JONES 1909

MATERIAL SAFETY DATA SHEET

D-Limonene

SECTION 1.

Identification of the Substance and Supplier

PRODUCTS APPLICABLE	D-Limonene 5L
PRODUCT USE	Formulating cleaning products and as a flavour and fragrance ingredient
SUPPLIER	Simms Jones Ltd, 217 Lichfield St, Christchurch
PHONE	(03) 366 5769
FAX	(03) 365 4727
E-MAIL	cleanser@simmsjones.co.nz
EMERGENCY CONTACT	Craig Keenan 027 291 6181

SECTION 2.

Hazards Identification

HAZARDS
Flammable liquids Category 3, Aspiration Hazard Category 1, Skin corrosion/irritation Category 2,
Skin sensitization, Aquatic toxicity (Acute) Category 1
HAZARD STATEMENTS
Danger. Flammable liquid and vapour. May be fatal if swallowed and enters airways.
Causes skin irritation. May cause an allergic skin reaction. Very toxic to aquatic life.
PREVENTION STATEMENTS
Keep away from heat, sparks, open flames, and hot surfaces. No smoking. Use explosion-proof electrical equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Keep container tightly closed. Keep out of reach of children. Read label before use. Avoid breathing vapours. Wear protective gloves and eye/face protection. Wash hands thoroughly after handling. Contaminated work clothing should not be allowed out of the workplace. Avoid release to the environment.
RESPONSE STATEMENTS
In case of fire: Use carbon dioxide, foam, or dry chemical. Collect spillage.
If medical advice is needed, have product container or label at hand.
IF SWALLOWED: Immediately call a POISON CENTER or doctor. Do NOT induce vomiting.
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical attention.
IF ON SKIN (or hair): Remove immediately all contaminated clothing. Wash with plenty of soap and water. Wash contaminated clothing before reuse. If skin irritation or rash occurs: Get medical attention.
STORAGE STATEMENTS
Store in a well-ventilated place. Keep cool. Store locked up.
DISPOSAL STATEMENT
Wash empty container with detergent and triple rinse empty container before offering for recycling or disposal.

SECTION 3.

Composition and Information on Ingredients

INGREDIENT	PROPORTION	CAS NUMBER
D-Limonene	100%	5989-27-5

SECTION 4.

First Aid Measures

IF SWALLOWED: Immediately call a POISON CENTER or doctor. Do NOT induce vomiting.
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical attention.
IF ON SKIN (or hair): Remove immediately all contaminated clothing. Wash with plenty of soap and water. Wash contaminated clothing before reuse. If skin irritation or rash occurs: Get medical attention.
IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing.

SECTION 5.

Fire-Fighting Measures

EXTINGUISHING MEDIA Carbon dioxide, foam, or dry chemical
COMBUSTION PRODUCTS Oxides of carbon
FIRE-FIGHTING PROCEDURES Firefighters should wear a positive-pressure self-contained breathing apparatus and protective firefighting clothing

SECTION 6.

Accidental Release Measures

EMERGENCY PROCEDURES Shut off all possible sources of ignition. Increase ventilation. Clean up immediately.
ENVIRONMENTAL PRECAUTIONS Avoid release to the environment
SPILL CONTROL Small spills can be wiped up but rags must be washed immediately as they may ignite spontaneously. Use absorbent for larger spills. Collect material, transfer to suitable containers, and dispose of as hazardous waste.

SECTION 7.

Handling and Storage

HANDLING PRECAUTIONS Keep away from heat, sparks, open flames, and hot surfaces. No smoking. Use explosion-proof electrical equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Product residue may remain on/in empty containers. Use all precautions for handling the product in handling the empty container and residue.
STORAGE Store in a well-ventilated place. Keep cool. Keep out of reach of children.

SECTION 8.

Exposure Controls/Personal Protection

EXPOSURE LIMIT	8 h TWA = 167 mg/m^3 (30ppm)
ENGINEERING CONTROLS	Normal room ventilation is usually adequate. Provide exhaust ventilation or other engineering controls to keep the airborne concentration below the exposure limit. Keep away from sparks and flames.
RESPIRATORY PROTECTION	Organic vapour respirator
PROTECTIVE GLOVES	Nitrile rubber or PVC
EYE PROTECTION	Splash-proof goggles

SECTION 9.

Physical and Chemical Properties

APPEARANCE	Clear, colourless or slight yellow liquid
ODOUR	Strong citrus odour
ODOUR THRESHOLD	Not Available
pH	Not Applicable
MELTING POINT/FREEZING POINT	-97ºC to -74ºC
BOILING RANGE	175ºC-178ºC
FLASH POINT	43ºC-49ºC closed cup
FLAMMABILITY	Flammable liquid Category 3
LOWER FLAMMABILITY LIMIT	0.7%
UPPER FLAMMABILITY LIMIT	6.1%
VAPOUR PRESSURE	0.13 kPa at 20ºC
VAPOUR DENSITY (AIR=1)	4.73
RELATIVE DENSITY	0.84
SOLUBILITY	Practically insoluble with water
PARTITION CO-EFFICIENT: n-OCTANOL/WATER	log P_{OW} = 4.232
AUTO-IGNITION TEMPERATURE	273ºC
DECOMPOSITION TEMPERATURE	450ºC
KINEMATIC VISCOSITY	$1.17x10^{-6}m^2/s$

SECTION 10.

Stability and Reactivity

REACTIVITY	Reacts rapidly with oxygen to form hydroperoxides
STORAGE CONDITIONS	Store in a well-ventilated place. Keep away from heat, sparks, open flames, static discharge, ignition sources, and sunlight.
INCOMPATIBLE SUBSTANCES	Oxygen, strong oxidising agents, iodine pentafluoride, tetrafluoroethylene, sulphur, tert-butyl peroxybenzoate, Lewis acids, Ziegler-Natta catalysts, acidic clays, and mineral acids
HAZARDOUS DECOMPOSITION PRODUCTS	Hydrocarbons and oxides of carbon

SECTION 11.

Toxicological Information

ACUTE TOXICITY	Oral LD_{50} = 4400 mg/kg (rat)
SKIN CORROSION/IRRITATION	Causes skin irritation
SERIOUS EYE DAMAGE/IRRITATION	Causes serious eye irritation
RESPIRATORY OR SKIN SENSITISATION	Skin sensitisation
GERM CELL MUTAGENICITY	No data available
CARCINOGENICITY	Not carcinogenic
REPRODUCTIVE TOXICITY	No reproductive toxicity
SPECIFIC TARGET ORGAN TOXICITY	
-SINGLE EXPOSURE	No specific organ toxicity
-REPEATED EXPOSURE	No specific organ toxicity
ASPIRATION HAZARD	Causes human aspiration toxicity

TOXICITY

ORAL

STUDY: Rat, LD_{50}

VALUE: 4400 mg/kg

SOURCE: Drugs in Japan. Ethical Drugs 6th edition, 1982, 887.

SKIN IRRITATION

RESULT: Irritant

SOURCE: OPP RED

EYE IRRITATION

SPECIES: Rabbit

RESULT: Irritant

SOURCE: Health effects of selected chemicals 2. d-Limonene and d/l-limonene. Nord PG:105-35, 1993.

SKIN SENSITISATION

CLASSIFICATION DESCRIPTION: Contact sensitiser

REMARKS: The sensitising capacity of limonene was demonstrated in different experimental studies on guinea pigs. It was found that the potential to sensitise increased as the formation of oxidation products was favoured. Contact allergy to limonene was demonstrated in humans. From the available data the critical effects are the irritative and sensitising properties of limonene.

SOURCE: Health effects of selected chemicals 2. d-Limonene and d/l-limonene. Nord PG:105-35, 1993.

SECTION 12.

Ecological Information

ECOTOXICITY	Very toxic to aquatic life with long lasting effects. Toxic to the soil environment.
BIODEGRADABILITY	Rapidly Degradable
BIOACCUMULATIVE POTENTIAL	Bioaccumulative
MOBILITY IN SOIL	Not Determined

AQUATIC STUDIES

STUDY: Water flea (Daphnia magna), flow-through, 48 h, EC_{50}

VALUE: 0.421 mg/L

SOURCE: ICPS, 19989, Concise International Chemical Assessment Document No. 5: Limonene. WHO, Geneva.

STUDY: Fathead minnow (Pimphales promelas), 96 h, LC_{50}

VALUE: 0.702 mg/L

SOURCE: Reference number 3217. Geiger D.L., Brooke L.T., and Call D.J. (1990),
Acute Toxicities of Organic Chemicals to Fathead Minnows (Pimephales promelasa), Volume 5.
Center for Lake Superior Environmental Studies, University of Wisconsin, Superior, WI: 332.

BIOACCUMULATIVE: Yes

WATER SOLUBILITY: 13.8 mg/L at 25ºC

SOURCE: Riddick, J.A. et al, Organic Solvents 4th edition, New York: Wiley Interscience (1986).

log P_{OW} = 4.232
SOURCE: Graphic Exposure Modeling System cLogP, United States Environmental Protection Agency.
BIOCENTRATION FACTORS: Octanol: 246
Water: 262
SOURCE: Lyman W.J. et al, Handbook of Chemical Property Estimation Methods, New York: McGraw-Hill (1982), pages 5-1 to 5-30.

BIODEGRADABILITY STUDIES
DEGRADATION: 100% after 28 days
RESULT: Biodegradable for certain microorganisms
SOURCE: Adrian SA, Marseille

DEGRADATION: 100%
RESULT: Inherently biodegradable
SOURCE: Weissmeer Baltische Import-Export GmbH

SOIL STUDIES
STUDY: Earthworm (Eisenia fetida) LD_{50}, LT_{50}
VALUES: LD_{50} = 6.0ppm, LT_{50} for 12.6ppm = 4.9 h
REMARKS: d-Limonene, a monocyclic monoterpenoid with known insecticidal properties, was assayed (by a standard method of cutaneous exposure) for general lethality effects as well as neurotoxic effects on escape reflex pathways in earthworms (Eisenia fetida). Neurotoxicity was assessed by noninvasive electrophysiological techniques involving (a) quantification of the impacts of chronic and acute sublethal exposures on impulse conduction in the worm's medial and lateral giant nerve fibre pathways, (b) determination of whether such effects were generalised or localised within various body regions, and (c) determination of the reversibility of toxic effects. Generally, chronic and acute intoxication involved a rapid and predictable cascade of behavioural and morphological symptoms, including increased mucus secretion, writhing, clitellar swelling, and elongation of the body. In addition, chronic d-limonene exposures induced significant weight loss, but there was no effect on median giant nerve fibre and lateral giant nerve fibre conduction velocities, even though abnormal rebounding of median giant nerve fibre impulses and spontaneous lateral giant nerve fibre spiking were often evident. Acute exposures, however, induced significant decreases in conduction velocity in both the median giant nerve fibre and lateral giant nerve fibre, but the effects were regionally specific; for example, lateral giant nerve fibre velocities were significantly rediced in the posterior half of the body but not in the anterior half. The magnitude of conduction velocity decreases was directly related to both concentration and duration of exposure. Decreases in conduction velocities after acute exposures were reversed once d-limonene exposure ceased.
SOURCE: Karr L.L. et al, Pesticide Biochemistry and Physiology 36 (2): 175-86 (1990).

SOIL DT_{50} ≤ 30 days
STUDY: Batch experiments were conducted to assess the biotransformation potential of four hydrocarbon monoterpenes (d-limonene, alpha-pinene, gamma-terpinene, and terpinolene) and four alcohols (arbanol, linalool, plinol, and alpha-terpineol) under aerobic conditions at 23ºC. Both forest-soil extract and enriched cultures were used as inocula for the biodegradation experiments conducted first without, then with prior microbial acclimation to the monoterpenes tested. All four hydrocarbons and two alcohols readily degraded. The increase in biomass and headspace CO_2 concentrations paralleled the depletion of monoterpenes, thus confirming that terpene disappearance was the result of biodegradation accompanied by microbial growth and mineralisation. A significant fraction of d-limonene-derived carbon was accounted for as non-extractable, dissolved organic carbon.
SOURCE: Misra et al. Aerobic biodegradation of selected monoterpenes. Applied Microbiology and Biotechnology 45 (6), 1996.

SECTION 13.

Disposal Considerations

DISPOSAL Wash empty container with detergent and rinse before offering for recycling or disposal.

SECTION 14.

Transportation Information

UN NUMBER	2319
SHIPPING NAME	Terpene Hydrocarbons, N.O.S.
DANGEROUS GOODS CLASS	3
UN PACKING GROUP	PG III
ENVIRONMENTAL HAZARDS	Very toxic to aquatic life with long lasting effects. Toxic to the soil environment.
SPECIAL PRECAUTIONS	No special precautions required

SECTION 15.

Regulatory Information

HSNO APPROVAL NUMBER	HSR002725
GROUP STANDARD	Not Applicable
SPECIAL REQUIREMENTS	Not Applicable

SECTION 16.

Other Information

Date Issued: 27-7-2018

ABBREVIATIONS

8 h TWA (Time-Weighted Average)
The time-weighted average airborne concentration of a substance when calculated over an eight-hour working day for a five-day working week.

EC_{50} (Half maximal effective concentration)
The concentration of a drug, antibody, or toxicant which induces a response halfway between the baseline and maximum after a specified exposure time.

LC_{50} (Lethal Concentration 50%)
The concentration of a drug, antibody, or toxicant that kills half of a population.

LT_{50} (Median Lethal Time)
The median time until death after exposure of an organism to a toxic substance.

UN
United Nations

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