



SAFETY DATA SHEET (According to US GHS (Rev.3) & 29 CFR 1910.1200)

PRODUCT : CITRONELLAL

Date of Issue: 26.09.2012

Version: 1.0

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME

CITRONELLAL

PRODUCT USE

Fragrance

SUPPLIER

Company: Chemtex USA, Inc.

Address: 150 River Road, Suite G3B,
Montville, NJ 07045-9441, USA

Telephone: (973) 33-2500; Fax: (973) 335-2552

Emergency Information :

North America (US & Canada)
1-800-255-3924 (**CHEMTEL INC.**)

Section 2 - HAZARDS IDENTIFICATION

Classification according to UN GHS/ 29 CFR § 1910.1200

Acute Toxicity (Oral) Category 5
Chronic Aquatic Hazard Category 2
Eye Irritation Category 2A
Flammable Liquid Category 4
Respiratory Effects Category 3
Respiratory Irritation Category 3
Skin Corrosion/Irritation Category 2
Skin Sensitizer Category 1

Label elements, including precautionary statements

Pictogram

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Signal Word

WARNING

Hazard statement(s):

H335	May cause respiratory irritation
H336	May cause drowsiness or dizziness
H411	Toxic to aquatic life with long lasting effects
H227	Combustible Liquid
H303	May be harmful if swallowed
H319	Causes serious eye irritation
H317	May cause allergic skin reaction
H315	Causes skin irritation

PRECAUTIONARY STATEMENTS

Prevention

P261	Avoid breathing dust/fume/gas/mist/vapour/spray.
P271	Use only outdoors or in well-ventilated area.
P273	Avoid release to the environment. P264
Wash hand thoroughly after handling.	
P280	Wear protective gloves/protective clothing/eye protection/face protection.
P272	Contaminated work clothing should not be allowed out of the workplace.

Response

P304+P340	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P312	Call a POISON CENTER or doctor/physician if you feel unwell.
P391	Collect spillage.
P305+ P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P337+P313	If eye irritation persists: Get medical advice/attention.
P302+P352	IF ON SKIN: Wash with plenty of soap and water.
P332+P313	If skin irritation occurs: Get medical advice/attention. P362
Take off contaminated clothing and wash before reuse.	
P333+P313	If skin irritation or rash occurs: Get medical advice/attention.
P363	Wash contaminated clothing before reuse.



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Storage

P403+P233
P405

Store in a well-ventilated place. Keep container tightly closed.
Store locked up.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

NAME	CAS RN	%
citronellal	106-23-0	>95
geraniol tetrahydride	106-21-8	0.25
beta- citronellol	106-22-9	0.5
citral	5392-40-5	0.85

Section 4 - FIRST AID MEASURES

SWALLOWED

- If swallowed do NOT induce vomiting.
- If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration.
- Observe the patient carefully.
- Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious.
- Give water to rinse out mouth, then provide liquid slowly and as much as casualty can comfortably drink.
- Seek medical advice.

EYE

ÿ If this product comes in contact with the eyes:

- Wash out immediately with fresh running water.
- Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids.
- Seek medical attention without delay; if pain persists or recurs seek medical attention.
- Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

SKIN

ÿ If skin contact occurs:

- Immediately remove all contaminated clothing, including footwear.
- Flush skin and hair with running water (and soap if available).
- Seek medical attention in event of irritation.

INHALED

- If fumes or combustion products are inhaled remove from contaminated area.
- Lay patient down. Keep warm and rested.
- Prostheses such as false teeth, which may block airway, should be removed, where possible, prior to initiating first aid procedures.
- Apply artificial respiration if not breathing, preferably with a demand valve resuscitator, bag-valve mask device, or pocket mask as trained. Perform CPR if necessary.



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- Transport to hospital, or doctor.

NOTES TO PHYSICIAN

ÿ In acute poisonings by essential oils the stomach should be emptied by aspiration and lavage. Give a saline purgative such as sodium sulfate (30 g in 250 ml water) unless catharsis is already present. Demulcent drinks may also be given. Large volumes of fluid should be given provided renal function is adequate. [MARTINDALE: The Extra Pharmacopoeia, 28th Ed.].

Section 5 - FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

- Foam.
- Dry chemical powder.
- BCF (where regulations permit).
- Carbon dioxide.
- Water spray or fog - Large fires only.

FIRE FIGHTING

- Alert Fire Brigade and tell them location and nature of hazard.
- Wear full body protective clothing with breathing apparatus.
- Prevent, by any means available, spillage from entering drains or water course.
- Use water delivered as a fine spray to control fire and cool adjacent area.
- Avoid spraying water onto liquid pools.
- DO NOT approach containers suspected to be hot.
- Cool fire exposed containers with water spray from a protected location.
- If safe to do so, remove containers from path of fire.

When any large container (including road and rail tankers) is involved in a fire, consider evacuation by 100 metres in all directions.

FIRE/EXPLOSION HAZARD

- Combustible.
- Slight fire hazard when exposed to heat or flame.
- Heating may cause expansion or decomposition leading to violent rupture of containers.
- On combustion, may emit toxic fumes of carbon monoxide (CO).
- May emit acrid smoke.
- Mists containing combustible materials may be explosive.

Combustion products include: carbon dioxide (CO₂), other pyrolysis products typical of burning organic material.

CARE: Water in contact with hot liquid may cause foaming and a steam explosion with wide scattering of hot oil and possible severe burns. Foaming may cause overflow of containers and may result in possible fire.

FIRE INCOMPATIBILITY

- Avoid contamination with oxidising agents i.e. nitrates, oxidising acids, chlorine bleaches, pool chlorine etc. as ignition may result.

Personal Protective Equipment

Breathing apparatus.



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Gas tight chemical resistant suit.
Limit exposure duration to 1 BA set 30 mins.

Personal Protective Equipment

Breathing apparatus.
Gas tight chemical resistant suit.
Limit exposure duration to 1 BA set 30 mins.

Section 6 - ACCIDENTAL RELEASE

MEASURES MINOR SPILLS

ÿ Environmental hazard - contain spillage.

- Clean up all spills immediately.
- Avoid breathing vapours and contact with skin and eyes.
- Control personal contact by using protective equipment.
- Contain and absorb spill with sand, earth, inert material or vermiculite.
- Wipe up.
- Place in a suitable, labelled container for waste disposal.

MAJOR SPILLS

ÿ Environmental hazard - contain spillage.

CARE: Absorbent materials wetted with occluded oil must be moistened with water as they may auto-oxidize, become self heating and ignite.

Some oils slowly oxidise when spread in a film and oil on cloths, mops, absorbents may autoxidise and generate heat, smoulder, ignite and burn. In the workplace oily rags should be collected and immersed in water.

Moderate hazard.

- Clear area of personnel and move upwind.
- Alert Fire Brigade and tell them location and nature of hazard.
- Wear breathing apparatus plus protective gloves.
- Prevent, by any means available, spillage from entering drains or water course.
- No smoking, naked lights or ignition sources.
- Increase ventilation.
- Stop leak if safe to do so.
- Contain spill with sand, earth or vermiculite.
- Collect recoverable product into labelled containers for recycling.
- Absorb remaining product with sand, earth or vermiculite.
- Collect solid residues and seal in labelled drums for disposal.
- Wash area and prevent runoff into drains.
- If contamination of drains or waterways occurs, advise emergency services.

Personal Protective Equipment advice is contained in Section 8 of the MSDS.

Section 7 - HANDLING AND STORAGE



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PROCEDURE FOR HANDLING

- DO NOT allow clothing wet with material to stay in contact with skin.
- Avoid all personal contact, including inhalation.
- Wear protective clothing when risk of exposure occurs.
- Use in a well-ventilated area.
- Prevent concentration in hollows and sumps.
- DO NOT enter confined spaces until atmosphere has been checked.
- Avoid smoking, naked lights or ignition sources.
- Avoid contact with incompatible materials.
- When handling, DO NOT eat, drink or smoke.
- Keep containers securely sealed when not in use.
- Avoid physical damage to containers.
- Always wash hands with soap and water after handling.
- Work clothes should be laundered separately.
- Use good occupational work practice.
- Observe manufacturer's storing and handling recommendations.
- Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions.

SUITABLE CONTAINER

- Metal can or drum
- Packaging as recommended by manufacturer.
- Check all containers are clearly labelled and free from leaks.

STORAGE INCOMPATIBILITY

ÿ HAZARD:

- Although anti-oxidants may be present, in the original formulation, these may deplete over time as they come into contact with air.
- Rags wet / soaked with unsaturated hydrocarbons / drying oils may auto-oxidise; generate heat and, in-time, smoulder and ignite. This is especially the case where oil-soaked materials are folded, bunched, compressed, or piled together - this allows the heat to accumulate or even accelerate the reaction
- Oily cleaning rags should be collected regularly and immersed in water, or spread to dry in safe-place away from direct sunlight.or stored, immersed, in solvents in suitably closed containers.
- Avoid strong bases.
- Avoid reaction with oxidising agents.

STORAGE REQUIREMENTS

- Store in original containers.
- Keep containers securely sealed.
- Store in a cool, dry, well-ventilated area.
- Store away from incompatible materials and foodstuff containers.
- Protect containers against physical damage and check regularly for leaks.
- Observe manufacturer's storing and handling recommendations.

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SAFE STORAGE WITH OTHER CLASSIFIED CHEMICALS

+



X



+



X



X



+

+: May be stored together

O: May be stored together with specific precautions

X: Must not be stored together

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE CONTROLS

The following materials had no OELs on our records

- | | |
|--------------------------|--|
| • citronellal: | CAS:106- 23- 0 CAS:2385- 77- 5 |
| • geraniol tetrahydride: | CAS:106- 21- 8 |
| • beta- citronellol: | CAS:106- 22- 9 CAS:1117- 61- 9 CAS:7540- 51- 4 |
| • citral: | CAS:5392- 40- 5 |

MATERIAL DATA**BETA-****CITRONELLOL:****CITRAL:****ANIOL TETRAHYDRIDE:**

Y Sensory irritants are chemicals that produce temporary and undesirable side-effects on the eyes, nose or throat. Historically occupational exposure standards for these irritants have been based on observation of workers' responses to various airborne concentrations. Present day expectations require that nearly every individual should be protected against even minor sensory irritation and exposure standards are established using uncertainty factors or safety factors of 5 to 10 or more. On occasion animal no-observable-effect-levels (NOEL) are used to determine these limits where human results are unavailable. An additional approach, typically used by the TLV committee (USA) in determining respiratory standards for this group of chemicals, has been to assign ceiling values (TLV C) to rapidly acting irritants and to assign short-term exposure limits (TLV STELs) when the weight of evidence from irritation, bioaccumulation and other endpoints combine to warrant such a limit. In contrast the MAK Commission (Germany) uses a five-category system based on intensive odour, local irritation, and elimination half-life. However this system is being replaced to be consistent with the European Union (EU) Scientific Committee for Occupational Exposure Limits (SCOEL); this is more closely allied to that of the USA.

OSHA (USA) concluded that exposure to sensory irritants can:

- cause inflammation
-



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- cause increased susceptibility to other irritants and infectious agents
- lead to permanent injury or dysfunction
- permit greater absorption of hazardous substances and
- acclimate the worker to the irritant warning properties of these substances thus increasing the risk of overexposure.

CITRONELLAL: Not available

CITRONELLAL:
CITRONELLA
L:

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OSHA (USA) concluded that exposure to sensory irritants can:

- cause inflammation
- cause increased susceptibility to other irritants and infectious agents
- lead to permanent injury or dysfunction
- permit greater absorption of hazardous substances and
- acclimate the worker to the irritant warning properties of these substances thus increasing the risk of overexposure.

GERANIOL TETRAHYDRIDE:

Y Class C fragrance - virtually nonsensitising fragrance (Nakayama 1998).

PERSONAL PROTECTION

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Selection of the Class and Type of respirator will depend upon the level of breathing zone contaminant and the chemical nature of the contaminant. Protection Factors (defined as the ratio of contaminant outside and inside the mask) may also be important.

Breathing Zone Level Respirator ppm (volume)	Maximum Protection Factor	Half- face Respirator	Full- Face
1000	10	ANO- AUS P	-
1000	50	-	ANO- AUS P
5000	50	Airline *	-
5000	100	-	ANO- 2 P
10000	100	-	ANO- 3 P
	100+		Airline**

* - Continuous Flow

** - Continuous-flow or positive pressure demand.

The local concentration of material, quantity and conditions of use determine the type of personal protective equipment required.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL PROPERTIES

Liquid.

State	Liquid	Molecular Weight	154.23
Melting Range (°C)	Not Available	Viscosity	Not
Available Boiling Range (°C)	206	Solubility in water (g/L)	
Immiscible Flash Point (°C)	>76.11	pH (1% solution)	Not
Applicable Decomposition Temp (°C)	Not Available	pH (as supplied)	Neutral
Autoignition Temp (°C)	Not Available	Vapour Pressure	0.028
mmHg(20°C) Upper Explosive Limit (%)		Not Available	Specific Gravity
(water=1)	0.850 ~ 0.860 (25/25°C)		



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Lower Explosive Limit (%)	Not Available	Relative Vapour Density (air=1)	>1
Volatile Component (%vol)	Not Available	Evaporation Rate	Not Available

Section 10 - CHEMICAL STABILITY AND REACTIVITY INFORMATION

CONDITIONS CONTRIBUTING TO INSTABILITY

For incompatible materials - refer to Section 7 - Handling and Storage.

Section 11 - TOXICOLOGICAL INFORMATION

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS

SWALLOWED

Ÿ Although ingestion is not thought to produce harmful effects (as classified under EC Directives), the material may still be damaging to the health of the individual, following ingestion, especially where pre-existing organ (e.g. liver, kidney) damage is evident. Present definitions of harmful or toxic substances are generally based on doses producing mortality rather than those producing morbidity (disease, ill-health). Gastrointestinal tract discomfort may produce nausea and vomiting. In an occupational setting however, ingestion of insignificant quantities is not thought to be cause for concern.

EYE

Ÿ This material can cause eye irritation and damage in some persons.

SKIN

Ÿ This material can cause inflammation of the skin on contact in some persons.

Ÿ Skin contact is not thought to have harmful health effects (as classified under EC Directives); the material may still produce health damage following entry through wounds, lesions or abrasions.

INHALED

Ÿ The material is not thought to produce respiratory irritation (as classified by EC Directives using animal models). Nevertheless inhalation of the material, especially for prolonged periods, may produce respiratory discomfort and occasionally, distress.

CHRONIC HEALTH EFFECTS

Ÿ Skin contact with the material is more likely to cause a sensitisation reaction in some persons compared to the



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general population.

TOXICITY AND IRRITATION

Y unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances.

Y Not available. Refer to individual constituents.

CITRONELLAL:

BETA-CITRONELLOL:

CITRAL:

CITRONELLAL:

Y Contact allergies quickly manifest themselves as contact eczema, more rarely as urticaria or Quincke's oedema. The pathogenesis of contact eczema involves a cell-mediated (T lymphocytes) immune reaction of the delayed type. Other allergic skin reactions, e.g. contact urticaria, involve antibody-mediated immune reactions. The significance of the contact allergen is not simply determined by its sensitisation potential: the distribution of the substance and the opportunities for contact with it are equally important. A weakly sensitising substance which is widely distributed can be a more important allergen than one with stronger sensitising potential with which few individuals come into contact. From a clinical point of view, substances are noteworthy if they produce an allergic test reaction in more than 1% of the persons tested.

CITRAL:

BETA-CITRONELLOL:

Y The material may cause severe skin irritation after prolonged or repeated exposure and may produce on contact skin redness, swelling, the production of vesicles, scaling and thickening of the skin. Repeated exposures may produce severe ulceration.

BETA-CITRONELLOL: CITRAL:

GERANIOL TETRAHYDRIDE:

Y Asthma-like symptoms may continue for months or even years after exposure to the material ceases. This may be due to a non-allergenic condition known as reactive airways dysfunction syndrome (RADS) which can occur following exposure to high levels of highly irritating compound. Key criteria for the diagnosis of RADS include the absence of preceding respiratory disease, in a non-atopic individual, with abrupt onset of persistent asthma-like symptoms within minutes to hours of a documented exposure to the irritant. A reversible airflow pattern, on spirometry, with the presence of moderate to severe bronchial hyperreactivity on methacholine challenge testing and the lack of minimal lymphocytic inflammation, without eosinophilia, have also been included in the criteria for diagnosis of RADS. RADS (or asthma) following an irritating inhalation is an infrequent disorder with rates related to the concentration of and duration of exposure to the irritating substance. Industrial bronchitis, on the other hand, is a disorder that occurs as result of exposure due to high concentrations of irritating substance (often particulate in nature) and is completely reversible after exposure ceases. The disorder is characterised by dyspnea, cough and mucus production.

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ÿ No significant acute toxicological data identified in literature search.

CITRONELLAL:

TOXICITY

IRRITATION Oral (Rat) LD50: 2420 mg/kg

CITRONELLAL:

TOXICITY

IRRITATION Oral (Rat) LD50: 2420 mg/kg

GERANIOL TETRAHYDRIDE:

TOXICITY

Oral (rat) LD50: >5000 mg/kg

Dermal (rabbit) LD50: 2400 mg/kg

IRRITATION

Skin (rabbit): 500 mg/24h

ÿ For alkyl alcohols C6-13:

This group of products are very similar in terms of physicochemical and toxicological properties. Interpolation of data can be used to assess the alkyl alcohols for which data is not available.

Acute toxicity: All of these alcohols have a low order of toxicity in rats via the oral route. The LD50 for C6-branched and linear alcohols were >3700 mg/kg; LD50s for the C6-8, C7-9, C8-10, C9-11 and C11-14 branched alkyl alcohols were all >2000 mg/kg.

These alcohols have a low order of toxicity via the dermal route. Dermal LD50s were greater than 2600 mg/kg.

Subchronic toxicity: Repeat dose studies indicate these alcohols have a low order of subchronic toxicity by both the oral and dermal route. Further they demonstrate that these alcohols display a consistent degree of subchronic toxicity by these routes. Developmental toxicity: Studies demonstrate that the alcohols are not selective developmental toxicants by either the oral or inhalation route of exposure. Inhalation of alkyl alcohols C6-13 is a primary concern during industrial use, particularly for lower molecular weight alcohols.

Collectively the weight of evidence demonstrates that these alcohols have a low order of maternal toxicity and do not induce signs of developmental toxicity until maternal toxicity is observed. The NOAELs for inhalation reflect the maximum achievable vapour concentration.

Reproductive toxicity: Developmental toxicity studies for several of these alcohols, conducted by the oral route, produce consistent results and demonstrate that these substances do not affect reproductive parameters. Although a slight increase in resorptions was observed in several studies, this occurred only in the highest dose group and in the presence of overt maternal toxicity.

Genotoxicity: The weight of evidence from existing data supports the conclusion that these materials are not genotoxic.

Further data to support this assessment comes from a series of alkyl acetates C6-13. Alkyl acetates are produced from alkyl alcohols and undergo metabolism by esterases to produce acetic acid and the corresponding alkyl alcohol. There is no evidence for genotoxicity with these compounds in a variety of strains of *S. typhimurium* in the presence or absence of metabolic activation. C6, C6-8, C7-9 and C11-14 alkyl acetates produced negative results in the Ames test.

Based on data for structurally similar substances these alcohols are not expected to be clastogenic. Alkyl acetates can also be used to predict clastogenic potential of alkyl alcohols. Although there is evidence of cytotoxicity at extremely high doses, no clastogenic activity was seen in a homologous family of alkyl acetates.

Metabolism: Alkyl alcohols are broken down, in the body, by mitochondrial beta-oxidation or by cytochrome P450



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omega and and omega-minus oxidation. The alcohol undergoes various oxidative steps to yield other alcohols, ketones, aldehydes, carboxylic acids and carbon dioxide, Data for monohydric, aliphatic alcohols show a systematic variation according to molecular weight in a manner similar to other homologous series. The body handles aliphatic hydrocarbons in a similar manner via oxidative conversion to alcohols, ketones, and eventual elimination as carbon dioxide and carboxylic acids. The undegraded alcohols can be conjugated either directly or as a metabolite with glucuronic acid, sulfuric acid or glycine and are readily excreted. Intermediate aldehydes may be reactive and bind with DNA and/ or proteins.

BETA-CITRONELLOL: TOXICITY

Oral (rat) LD50: 3450 mg/kg
Subcutaneous (mouse) LD50: 880 mg/kg
Intramuscular (mouse) LD50: 4000 mg/kg
Dermal (rabbit) LD50: 2650 mg/kg

IRRITATION

Skin (man): 16 mg/48h - Moderate
Skin (rabbit): 100 mg/24h- SEVERE
Skin (guin.pig): 100mg/24h- SEVERE

ÿ For terpenoid primary alcohols and related esters

This family includes includes three terpenoid acyclic aliphatic primary alcohols, citronellol, geraniol, and nerol. The category also includes a mixture of terpenoid esters and alcohols called acetylated myrcene. Geranyl acetate and neryl acetate are the principal products formed when myrcene is acetylated. Thus, the mixture is commonly recognised as acetylated myrcene. The four substances are grouped together because of their close structural relationships and the resulting similarities of their physiochemical and toxicological properties.

tronellol, geraniol, nerol, and geranyl acetate are currently recognized by the U.S. Food and Drug Administration (FDA) as GRAS (generally regarded as safe for their intended use as flavouring substances. In nature, terpenes are produced by the isoprene pathway that is an integral part of normal plant and animal biosynthesis. Oxygenated terpene substances {e.g., geraniol, nerol, citronellol, citral (a mixture of aldehydes, geranial and neral), and geranyl acetate} are therefore, ubiquitous in the plant kingdom. Acetylated myrcene (geranyl and neryl acetate), being mainly a mixture of esters, is expected to be somewhat less polar and therefore less water soluble than the three terpenoid alcohols. It is however, expected to be rapidly hydrolysed in vivo to yield nerol, geraniol, and acetic acid. Similar hydrolysis also occurs in the environment albeit at a somewhat slower rate. Terpenoid alcohols formed in the gastrointestinal tract, as a result of hydrolysis are rapidly absorbed.

Following hydrolysis, geraniol, nerol, and citronellol undergo a complex pattern of alcohol oxidation, omega-oxidation, hydration, selective hydrogenation and subsequent conjugation to form oxygenated polar metabolites, which are rapidly excreted primarily in the urine of animals. Alternately, the corresponding carboxylic acids formed by oxidation of the alcohol function may enter the beta-oxidation pathway and eventually undergo cleavage to yield shorter chain carboxylic acids that are completely metabolised to carbon dioxide. Geraniol, related terpenoid alcohols (citronellol and nerol), and the related terpene aldehydes (geranial and neral) exhibit similar pathways of metabolic detoxication in animals.

In rats and mice, a mixture of geranial and neral, commonly recognised as citral, undergoes rapid absorption from the gastrointestinal tract and distribution throughout the body.

Genotoxicity: In vitro genotoxicity assays available for citronellol, geraniol, citral (geranial and neral mixture) and acetylated myrcene (geranyl acetate and neryl acetate mixture) demonstrate that these substances



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have a low genotoxic potential. No evidence of mutagenicity was reported in an Ames assay with citronellol metabolites. In two chromosomal aberration assays with geraniol and a geranial/neral mixture, there was no evidence of increased incidence of chromosomal aberrations when Chinese hamster lung fibroblasts were incubated with 125 ug/plate of geraniol or 30 ug/plate of the geranial/neral mixture, respectively. Nerol, being a geometrical isomer of geraniol would also be expected to be negative. The acetates of nerol and geraniol, the principal constituents of acetylated myrcene, which will hydrolyse to nerol and geraniol, have also been tested and found to be negative in Ames assays at concentrations up to 20,000 ug/plate.

In vivo: Tests on citronellol and acetylated myrcene (geranyl acetate) confirm the lack of genotoxic potential. A mixture of geranyl acetate (79%) and citronellyl acetate (21%) showed no evidence of increased micronuclei in a standardized mouse (B6C3F1 strain) micronucleus assay at dose levels up to and including 1800 mg/kg bw and there was no evidence of unscheduled DNA synthesis when the geranyl acetate/citronellyl acetate mixture was given orally to Fisher F344 rats. Since these esters hydrolyse to geraniol and citronellol in rodents, these results apply directly to geraniol and citronellol. Repeat dose toxicity:

Short term: Citronellol, as an equal mixture with the structurally similar material linalool, administered to rats at 100 mg/kg/day for 12 weeks, resulted in no adverse effects. Geraniol, in combination with a structural isomer, was administered to groups of rats (5/sex/group) in the diet at concentrations of 10,000ppm for 16 weeks or 1000 ppm for 27 weeks. No adverse effects were reported in either study. Likewise, no adverse effects were observed when rats were maintained on a diet calculated to provide an estimated average daily intake of greater than 200 mg/kg bw/day of citral, a mixture of geranial and neral, for 91 days. Long-term studies: Citronellol, geraniol and nerol and the principal hydrolysis products of acetylated myrcene (geranyl acetate) were all included as structural similar acyclic terpenes in a QSAR study by molecular orbital calculations for prediction of their potential toxicity/carcinogenicity. None of the substances in this group were predicted to have significant toxicity and/or carcinogenicity potential. This conclusion is supported by the results of a 2 year bioassay on a mixture of acetate esters of geraniol and citronellol that showed no toxic or carcinogenic effects at dose levels up to 2000 mg/kg bw/day in rats and 1000 mg/kg bw/day in mice.

Reproductive toxicity: A mixture of the aldehydes, geranial and neral, has been subjected to an oral generation reproductive study in rats. There were no reproductive effects at the maternal NOAEL of 50mg/kg/day and a foetal/pup NOAEL of 160 mg/kg bw/day. At a maternally toxic level of 500 mg/kg bw/day, the only effect reported was a slightly decreased pup weight.

Given that other studies show the mixture of aldehydes exhibits a higher level of toxicity than the corresponding alcohols geraniol and nerol, data on reproductive and developmental toxicity for the aldehydes may be used to conservatively estimate reproductive toxicity for the corresponding alcohols.

Developmental toxicity: In a developmental/reproduction screening study, rats were administered the acetal formed from citral (geranial and neral mixture) and ethanol. The acetal will readily hydrolyse to citral. The NOAELs for maternal toxicity and developmental toxicity were reported to be 125 and 250 mg/kg bw/day, respectively.

A geranial/neral mixture has been subjected to an oral foetotoxicity study in rats and NOAEL for maternal and developmental toxicities were reported to be 60 mg/kg bw/day

In an inhalation developmental study in rats using a geranial/neral mixture A NOAEL for maternal toxicity was reported to be 35 ppm. There were some slight foetotoxic effects at the maternally toxic level of 85 ppm (as a vapor/aerosol).

The material may produce moderate eye irritation leading to inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.



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The material may produce respiratory tract irritation, and result in damage to the lung including reduced lung function.

CITRAL:

TOXICITY

Oral (rat) LD50: 4960 mg/kg

Intraperitoneal (rat) LD50: 460 mg/kg

SEVERE Oral (mouse) LD50: 6000 mg/kg

Moderate

IRRITATION

Skin (human): 40 mg/24h - Mild

Skin (man): 16 mg/48h -

Skin (rabbit): 500 mg/24h -

Skin (rabbit): 100 mg/24h-

SEVERE Skin (pig): 50 mg/24h

- SEVERE

Skin (guinea pig): 1%/48h - Moderate

Skin (guinea

pig):100mg/24hSEVERE Produces maternal effects (oogenesis, ovaries, fallopian tube changes) and effects live-birth index.

Section 12 - ECOLOGICAL INFORMATION

Refer to data for ingredients, which follows:

CITRAL:

BETA-CITRONELLOL:

Ÿ Substances containing unsaturated carbons are ubiquitous in indoor environments. They result from many sources (see below). Most are reactive with environmental ozone and many produce stable products which are thought to adversely affect human health. The potential for surfaces in an enclosed space to facilitate reactions should be considered.

Source of unsaturated substances

Occupants (exhaled breath, ski oils, personal care products)

Soft woods, wood flooring, including cypress, cedar and silver fir boards, houseplants

Carpets and carpet backing

Unsaturated substances (Reactive Emissions)

Isoprene, nitric oxide, squalene, unsaturated sterols, oleic acid and other unsaturated fatty acids, unsaturated oxidation products

Isoprene, limonene, alpha-pinene, other terpenes and sesquiterpenes

4- Phenylcyclohexene, 4-vinylcyclohexene, styrene, 2-

Major Stable Products produced following reaction with ozone.

Methacrolein, methyl vinyl ketone, nitrogen dioxide, acetone, 6MHQ, geranyl acetone, 4OPA, formaldehyde, nonanol, decanal, 9- oxo- nonanoic acid, azelaic acid, nonanoic acid. Formaldehyde, 4- AMC, pinoaldehyde, pinic acid, pinonic acid, formic acid, methacrolein, methyl vinyl ketone, SOAs including ultrafine particles Formaldehyde, acetaldehyde, benzaldehyde, hexanal, nonanal,



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	ethylhexyl acrylate, unsaturated fatty acids and esters	2- nonenal
Linoleum and paints/polishes containing linseed oil	Linoleic acid, linolenic acid	Propanal, hexanal, nonanal, 2- heptenal, 2- nonenal, 2- decenal, 1- pentene- 3- one, propionic acid, n- butyric acid
Latex paint Certain cleaning products, polishes, waxes, air fresheners	Residual monomers Limonene, alpha- pinene, terpinolene, alpha- terpineol, linalool, linalyl acetate and other terpenoids, longifolene and other sesquiterpenes	Formaldehyde Formaldehyde, acetaldehyde, glycoaldehyde, formic acid, acetic acid, hydrogen and organic peroxides, acetone, benzaldehyde, 4- hydroxy- 4- methyl- 5- hexen- 1- al, 5- ethenyl- dihydro- 5- methyl- 2(3H)- furanone, 4- AMC, SOAs including ultrafine particles
Natural rubber adhesive	Isoprene, terpenes	Formaldehyde, methacrolein, methyl vinyl ketone
Photocopier toner, printed paper, styrene polymers Environmental tobacco smoke	Styrene Styrene, acrolein, nicotine	Formaldehyde, benzaldehyde Formaldehyde, benzaldehyde, hexanal, glyoxal, N- methylformamide, nicotinaldehyde, cotinine
Soiled clothing, fabrics, bedding	Squalene, unsaturated sterols, oleic acid and other saturated fatty acids	Acetone, geranyl acetone, 6MHO, 40PA, formaldehyde, nonanal, decanal, 9- oxo- nonanoic acid, azelaic acid, nonanoic acid
Soiled particle filters	Unsaturated fatty acids from plant waxes, leaf litter, and other vegetative debris; soot; diesel particles	Formaldehyde, nonanal, and other aldehydes; azelaic acid; nonanoic acid; 9- oxo- nonanoic acid and other oxo- acids; compounds with mixed functional groups (=O, - OH, and - COOH)
Ventilation ducts and duct liners	Unsaturated fatty acids and esters, unsaturated oils, neoprene	C5 to C10 aldehydes
" Urban grime"	Polycyclic aromatic hydrocarbons	Oxidized polycyclic aromatic hydrocarbons



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acetone, oils (e.g. lavender, eucalyptus, hexen- tea tree)	Limonene, alpha- pinene, linalool, linalyl acetate, terpinene- 4- ol, gamma-terpinene	Perfumes, colognes, essential Formaldehyde, 4- AMC, 4- hydroxy- 4- methyl- 5- 1- al, 5- ethenyl- dihydro- 5- methyl- 2(3H) furanone, SOAs including ultrafine particles
Overall home emissions	Limonene, alpha- pinene, styrene	Formaldehyde, 4- AMC, pinonaldehyde, acetone, pinic acid, pinonic acid, formic acid, benzaldehyde, SOAs including ultrafine particles

Abbreviations: 4-AMC, 4-acetyl-1-methylcyclohexene; 6MHQ, 6-methyl-5-heptene-2-one, 4OPA, 4-oxopentanal, SOA, Secondary Organic Aerosols

Reference: Charles J Weschler; Environmental Health Perspectives, Vol 114, October 2006.

Terpenes such as limonene and isoprene contribute to aerosol and photochemical smog formation. Emissions of biogenic hydrocarbons, such as the terpenes, to the atmosphere may either decrease ozone concentrations when oxides of nitrogen are low or, if emissions take place in polluted air (i.e containing high concentrations of nitrogen oxides), leads to an increase in ozone concentrations. Lower terpenoids can react with unstable reactive gases and may act as precursors of photochemical smog therefore indirectly influencing community and ecosystem properties.

Complex chlorinated terpenes such as toxaphene (a persistent, mobile and toxic insecticide) and its degradation products, were produced by photoinitiated reactions in an aqueous system, initially containing limonene and other monoterpenes, simulating pulp bleach conditions

The reactions of ozone with larger unsaturated compounds, such as the terpenes can give rise to oxygenated species with low vapour pressures that subsequently condense to form secondary organic aerosol.

BETA-

CITRONELLOL:

CITRAL:

GERANIOL TETRAHYDRIDE:

Do NOT discharge into sewer or waterways.

BETA-CITRONELLOL:

GERANIOL

TETRAHYDRIDE:

Do NOT allow product to come in contact with surface waters or to intertidal areas below the mean high water mark. Do not contaminate water when cleaning equipment or disposing of equipment wash-waters. Wastes resulting from use of the product must be disposed of on site or at approved waste sites.



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CITRONELLAL:

Refer to data for ingredients, which follows:

ÿ Toxic to aquatic organisms.

ÿ Do NOT allow product to come in contact with surface waters or to intertidal areas below the mean high water mark. Do not contaminate water when cleaning equipment or disposing of equipment wash-waters. Wastes resulting from use of the product must be disposed of on site or at approved waste sites.

ÿ May cause long-term adverse effects in the aquatic environment.

ÿ Terpenes such as limonene and isoprene contribute to aerosol and photochemical smog formation. Emissions of biogenic hydrocarbons, such as the terpenes, to the atmosphere may either decrease ozone concentrations when oxides of nitrogen are low or, if emissions take place in polluted air (i.e containing high concentrations of nitrogen oxides), leads to an increase in ozone concentrations. Lower terpenoids can react with unstable reactive gases and may act as precursors of photochemical smog therefore indirectly influencing community and ecosystem properties.

Complex chlorinated terpenes such as toxaphene (a persistent, mobile and toxic insecticide) and its degradation products, were produced by photoinitiated reactions in an aqueous system, initially containing

limonene and other monoterpenes, simulating pulp bleach conditions

The reactions of ozone with larger unsaturated compounds, such as the terpenes can give rise to oxygenated species with low vapour pressures that subsequently condense to form secondary organic aerosol.

ÿ Substances containing unsaturated carbons are ubiquitous in indoor environments. They result from many sources (see below). Most are reactive with environmental ozone and many produce stable products which are thought to adversely affect human health. The potential for surfaces in an enclosed space to facilitate reactions should be considered.

Source of unsaturated substances	Unsaturated substances (Reactive Emissions)	Major Stable Products produced following reaction with ozone.
Occupants (exhaled breath, ski oils, personal care products)	Isoprene, nitric oxide, squalene, unsaturated sterols, oleic acid and other unsaturated fatty acids, unsaturated oxidation products	Methacrolein, methyl vinyl ketone, nitrogen dioxide, acetone, 6MHQ, geranyl acetone, 4OPA, formaldehyde, nonanol, decanal, 9- oxo- nonanoic acid, azelaic acid, nonanoic acid.
Soft woods, wood flooring, including cypress, cedar and silver fir boards, houseplants	Isoprene, limonene, alpha-pinene, other terpenes and sesquiterpenes	Formaldehyde, 4- AMC, pinoaldehyde, pinic acid, pinonic acid, formic acid, methacrolein, methyl vinyl ketone, SOAs including ultrafine particles
Carpets and carpet backing	4- Phenylcyclohexene, 4-vinylcyclohexene, styrene, 2-ethylhexyl acrylate, unsaturated fatty acids and esters	Formaldehyde, acetaldehyde, benzaldehyde, hexanal, nonanal, 2- nonenal



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Linoleum and paints/polishes containing linseed oil	Linoleic acid, linolenic acid	Propanal, hexanal, nonanal, 2-heptenal, 2- nonenal, 2-decenal, 1- pentene- 3- one, propionic acid, n- butyric acid
Latex paint Certain cleaning products, polishes, waxes, air fresheners	Residual monomers Limonene, alpha- pinene, terpinolene, alpha- terpineol, linalool, linalyl acetate and other terpenoids, longifolene and other sesquiterpenes	Formaldehyde Formaldehyde, acetaldehyde, glycoaldehyde, formic acid, acetic acid, hydrogen and organic peroxides, acetone, benzaldehyde, 4- hydroxy- 4-methyl- 5- hexen- 1- al, 5- ethenyl- dihydro- 5- methyl- 2(3H)- furanone, 4- AMC, SOAs including ultrafine particles Formaldehyde, methacrolein, methyl vinyl ketone Formaldehyde, benzaldehyde
Natural rubber adhesive	Isoprene, terpenes	Formaldehyde, benzaldehyde, hexanal, glyoxal, N- methylformamide, nicotinaldehyde, cotinine Acetone, geranyl acetone, 6MHO, 40PA, formaldehyde, nonanal, decanal, 9- oxo- nonanoic acid, azelaic acid, nonanoic acid Formaldehyde, nonanal, and other aldehydes; azelaic acid; nonanoic acid; 9- oxo- nonanoic acid and other oxo- acids; compounds with mixed functional groups (=O, - OH, and - COOH)
Photocopier toner, printed paper, styrene polymers Environmental tobacco smoke	Styrene Styrene, acrolein, nicotine	
Soiled clothing, fabrics, bedding	Squalene, unsaturated sterols, oleic acid and other saturated fatty acids	
Soiled particle filters	Unsaturated fatty acids from plant waxes, leaf litter, and other vegetative debris; soot; diesel particles	
Ventilation ducts and duct liners	Unsaturated fatty acids and esters, unsaturated oils, neoprene	C5 to C10 aldehydes
" Urban grime"	Polycyclic aromatic hydrocarbons	Oxidized polycyclic aromatic hydrocarbons
Perfumes, colognes, essential acetone, oils (e.g. lavender, eucalyptus, hexen- tea tree)	Limonene, alpha- pinene, linalool, linalyl acetate, terpinene- 4- ol, gamma- terpinene	Formaldehyde, 4- AMC, 4- hydroxy- 4- methyl- 5- 1- al, 5- ethenyl- dihydro- 5- methyl- 2(3H) furanone, SOAs including ultrafine



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Overall home emissions	Limonene, alpha- pinene, styrene	particles Formaldehyde, 4- AMC, pinonaldehyde, acetone, pinic acid, pinonic acid, formic acid, benzaldehyde, SOAs including ultrafine particles
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Abbreviations: 4-AMC, 4-acetyl-1-methylcyclohexene; 6MHQ, 6-methyl-5-heptene-2-one, 4OPA, 4-oxopentanal, SOA, Secondary Organic Aerosols

Reference: Charles J Weschler; Environmental Helath Perspectives, Vol 114, October 2006.

ÿ DO NOT discharge into sewer or waterways.

GERANIOL TETRAHYDRIDE:

ÿ For alkyl alcohols

C6-13: Environmental

fate:

Biodegradation data for several alcohols in this group show the potential to biodegrade to a great extent (58-82%) within a standard 28-day test duration; these products are therefore not expected to persist in the environment.

Data suggests that these alcohols are expected to partition primarily to water and soil, however their fate in air is interesting. The majority of the alcohols have relatively low Kow values which suggest that they will not tend to partition to suspended organic matter in air and precipitate to aquatic and terrestrial environmental compartments to a significant extent.

The alkyl alcohols are not expected to hydrolyse at a measurable rate.

Alkyl alcohols have the potential to volatilise. Atmospheric oxidation as a result of hydroxyl radical attack (OH-) may transform these molecule. Ecotoxicity:

The alkyl alcohols ranging from hexanol, branched and linear, to C11-14 iso-, C13 rich have been shown to produce an expected increasing level of acute toxicity to freshwater fish and invertebrates.

Although there

is insufficient data to confirm a similar pattern of algal toxicity, based on fish and invertebrate data, a similar level of toxicity is expected from the lower to higher molecular weight products

These alcohols demonstrate a moderate to high degree of aquatic toxicity from the low to high molecular weight products, respectively.

Test	hexanol, branched iso and linear	alcohols C6- 8, branched	alcohols C7- 9, branched	alcohols C8- 10 iso, C9- rich	alcohols C9- 11 iso, C10 rich	alcohols C11- 14 iso, C10 rich	alcohols C11- 14 C13 rich
Fish LC50	97.7 mg/l	34.5 mg/l	14 mg/l	10.1 mg/l	3.1 mg/l	1.2 mg/l	0.42 mg/l



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(96 h

Experimental and modeled data show the potential to cause acute toxicity in Daphnid. EL50/ EC50 (48 h) ranges from 137 to 0.7 with increasing molecular weight.

Acute experimental toxicity threshold values are reported for freshwater alga (*Scenedesmus quadricauda*) and are used as read across data to the C8-10, iso, C9 rich alkyl alcohol product; this result suggests that C9-11, C10 rich, alkyl alcohol has the potential to cause acute toxicity (based on cell growth) at a concentration above 8.5 mg/l.

BETA-CITRONELLOL:

Y Toxic to aquatic organisms.

Y May cause long-term adverse effects in the aquatic environment.

Y For terpenoid primary alcohols and related esters

Environmental fate:

Water solubility: While the reported water solubilities were not obtained according to OECD guidelines, the agreement of the values reported, 600 mg/L for citronellol and 300 mg/L for geraniol, with the calculated values 211, 256 and 256 mg/L for citronellol, geraniol and nerol, respectively, support their reliability.

No water solubility

data are available for acetylated myrcene. However, the principle components being esters have lower solubilities than their component alcohols. The calculated water solubilities of neryl acetate and geranyl acetate are both 6.9 mg/L. The other major component, limen has a calculated solubility of 3.1 mg/L.

Photodegradation: The calculated photodegradation half lives for citronellol, geraniol and nerol are in the range from 19 minutes to 1.3 hours. Acetylated myrcene can be expected to be in the same range since the calculated half-life for its principal constituents, neryl acetate and geranyl acetate, is 19 minutes and for the second major constituent, limen, is 37 minutes. Structurally, these substances are unsaturated primary alcohols that have the potential to form radical species in the gas phase and also be oxidized to the corresponding unsaturated aldehyde. The known chemical reactivity of these substrates supports short photodegradation half-lives predicted by the model.

Stability in Water: No hydrolysis is possible for the three terpenoid primary alcohols, citronellol, geraniol and nerol. All three are expected to be very stable in aqueous solution. The principal constituents of acetylated myrcene, geranyl acetate and neryl acetate are esters and are calculated to have half-lives for hydrolysis of 23 days at pH 8 and 231 days at pH 7. Hydrolysis of geranyl acetate and neryl acetate is expected both in vivo and in the environment. The second major constituent of acetylated myrcene, limen, will not hydrolyse in water. The significance of calculated half-life data for geranyl acetate must take into account the experimental data that aliphatic ester, in general, are readily hydrolysed in fish. Biodegradation: Duplicate studies on citronellol and geraniol show these materials to be readily biodegradable (i.e., 100% biodegradation [OECD 301B, OECD 301C]. Likewise, a mixture of geraniol and nerol (citral) exhibits greater than 92% and 99.5% biodegradation. Nerol is a stereoisomer of geraniol and would likewise be expected to be readily biodegradable. Geranyl acetate has also been shown to be readily biodegradable (greater than 82% biodegradation) and, therefore, neryl acetate would be as well. The other significant constituent of acetylated myrcene, limen, has not been shown to be readily biodegradable. However, since limen makes up only 10% of the mixture, a ready biodegradation test of the mixture is expected to result in apparent ready biodegradation. In summary, all members of the chemical category are expected to readily biodegrade in the environment.



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Ecotoxicity:

Experimental data for citronellol, geraniol, nerol, and citral indicates a very low order of acute toxicity to algae. No inhibition to growth was observed at 100 mg/L for any of the four substances.

CITRAL:

ÿ For alkenes (olefins) Environmental fate:

The potential for exposure of aquatic organisms to members of the higher olefins will be influenced by their physico-chemical properties. The predicted or measured water solubilities of these olefins range from 50 mg/L at 20 C for hexene to 0.00015 mg/L at 25 C for 1-octadecene, and to 6.33 [E-23] mg/L at 25 C for C54 alpha olefin, which suggests there is a lower potential for the larger olefins to be bioavailable to aquatic organisms due to their low solubilities. Their vapor pressures range from 230.6 hPa at 25 C for hexene to 0.00009 hPa at 25 C for 1-octadecene, and to 1.13 [E-16] hPa at 25 C for C54 alpha olefin, which suggests the shorter chain olefins will tend to partition to the air at a significant rate and not remain in the other environmental compartments for long periods of time; while the longer chain olefins will tend to partition primarily to water, soil or sediment, depending on water solubility and sorption behavior.

The predicted soil adsorption coefficients (Koc) range from 149 for C6 to 230,800 for C18 and to 1.0 [E10] for C54, indicating increasing partitioning to soil/sediment with increasing carbon number.

Level I fugacity modelling predicts that the C6-13 olefins would partition primarily to air, while the C16 and longer chain olefins would partition primarily to soil. Results of Level III fugacity modelling suggest that the C6 -8 olefins

will partition primarily to the water compartment; and, as the chain length increases beyond C10, soil and sediment become the primary compartments.

These chemicals have a very low potential to hydrolyse and do not photodegrade directly. However, in the air, all members of the category are subject to atmospheric oxidation from hydroxyl radical attack, with calculated degradation half- lives of 1.8 to 4.8 hours. C6 -30 olefins have been shown to degrade to an extent of approximately 8-92% in standard 28 day biodegradation tests. These results were not clearly correlated with carbon number or any other identifiable parameter; however, the weight of evidence shows that the members of the higher olefins have potential for degradation in the environment. Volatilisation from water is predicted to occur rapidly (hours to days), with Henry's Law Constants (bond method) ranging from 0.423 (C6) to 10.7 (C18), and to 2.89 [E5] (C54) atm- m³/mol. Consideration of these degradation processes supports the assessment that these substances will degrade relatively rapidly in the environment and not persist. Based on calculated bioconcentration factors, the C6, C7, and C16 and longer chain length category members are not expected to bioaccumulate (BCF: C6 = 44-46, C7 = 236, C16 = 71-92 and >= C18 = 3.2-4.6). Although the C8 - 15 olefins have BCFs ranging from 313 to 2030, and Kow values ranging from 4.13 to 7.49, and thus are considered to have the potential for bioaccumulation, their physico-chemical properties and fate indicate that there would be limited environmental exposure because of volatility, biodegradability and limited solubility.

Ecotoxicity:

Data indicate that acute aquatic toxicity can be observed for C6 through the C10 olefins (C6: EC/LC50 range of 1-10 mg/L; C7-C10: EC/LC50 range of 0.1-1.0 mg/L), and that toxicity increases with increasing carbon number within that range, which is consistent with increasing Kow values (3.07 -5.12). Above a chain length of 10, toxicity is not observed within the limits of solubility. However, data indicate that chronic aquatic toxicity can be observed in the C10 olefins (EC10 = 20.0 ug/L, EC50= 28.1 ug/L, NOEC = 19.04 ug/L). Data also suggest that aquatic toxicity does not differ with bond location or presence of branching.



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Ecotoxicity

Ingredient	Persistence: Water/Soil	Persistence: Air	Bioaccumulation	Mobility
citronellal	LOW		MED	MED
geraniol tetrahydride	LOW		LOW	HIGH
beta- citronellol	HIGH		MED	HIGH
citral	LOW		LOW	MED

Section 13 - DISPOSAL CONSIDERATIONS

- Containers may still present a chemical hazard/ danger when empty.
 - Return to supplier for reuse/ recycling if possible. Otherwise:
 - If container can not be cleaned sufficiently well to ensure that residuals do not remain or if the container cannot be used to store the same product, then puncture containers, to prevent re-use, and bury at an authorised landfill.
 - Where possible retain label warnings and MSDS and observe all notices pertaining to the product.
- Legislation addressing waste disposal requirements may differ by country, state and/ or territory. Each user must refer to laws operating in their area. In some areas, certain wastes must be tracked.
- A Hierarchy of Controls seems to be common - the user should investigate:
- Reduction
 - Reuse
 - Recycling
 - Disposal (if all else fails)

This material may be recycled if unused, or if it has not been contaminated so as to make it unsuitable for its intended use. If it has been contaminated, it may be possible to reclaim the product by filtration, distillation or some other means. Shelf life considerations should also be applied in making decisions of this type. Note that properties of a material may change in use, and recycling or reuse may not always be appropriate.

- DO NOT allow wash water from cleaning or process equipment to enter drains.
- It may be necessary to collect all wash water for treatment before disposal.
- In all cases disposal to sewer may be subject to local laws and regulations and these should be considered first.
- Where in doubt contact the responsible authority.
- Recycle wherever possible or consult manufacturer for recycling options.
- Consult State Land Waste Authority for disposal.
- Bury or incinerate residue at an approved site.
- Recycle containers if possible, or dispose of in an authorised landfill.

Section 14 - TRANSPORTATION INFORMATION



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US DOT 49 CFR 172.101: Non-hazardous and Not Regulated

Section 15 - REGULATORY INFORMATION

REGULATIONS

Regulations for ingredients

US Regulatory Information:

All the ingredients are listed on TSCA inventory
CAS# 106-23-0, 106-22-9 & 5392-40-5 are present on FIFRA-Inerts List.

Other Regulatory Information

citronellal (CAS: 106-23-0,2385-77-5) is found on the following regulatory lists;

"European Chemicals Agency (ECHA) List of substances identified for registration in 2010", "European Customs Inventory of Chemical Substances (English)", "European Union - European Inventory of Existing Commercial Chemical Substances (EINECS) (English)", "European Union (EU) Inventory of Fragrance Ingredients (Perfume and Aromatic Raw Materials)", "European Union (EU) Inventory of Ingredients used in Cosmetic Products", "International Fragrance Association (IFRA) Survey: Transparency List", "OECD Representative List of High Production Volume (HPV) Chemicals"

geraniol tetrahydride (CAS: 106-21-8) is found on the following regulatory lists;

"European Customs Inventory of Chemical Substances (English)", "European Union - European Inventory of Existing Commercial Chemical Substances (EINECS) (English)", "European Union (EU) Inventory of Fragrance Ingredients (Perfume and Aromatic Raw Materials)", "European Union (EU) Inventory of Ingredients used in Cosmetic Products", "International Fragrance Association (IFRA) Survey: Transparency List"

beta-citronellol (CAS: 106-22-9,1117-61-9,7540-51-4) is found on the following regulatory lists;

"European Customs Inventory of Chemical Substances (English)", "European Union - European Inventory of Existing Commercial Chemical Substances (EINECS) (English)", "European Union (EU) Inventory of Fragrance Ingredients (Perfume and Aromatic Raw Materials)", "European Union (EU) Inventory of Ingredients used in Cosmetic Products", "International Fragrance Association (IFRA) Survey: Transparency List", "OECD Representative List of High Production Volume (HPV) Chemicals"

citral (CAS: 5392-40-5) is found on the following regulatory lists;

"European Chemicals Agency (ECHA) List of substances identified for registration in 2010", "European Customs Inventory of Chemical Substances (English)", "European Union - European Inventory of Existing Commercial Chemical Substances (EINECS) (English)", "European Union (EU) Annex I to Directive 67/548/EEC on Classification and Labelling of Dangerous Substances - updated by ATP: 31", "European Union (EU) Inventory of Fragrance Ingredients (Perfume and Aromatic Raw Materials)", "European Union (EU) Inventory of Ingredients used in Cosmetic Products", "European Union (EU) Regulation (EC) No 1272/2008 on Classification, Labelling and Packaging of Substances and Mixtures - Annex VI", "International Fragrance Association (IFRA) Survey: Transparency List", "OECD Representative List of High Production Volume (HPV) Chemicals"

Section 16 - OTHER INFORMATION

No information available:



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