Cypermethrin

sc-24012

Material Safety Data Sheet

Hazard Alert Code Key:	EXTREME	HIGH	MODERATE	LOW

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME
Cypermethrin

SYNONYMS
C22-H19-Cl2-N-O3, C22-H19-Cl2-N-O3, "cyclopropanecarboxylic acid, 3-(2, 2-dichloroethenyl)-2, 2-dimethyl-, ", "cyano(3-phenoxyphenyl) methyl ester", "cyclopropanecarboxylic acid, 3-(2, 2-dichloroethenyl)-2, 2-dimethyl-, ", "cyano(3-phenoxyphenyl) methyl ester", "[cyano(3-phenoxyphenyl)methyl-3-(2, 2-dichlorovinyl-", "[cyano(3-phenoxyphenyl)methyl-3-(2, 2-dichlorovinyl-", "2, 2-dimethylcyclopropane carboxylate)", "2, 2-dimethylcyclopropane carboxylate)", "3-(2, 2-dichloroethenyl)-2, 2-dimethylcyclopropaneca", "3-(2, 2-dichloroethenyl)-2, 2-dimethylcyclopropaneca", "rboxylic acid", "cyano(3-phenoxyphenyl) methyl ester", "(RS)-a-cyano-3-phenoxybenzyl (1RS, 3RS; 1RS, 3SR)-3-(2, 2-dichlorovinyl)-", "2, 2-dimethylcyclopropanecarboxylate", "(RS)-a-cyano-3-phenoxybenzyl (1RS, 3RS; 1RS, 3SR)-3-(2, 2-dichlorovinyl)-", "2, 2-dimethylcyclopropanecarboxylate", or, (RS)-a-cyano-3-phenoxybenzyl, (RS)-a-cyano-3-phenoxybenzyl, "(1RS)-cis-trans-3-(2, 2-dichlorovinyl)-2, 2-dimethyl", "(1RS)-cis-trans-3-(2, 2-dichlorovinyl)-2, 2-dimethyl", "cyclopropanecarboxylate CAS:", cyano(3-phenoxyphenyl)methyl, rboxylate, Agrothrin, "Ambush C", "Ammo (pesticide)", "Antiborer 3767", Ardap, Basathrin, CCN-52, Chinmix, Cybil, Cymbush, Cyperkill, "Cypermethrin Technical", Cypermethrin-25EC, Cypemtryna, Cypor, "EXP 5598", Ectpor, FMC-30980, FMC-45497, FMC-45806, Fendona, Flectron, Hilcyperin, JF-5705F, Kordon, "NRDC 149", "NRDC 160", "NRDC 166", Nurele, Polytrin, RU-27998, Ripcord, "SF 06646", Sherpa, Supercypermethrin, "Supercypermethrin Forte", Supermethrin, "Vucht 424", "WL 43467", WL-8517, YT-305, zeta-cypermethrin, beta-cypermethrin, alpha-cypermethrin, "synthetic pyrethroid insecticide pesticide", pyrethrum/pyrethroid

PROPER SHIPPING NAME
PYRETHROID PESTICIDE, SOLID, TOXIC(contains cypermethrin)

PRODUCT USE
■ Dangerous POISON. Available ONLY for industrial and manufacturing purposes. To be used by or in accordance with directions of accredited pest control officers. Operators to be trained in procedures for safe use of material. Biologically active component of insecticide against many pests, particular lepidoptera in cotton, fruit and vegetables. Also used as an insect repellent for horses and ponies and in the treatment of buildings. Since alpha-cypermethrin is more biologically active than cypermethrin it is used at lower application rates and as a result the residues on crops are approximately half those of cypermethrin. Cypermethrin toxicology depends on the precise ratio of cis- and trans-species present in commercial mixtures - for example a mixture of 80:20 cis-trans species shows different toxicology to a mixture of 40:60 cis-trans species.

SUPPLIER
Company: Santa Cruz Biotechnology, Inc.
Address:
2145 Delaware Ave
Santa Cruz, CA 95060
Telephone: 800.457.3801 or 831.457.3800
Emergency Tel: Luis Yanez at 831.251.2170

HAZARD RATINGS

		Min	Max
Flammability:	1		
Toxicity:	4		
Body Contact:	3		
Reactivity:	1		
Chronic:	3		

Min/Nil=0
Low=1
Moderate=2
High=3
Extreme=4

Section 2 - HAZARDS IDENTIFICATION

STATEMENT OF HAZARDOUS NATURE
HAZARDOUS SUBSTANCE. DANGEROUS GOODS. According to the Criteria of NOHSC, and the ADG Code.

POISONS SCHEDULE
S7

RISK	SAFETY
■ Harmful by inhalation.	■ Keep locked up.
■ Toxic if swallowed.	■ In case of insufficient ventilation wear suitable respiratory equipment.
■ Irritating to eyes respiratory system and skin.	■ Use only in well ventilated areas.
■ May cause SENSITISATION by skin contact.	■ Keep container in a well ventilated place.
■ Very toxic to aquatic organisms may cause long-term adverse effects in the aquatic environment.	■ Avoid exposure - obtain special instructions before use.
■ Toxic to bees.	■ To clean the floor and all objects contaminated by this material use water and detergent.
■ Cumulative effects may result following exposure*.	■ This material and its container must be disposed of in a safe way.
■ Limited evidence of a carcinogenic effect*.	■ Keep away from food drink and animal feeding stuffs.
■ Possible respiratory sensitiser*.	■ Take off immediately all contaminated clothing.
■ May be harmful to the foetus/ embryo*.	■ In case of contact with eyes rinse with plenty of water and contact Doctor or Poisons Information Centre.
■ Exposure may produce irreversible effects*.	■ Use appropriate container to avoid environment contamination.
* (limited evidence).	■ Avoid release to the environment. Refer to special instructions/ safety data sheets.
	■ This material and its container must be disposed of as hazardous waste.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

NAME	CAS RN	%
cypermethrin	52315-07-8	>60
being a mixture of 8 isomers including		
cypermethrin, alpha-	67375-30-8	>20

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cypermethrin, beta-	65731-84-2
cypermethrin, theta-	71697-59-1
cypermethrin, zeta-	52315-07-8

Section 4 - FIRST AID MEASURES

SWALLOWED

■

- Give a slurry of activated charcoal in water to drink. NEVER GIVE AN UNCONSCIOUS PATIENT WATER TO DRINK.
- At least 3 tablespoons in a glass of water should be given.
- Although induction of vomiting may be recommended (IN CONSCIOUS PERSONS ONLY), such a first aid measure is dissuaded due to the risk of aspiration of stomach contents. (i) It is better to take the patient to a doctor who can decide on the necessity and method of emptying the stomach. (ii) Special circumstances may however exist; these include non- availability of charcoal and the ready availability of the doctor.

NOTE: If vomiting is induced, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration. NOTE: Wear protective gloves when inducing vomiting.

- REFER FOR MEDICAL ATTENTION WITHOUT DELAY.
- In the mean time, qualified first-aid personnel should treat the patient following observation and employing supportive measures as indicated by the patient's condition.
- If the services of a medical officer or medical doctor are readily available, the patient should be placed in his/her care and a copy of the MSDS should be provided. Further action will be the responsibility of the medical specialist.
- If medical attention is not available on the worksite or surroundings send the patient to a hospital together with a copy of the MSDS. (ICSC20305/20307)

EYE

■ If this product comes in contact with the eyes:

- Immediately hold eyelids apart and flush the eye continuously with 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.
- Continue flushing until advised to stop by the Poisons Information Centre or a doctor, or for at least 15 minutes.
- Transport to hospital or doctor without delay.
- Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

SKIN

■ 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.
- Transport to hospital, or doctor, without delay.

NOTES TO PHYSICIAN

■ For chronic or short term repeated exposures to pyrethrum and synthetic pyrethroids:

- Mammalian toxicity of pyrethrum and synthetic pyrethroids is low, in part because of poor bioavailability and a large first pass extraction by the liver.
- The most common adverse reaction results from the potent sensitising effects of pyrethrins.
- Clinical manifestations of exposure include contact dermatitis (erythema, vesiculation, bullae); anaphylactoid reactions (pallor, tachycardia, diaphoresis) and asthma. [Ellenhorn Barceloux]
- In cases of skin contact, it has been reported that topical application of Vitamin E Acetate (alpha-tocopherol acetate) has been found to have high therapeutic value, eliminating almost all skin pain associated with exposure to synthetic pyrethroids. [Incitec]

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 fire fighting procedures suitable for surrounding area.
- 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.
- Equipment should be thoroughly decontaminated after use.

FIRE/EXPLOSION HAZARD

■

- Combustible solid which burns but propagates flame with difficulty.
- Avoid generating dust, particularly clouds of dust in a confined or unventilated space as dusts may form an explosive mixture with air, and any source of ignition, i.e. flame or spark, will cause fire or explosion. Dust clouds generated by the fine grinding of the solid are a particular hazard; accumulations of fine dust (420 micron or less) may burn rapidly and fiercely if ignited.; once initiated larger particles up to 1400 microns diameter will contribute to the propagation of an explosion.
- A dust explosion may release of large quantities of gaseous products; this in turn creates a subsequent pressure rise of explosive force capable of damaging plant and buildings and injuring people.
- Usually the initial or primary explosion takes place in a confined space such as plant or machinery, and can be of sufficient force to damage or rupture the plant. If the shock wave from the primary explosion enters the surrounding area, it will disturb any settled dust layers, forming a second dust cloud, and often initiate a much larger secondary explosion. All large scale explosions have resulted from chain reactions of this type.
- Dry dust can be charged electrostatically by turbulence, pneumatic transport, pouring, in exhaust ducts and during transport.
- Build-up of electrostatic charge may be prevented by bonding and grounding.
- Powder handling equipment such as dust collectors, dryers and mills may require additional protection measures such as explosion venting.

- All movable parts coming in contact with this material should have a speed of less than 1-meter/sec

Combustion products include: carbon monoxide (CO), carbon dioxide (CO2), hydrogen chloride, phosgene, nitrogen oxides (NOx), other pyrolysis products typical of burning organic material.
May emit poisonous fumes.

FIRE INCOMPATIBILITY

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

HAZCHEM

2X

Personal Protective Equipment

Gas tight chemical resistant suit.

Section 6 - ACCIDENTAL RELEASE MEASURES

EMERGENCY PROCEDURES

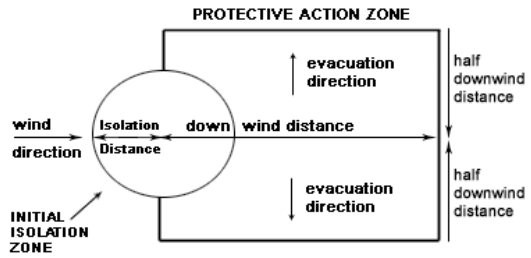
MINOR SPILLS

- Environmental hazard - contain spillage.
- Remove all ignition sources.
- Clean up all spills immediately.
- Avoid contact with skin and eyes.
- Control personal contact by using protective equipment.
- Use dry clean up procedures and avoid generating dust.
- Place in a suitable, labelled container for waste disposal.

MAJOR SPILLS

- Environmental hazard - contain spillage.
- Clear area of personnel and move upwind.
- 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.
- Stop leak if safe to do so.
- Contain spill with sand, earth or vermiculite.
- Collect recoverable product into labelled containers for recycling.
- Neutralise/decontaminate residue.
- Collect solid residues and seal in labelled drums for disposal.
- Wash area and prevent runoff into drains.
- After clean up operations, decontaminate and launder all protective clothing and equipment before storing and re-using.
- If contamination of drains or waterways occurs, advise emergency services.

PROTECTIVE ACTIONS FOR SPILL



From IERG (Canada/Australia)	
Isolation Distance	25 metres
Downwind Protection Distance	250 metres
IERG Number	35

FOOTNOTES

1 PROTECTIVE ACTION ZONE is defined as the area in which people are at risk of harmful exposure. This zone assumes that random changes in wind direction confines the vapour plume to an area within 30 degrees on either side of the predominant wind direction, resulting in a crosswind protective action distance equal to the downwind protective action distance.
2 PROTECTIVE ACTIONS should be initiated to the extent possible, beginning with those closest to the spill and working away from the site in the downwind direction. Within the protective action zone a level of vapour concentration may exist resulting in nearly all unprotected persons becoming incapacitated and unable to take protective action and/or incurring serious or irreversible health effects.
3 INITIAL ISOLATION ZONE is determined as an area, including upwind of the incident, within which a high probability of localised wind reversal may expose nearly all persons without appropriate protection to life-threatening concentrations of the material.
4 SMALL SPILLS involve a leaking package of 200 litres (55 US gallons) or less, such as a drum (jerrican or box with inner containers). Larger packages leaking less than 200 litres and compressed gas leaking from a small cylinder are also considered "small spills". LARGE SPILLS involve many small leaking packages or a leaking package of greater than 200 litres, such as a cargo tank, portable tank or a "one-tonne" compressed gas cylinder.
5 Guide 151 is taken from the US DOT emergency response guide book.
6 IERG information is derived from CANUTEC - Transport Canada.

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

Section 7 - HANDLING AND STORAGE

PROCEDURE FOR HANDLING

- 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.
- DO NOT allow material to contact humans, exposed food or food utensils.
- Avoid contact with incompatible materials.
- When handling, DO NOT eat, drink or smoke.
- Keep containers securely sealed when not in use.

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- Avoid physical damage to containers.
- Always wash hands with soap and water after handling.
- Work clothes should be laundered separately. Launder contaminated clothing before re-use.
- 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 are maintained.

Empty containers may contain residual dust which has the potential to accumulate following settling. Such dusts may explode in the presence of an appropriate ignition source.

- Do NOT cut, drill, grind or weld such containers
- In addition ensure such activity is not performed near full, partially empty or empty containers without appropriate workplace safety authorisation or permit.

SUITABLE CONTAINER

■

- Lined metal can, lined metal pail/ can.
- Plastic pail.
- Polyliner drum.
- Packing as recommended by manufacturer.
- Check all containers are clearly labelled and free from leaks.

For low viscosity materials

- Drums and jerricans must be of the non-removable head type.
- Where a can is to be used as an inner package, the can must have a screwed enclosure.

For materials with a viscosity of at least 2680 cSt. (23 deg. C) and solids (between 15 C deg. and 40 deg C.):

- Removable head packaging;
- Cans with friction closures and
- low pressure tubes and cartridges

may be used.

-

Where combination packages are used, and the inner packages are of glass, there must be sufficient inert cushioning material in contact with inner and outer packages *.

-

In addition, where inner packagings are glass and contain liquids of packing group I and II there must be sufficient inert absorbent to absorb any spillage *.

-

* unless the outer packaging is a close fitting moulded plastic box and the substances are not incompatible with the plastic.

STORAGE INCOMPATIBILITY

■ Pyrethrins and permethrins:

- are unstable in the presence of light, heat, moisture and air
- are hydrolysed by oxygen and/ or sunlight
- may react with strong oxidisers to produce fire and explosions
- are incompatible with alkalis
- 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.

SAFE STORAGE WITH OTHER CLASSIFIED CHEMICALS

X	X	+	X	X	+

X: Must not be stored together
O: May be stored together with specific preventions
+: May be stored together

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE CONTROLS

The following materials had no OELs on our records

• cypermethrin:	CAS:52315-07-8 CAS:69865-47-0 CAS:86752-99-0 CAS:86753-92-6 CAS:88161-75-5 CAS:97955-44-7 CAS:137497-61-1 CAS:139203-31-9 CAS:142443-95-6 CAS:146909-55-9 CAS:186554-45-0 CAS:67375-30-8 CAS:65731-84-2 CAS:71697-59-1
• cypermethrin, alpha-:	CAS:67375-30-8
• cypermethrin, beta-:	CAS:65731-84-2
• cypermethrin, theta-:	CAS:71697-59-1
• cypermethrin, zeta-:	CAS:52315-07-8

MATERIAL DATA

CYPERMETHRIN:

■ For pyrethrum and its active components:

IDLH Level: 5000 mg/m3

Pyrethrum and/or its active components, the pyrethrins, cause dermatitis and sensitisation. Ingestion of massive doses can induce convulsions, vomiting and bradycardia. Animals exhibit liver damage and death through respiratory failure. The recommended TLV-TWA is equivalent to an occupational dose of 0.7 mg/kg/day and is thought to minimise the potential for systemic effects. The TLV may NOT prevent the development of hypersensitisation, particularly among those with pre-existing allergies to pollen and related agents.

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Synthetic pyrethrins (pyrethroids) often produce a range of toxic effects resembling pyrethrum; in the absence of a regulated exposure limit prudence dictates that the value for pyrethrum serves as a reference.
CEL TWA: 0.5 mg/m3 [ICI]
CYPERMETHRIN, ALPHA-:
■ For pyrethrum and its active components:
IDLH Level: 5000 mg/m3
Pyrethrum and/or its active components, the pyrethrins, cause dermatitis and sensitisation. Ingestion of massive doses can induce convulsions, vomiting and bradycardia. Animals exhibit liver damage and death through respiratory failure. The recommended TLV-TWA is equivalent to an occupational dose of 0.7 mg/kg/day and is thought to minimise the potential for systemic effects. The TLV may NOT prevent the development of hypersensitisation, particularly among those with pre-existing allergies to pollen and related agents.
Synthetic pyrethrins (pyrethroids) often produce a range of toxic effects resembling pyrethrum; in the absence of a regulated exposure limit prudence dictates that the value for pyrethrum serves as a reference.
CEL TWA: 0.5 mg/m3 [ICI]
CYPERMETHRIN, BETA-:
■ For pyrethrum and its active components:
IDLH Level: 5000 mg/m3
Pyrethrum and/or its active components, the pyrethrins, cause dermatitis and sensitisation. Ingestion of massive doses can induce convulsions, vomiting and bradycardia. Animals exhibit liver damage and death through respiratory failure. The recommended TLV-TWA is equivalent to an occupational dose of 0.7 mg/kg/day and is thought to minimise the potential for systemic effects. The TLV may NOT prevent the development of hypersensitisation, particularly among those with pre-existing allergies to pollen and related agents.
Synthetic pyrethrins (pyrethroids) often produce a range of toxic effects resembling pyrethrum; in the absence of a regulated exposure limit prudence dictates that the value for pyrethrum serves as a reference.
CEL TWA: 0.5 mg/m3
CYPERMETHRIN, THETA-:
■ For pyrethrum and its active components:
IDLH Level: 5000 mg/m3
Pyrethrum and/or its active components, the pyrethrins, cause dermatitis and sensitisation. Ingestion of massive doses can induce convulsions, vomiting and bradycardia. Animals exhibit liver damage and death through respiratory failure. The recommended TLV-TWA is equivalent to an occupational dose of 0.7 mg/kg/day and is thought to minimise the potential for systemic effects. The TLV may NOT prevent the development of hypersensitisation, particularly among those with pre-existing allergies to pollen and related agents.
Synthetic pyrethrins (pyrethroids) often produce a range of toxic effects resembling pyrethrum; in the absence of a regulated exposure limit prudence dictates that the value for pyrethrum serves as a reference.
CYPERMETHRIN, ZETA-:
■ For pyrethrum and its active components:
IDLH Level: 5000 mg/m3
Pyrethrum and/or its active components, the pyrethrins, cause dermatitis and sensitisation. Ingestion of massive doses can induce convulsions, vomiting and bradycardia. Animals exhibit liver damage and death through respiratory failure. The recommended TLV-TWA is equivalent to an occupational dose of 0.7 mg/kg/day and is thought to minimise the potential for systemic effects. The TLV may NOT prevent the development of hypersensitisation, particularly among those with pre-existing allergies to pollen and related agents.
Synthetic pyrethrins (pyrethroids) often produce a range of toxic effects resembling pyrethrum; in the absence of a regulated exposure limit prudence dictates that the value for pyrethrum serves as a reference.
CEL TWA: 0.5 mg/m3

PERSONAL PROTECTION

EYE

■
- Safety glasses with side shields.
- Chemical goggles.
- Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lens or restrictions on use, should be created for each workplace or task. This should include a review of lens absorption and adsorption for the class of chemicals in use and an account of injury experience. Medical and first-aid personnel should be trained in their removal and suitable equipment should be readily available. In the event of chemical exposure, begin eye irrigation immediately and remove contact lens as soon as practicable. Lens should be removed at the first signs of eye redness or irritation - lens should be removed in a clean environment only after workers have washed hands thoroughly. [CDC NIOSH Current Intelligence Bulletin 59]

HANDS/FEET

■
- Wear chemical protective gloves, eg. PVC.
- Wear safety footwear or safety gumboots, eg. Rubber

NOTE:
- The material may produce skin sensitisation in predisposed individuals. Care must be taken, when removing gloves and other protective equipment, to avoid all possible skin contact.
- Contaminated leather items, such as shoes, belts and watch-bands should be removed and destroyed.

Suitability and durability of glove type is dependent on usage. Factors such as:
- frequency and duration of contact,
- chemical resistance of glove material,
- glove thickness and
- dexterity,

are important in the selection of gloves.

OTHER

■
- Overalls.
- Eyewash unit.
- Barrier cream.
- Skin cleansing cream.

■
- Respirators may be necessary when engineering and administrative controls do not adequately prevent exposures.
- The decision to use respiratory protection should be based on professional judgment that takes into account toxicity information, exposure measurement data, and frequency and likelihood of the worker's exposure - ensure users are not subject to high thermal loads which may result in heat stress or distress due to personal protective equipment (powered, positive flow, full face apparatus may be an option).
- Published occupational exposure limits, where they exist, will assist in determining the adequacy of the selected respiratory . These may be government mandated or vendor recommended.
- Certified respirators will be useful for protecting workers from inhalation of particulates when properly selected and fit tested as part of a complete respiratory protection program.
- Use approved positive flow mask if significant quantities of dust becomes airborne.
- Try to avoid creating dust conditions.

RESPIRATOR

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■

Protection Factor	Half-Face Respirator	Full-Face Respirator	Powered Air Respirator
10 x ES	P1 Air-line*	- -	PAPR-P1 -
50 x ES	Air-line**	P2	PAPR-P2
100 x ES	-	P3	-
		Air-line*	-
100+ x ES	-	Air-line**	PAPR-P3

* - Negative pressure demand ** - Continuous flow.
The local concentration of material, quantity and conditions of use determine the type of personal protective equipment required.
For further information consult site specific CHEMWATCH data (if available), or your Occupational Health and Safety Advisor.

ENGINEERING CONTROLS

■

- Local exhaust ventilation is required where solids are handled as powders or crystals; even when particulates are relatively large, a certain proportion will be powdered by mutual friction.
- Exhaust ventilation should be designed to prevent accumulation and recirculation of particulates in the workplace.
- If in spite of local exhaust an adverse concentration of the substance in air could occur, respiratory protection should be considered. Such protection might consist of:

(a): particle dust respirators, if necessary, combined with an absorption cartridge;
(b): filter respirators with absorption cartridge or canister of the right type;
(c): fresh-air hoods or masks

- Build-up of electrostatic charge on the dust particle, may be prevented by bonding and grounding.
- Powder handling equipment such as dust collectors, dryers and mills may require additional protection measures such as explosion venting.

Air contaminants generated in the workplace possess varying "escape" velocities which, in turn, determine the "capture velocities" of fresh circulating air required to efficiently remove the contaminant.

Type of Contaminant:	Air Speed:
direct spray, spray painting in shallow booths, drum filling, conveyer loading, crusher dusts, gas discharge (active generation into zone of rapid air motion)	1-2.5 m/s (200-500 f/min.)
grinding, abrasive blasting, tumbling, high speed wheel generated dusts (released at high initial velocity into zone of very high rapid air motion).	2.5-10 m/s (500-2000 f/min.)

Within each range the appropriate value depends on:

Lower end of the range	Upper end of the range
1: Room air currents minimal or favourable to capture	1: Disturbing room air currents
2: Contaminants of low toxicity or of nuisance value only	2: Contaminants of high toxicity
3: Intermittent, low production.	3: High production, heavy use
4: Large hood or large air mass in motion	4: Small hood-local control only

Simple theory shows that air velocity falls rapidly with distance away from the opening of a simple extraction pipe. Velocity generally decreases with the square of distance from the extraction point (in simple cases). Therefore the air speed at the extraction point should be adjusted, accordingly, after reference to distance from the contaminating source. The air velocity at the extraction fan, for example, should be a minimum of 4-10 m/s (800-2000 f/min) for extraction of crusher dusts generated 2 metres distant from the extraction point. Other mechanical considerations, producing performance deficits within the extraction apparatus, make it essential that theoretical air velocities are multiplied by factors of 10 or more when extraction systems are installed or used.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE

Colourless, odourless crystalline solid; insoluble in water. Soluble in methanol, acetone, cyclohexanone and xylene. A racemic mixture of eight isomers; alpha-cypermethrin is a mixture of two of the four cis isomers present to approximately 25% in cypermethrin ie (1R,cis)S and (1S,cis)R which produce 90% of the insecticidal activity. Stable in acidic conditions but hydrolyses at pH 12-13.

PHYSICAL PROPERTIES

Solid.
Does not mix with water.
Sinks in water.

Molecular Weight: 416.3	Boiling Range (°C): 195-200	Melting Range (°C): 80.5
Specific Gravity (water=1): 1.28 @ 22 C.	Solubility in water (g/L): Immiscible	pH (as supplied): Not applicable
pH (1% solution): Not applicable	Vapour Pressure (kPa): Negligible	Volatile Component (%vol): Nil @ 38 C.
Evaporation Rate: Not applicable	Relative Vapour Density (air=1): Not applicable	Flash Point (°C): Not available
Lower Explosive Limit (%): Not available	Upper Explosive Limit (%): Not available	Autoignition Temp (°C): Not available
Decomposition Temp (°C): Not Available	State: Divided solid	Viscosity: Not Applicable

Material	Value
log Kow	4.47-6.3

Section 10 - CHEMICAL STABILITY

CONDITIONS CONTRIBUTING TO INSTABILITY

■

- Presence of incompatible materials.
- Product is considered stable.
- Hazardous polymerisation will not occur.

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

Section 11 - TOXICOLOGICAL INFORMATION

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS

SWALLOWED

■ Toxic effects may result from the accidental ingestion of the material; animal experiments indicate that ingestion of less than 40 gram may be fatal or may produce serious damage to the health of the individual.
Limited evidence exists that this substance may cause irreversible mutations (though not lethal) even following a single exposure.

Cypermethrin

sc-24012

Material Safety Data Sheet

Hazard Alert Code Key:	EXTREME	HIGH	MODERATE	LOW

Exposure to cypermethrin may produce convulsions, loss of consciousness and possible death. Short-term exposure to rats of alpha-cypermethrin at concentrations up to 200 mg/kg diet for 5 weeks or up to 180 mg/kg diet per day for 13 weeks did not cause toxic effects. At higher doses rats exhibited signs of intoxication associated with pathology of the nervous system, decreased growth or increased liver and kidney weights. Alpha-cypermethrin induces neurotoxicity due to histopathological alterations of the tibial and sciatic nerves, axonal degeneration and increased beta-galactosidase activity.
Short-term toxicity studies indicate that alpha-cypermethrin is approximately 2 to 3 times more toxic than cypermethrin in rats and dogs. Following oral administration to rats 90% of the dose was eliminated from the body over a 4-day period, 78% in the first day. residues in tissues were low except in fat tissue. In human volunteers 43% of an oral dose (0.25-0.75 mg) was excreted within 24 hours in the urine as free or conjugated cis-cyclopropane carboxylic acid.

EYE

■ If applied to the eyes, this material causes severe eye damage.

SKIN

■ This material can cause inflammation of the skin oncontact in some persons.
The material may accentuate any pre-existing dermatitis condition.
Occupational dermal exposure to cypermethrin in operators, during mixing/loading, during spraying and washing of equipment, was found to be up to 2.94 mg, 0.61 mg and 0.73 mg respectively. Mild skin sensations were reported during formulation. Single dermal applications of alpha-cypermethrin to mice and rats at 100 and 500 mg/kg body weight did not cause mortality or signs of intoxication.
Alpha-substituted synthetic pyrethroids can cause "pins and needles" of the skin with a stinging or burning sensation sometimes progressing to tingling and numbness. Tears, sensitivity to light and swelling of the eyes can occur on direct contact.
Open cuts, abraded or irritated skin should not be exposed to this material.
Entry into the blood-stream, through, for example, cuts, abrasions or lesions, may produce systemic injury with harmful effects. Examine the skin prior to the use of the material and ensure that any external damage is suitably protected.

INHALED

■ Inhalation of dusts, generated by the material, during the course of normalhandling, may be harmful.
The material can cause respiratory irritation in some persons. The body's response to such irritation can cause further lung damage.
Personal exposure levels during formulation of the technical concentrate of cypermethrin have been measured up to 54.1 mg/m3. A 4-hour inhalation exposure of rats to an atmospheric concentration of 400 mg/m3 did not result in mortality or clinical signs.
Persons with impaired respiratory function, airway diseases and conditions such as emphysema or chronic bronchitis, may incur further disability if excessive concentrations of particulate are inhaled.
If prior damage to the circulatory or nervous systems has occurred or if kidney damage has been sustained, proper screenings should be conducted on individuals who may be exposed to further risk if handling and use of the material result
in excessive exposures.
This material, like natural pyrethrins, may cause central stimulation with nausea, vomiting, stomach upset, diarrhoea, hypersensitivity, inco-ordination, tremors, muscle paralysis, convulsion, coma and respiratory failure. Type II compounds cause a "Type II syndrome" characterized by irregular jerky movements, increased saliva production without tears, upper abdominal pain, nausea and vomiting, headache, dizziness, loss of appetite, tiredness, chest tightness, blurred vision, "pins and needles", palpitations, coarse muscle jerks in limbs and altered consciousness. Convulsions can occur in severe cases with flexed arms, extended legs (spastic posture) and unconsciousness. Recovery may take weeks.

CHRONIC HEALTH EFFECTS

■ Long-term exposure to respiratory irritants may result in disease of the airways involving difficult breathing and related systemic problems.
Skin contact with the material is more likely to cause a sensitisation reaction in some persons compared to the general population.
There has been some concern that this material can cause cancer or mutations but there is not enough data to make an assessment.
Substance accumulation, in the human body, may occur and may cause some concern following repeated or long-term occupational exposure.
There is some evidence that inhaling this product is more likely to cause a sensitisation reaction in some persons compared to the general population.
There is some evidence from animal testing that exposure to this material may result in toxic effects to the unborn baby.
Based on laboratory and animal testing, exposure to the material may result in irreversible effects and mutations in humans.
Long-term testing does not indicate any carcinogenic potential for cypermethrin.
Chronic poisoning by natural pyrethrins may result in convulsion, paralysis with extreme muscle tone, rapid and uneven heart beat, liver and kidney damage, or death. Natural pyrethrins may cause hypersensitivity especially if past exposure has occurred. Generally it takes 2-3 years of repeated exposure for this to develop, and it usually follows exposure to pyrethrum rather than its individual components. The most common syndrome consists of skin inflammation with blisters, itchiness, local swelling, nose inflammation, increased heart rate, pallor and sweating. Skin effects can progress to swelling and cracking. Inflammation of the skin increases in hot weather or when sweating. Patients allergic to ragweed pollen are especially sensitive to pyrethrin.
Exposure to the material for prolonged periods may cause physical defects in the developing embryo (teratogenesis).

TOXICITY AND IRRITATION

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

TOXICITY	IRRITATION
Oral (Rat) LD50: 57 mg/kg	Skin (rabbit): non irritating*
Inhalation (Rat) LC50: 7889 mg/m³/4h	Eye (rabbit): mild*
Dermal (Rat) LD50: >1600 mg/kg *[EPA Report]	
Intraperitoneal (Rat) LD50: 404 mg/kg	
Oral (Mouse) LD50: 245.7 mg/kg	
Intraperitoneal (Mouse) LD50: 25 mg/kg	
Oral (Rabbit) LD50: 1500 mg/kg	
Dermal (Rabbit) LD50: >2400 mg/kg	
Oral (Guinea pig) LD50: 500 mg/kg	
Intraperitoneal (Rat) LD50: 43 mg/kg	
Dermal (Rabbit) LD50: 2460 mg/kg	
Oral (Rat) LD50: 86 mg/kg	

■ 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.
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.

For cypermethrin:

Toxicological Effects:

Acute toxicity: Cypermethrin is a moderately toxic material by dermal absorption or ingestion . Symptoms of high dermal exposure include numbness, tingling, itching, burning sensation, loss of bladder control, incoordination, seizures, and possible death . Pyrethroids like cypermethrin may adversely affect the central nervous system . Symptoms of high-dose ingestion include nausea, prolonged vomiting, stomach pains, and diarrhea which progresses to convulsions, unconsciousness, and coma. Cypermethrin is a slight skin or eye irritant, and may cause allergic skin reactions . The oral LD50 for cypermethrin in rats is 250 mg/kg (in corn oil) or 4123 mg/kg (in water) . EPA reports an oral LD50 of 187 to 326 mg/kg in male rats and 150 to 500 mg/kg in female rats . The oral LD50 varies from 367 to 2000 mg/kg in female rats, and from 82 to 779 mg/kg in mice, depending on the ratio of cis/trans- isomers present . This wide variation in toxicity may reflect different mixtures of isomers in the materials tested. The dermal LD50 in rats is 1600 mg/kg and in rabbits is greater than 2000 mg/kg .
Reproductive effects: No adverse effects on reproduction were observed in a three-generation study with rats given doses of 37.5 mg/kg/day, the highest dose tested .

Hazard Alert Code Key:	EXTREME	HIGH	MODERATE	LOW

Teratogenic effects: Cypermethrin is not teratogenic No birth defects were observed in the offspring of rats given doses as high as 70 mg/kg/day nor in the offspring of rabbits given doses as high as 30 mg/kg/day
Mutagenic effects: Cypermethrin is not mutagenic, but tests with very high doses on mice caused a temporary increase in the number of bone marrow cells with micronuclei. Other tests for mutagenic effects in human, bacterial, and hamster cell cultures and in live mice have been negative .
Carcinogenic effects: EPA has classified cypermethrin as a possible human carcinogen because available information is inconclusive. It caused benign lung tumors in female mice at the highest dose tested (229 mg/kg/day); however, no tumours occurred in rats given high doses of up to 75 mg/kg/day .
Organ toxicity: Pyrethroids like cypermethrin may cause adverse effects on the central nervous system. Rats fed high doses (37.5 mg/kg) of the cis-isomer of cypermethrin for five weeks exhibited severe motor incoordination, while 20 to 30% of rats fed 85 mg/kg died 4 to 17 days after treatment began. Long-term feeding studies have shown increased liver and kidney weights and adverse changes in liver tissues in test animals.. Pathological changes in the cortex of the thymus, liver, adrenal glands, lungs, and skin were observed in rabbits repeatedly fed high doses of cypermethrin .
Fate in humans and animals: In humans, urinary excretion of cypermethrin metabolites was complete 48 hours after the last of five doses of 1.5 mg/kg/day . Studies in rats have shown that cypermethrin is rapidly metabolized by hydroxylation and cleavage, with over 99% being eliminated within hours. The remaining 1% becomes stored in body fat. This portion is eliminated slowly, with a half-life of 18 days for the cis-isomer and 3.4 days for the trans-isomer.
Exposure to the material for prolonged periods may cause physical defects in the developing embryo (teratogenesis).
NOTE: Substance has been shown to be mutagenic in at least one assay, or belongs to a family of chemicals producing damage or change to cellular DNA.
ADI: 0.05 mg/kg/day
NOEL: 4.7 mg/kg/day
Somnolence, convulsions, tremor, spasticity, muscle weakness, respiratory obstruction, lachrymation, normocytic anaemia, leukopenia, ataxia, microcytosis without anaemia, changes in erythrocyte/ leucocyte (WBC), allergic disease in cellular and humoral immune response, proteinuria, hypoglycaemia, cutaneous sensitisation, delayed hypersensitivity, tumours, effects on newborn, effects on embryo/ foetus, paternal effects, specific developmental abnormalities (urogenital system, blood and lymphatic systems, immune and reticuloendothelial system) recorded.
Tumourigenic/ neoplastic by RTECS criteria (facilitates the action of a know carcinogen)

CYPERMETHRIN, ALPHA-:

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

TOXICITY	IRRITATION
Oral (Rat) LD50: 79 mg/kg	Nil Reported
Inhalation (Rat) LC50: 1900 mg/m³/4h	
Dermal (Rat) LD50: 500 mg/kg	
Dermal (Rabbit) LD50: 2000 mg/kg	

■ 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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Fate in humans and animals: In humans, urinary excretion of cypermethrin metabolites was complete 48 hours after the last of five doses of 1.5 mg/kg/day . Studies in rats have shown that cypermethrin is rapidly metabolized by hydroxylation and cleavage, with over 99% being eliminated within hours. The remaining 1% becomes stored in body fat. This portion is eliminated slowly, with a half-life of 18 days for the cis-isomer and 3.4 days for the trans-isomer.

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ADI: 0.05 mg/kg/day

NOEL: 5 mg/kg/day

CARCINOGEN

Non-arsenical insecticides (occupational exposures in spraying and application of)	International Agency for Research on Cancer (IARC) - Agents Reviewed by the IARC Monographs	Group 2A

Section 12 - ECOLOGICAL INFORMATION

Refer to data for ingredients, which follows:
CYPERMETHRIN:
CYPERMETHRIN, ZETA-:
CYPERMETHRIN, THETA-:

Hazard Alert Code Key:	EXTREME	HIGH	MODERATE	LOW

CYPERMETHRIN, BETA-:
CYPERMETHRIN, ALPHA-:
■ Very toxic to aquatic organisms.
CYPERMETHRIN:
CYPERMETHRIN, ZETA-:
CYPERMETHRIN, THETA-:
CYPERMETHRIN, BETA-:
CYPERMETHRIN, ALPHA-:
■ 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.
CYPERMETHRIN:
CYPERMETHRIN, ZETA-:
CYPERMETHRIN, THETA-:
CYPERMETHRIN, BETA-:
CYPERMETHRIN, ALPHA-:
■ For cypermethrin:
Environmental Fate
Cypermethrin has a moderate persistence in soils. Under laboratory conditions, it degrades more rapidly on sandy clay and sandy loam soils than on clay soils, and more rapidly in soils low in organic matter.
Cypermethrin rapidly degrades in sunlight with a half-life of 8-16 days.
Cypermethrin is not soluble in water and has a strong tendency to adsorb to soil particles. It is therefore unlikely to cause groundwater contamination.
Air: Cypermethrin has a very low vapor pressure and is not readily volatilized into the atmosphere. A low Henry's Law Constant (H) , 2.5 x10-7 atm-m3/mol at 200 C, indicates that cypermethrin has almost no tendency to volatilise from an aqueous solution. Experimental results indicate that there is practically no movement of cypermethrin from contaminated soils to the surrounding air unless bound to air-borne particulates. Aside from drift that may occur with spray applications, cypermethrin is not expected to be found in air.
Soil: Cypermethrin occurs as a mixture of both the cis and trans isomers. The cis/trans ratio in technical grade cypermethrin is 1:1 . The cis isomers are more active than trans by a factor of two. No significant difference was observed between the photodegradation rates of the two isomers in soil, although the trans-isomer was hydrolysed 1.2-1.7 times faster . Hydrolysis and photolysis play major roles in the degradation of cypermethrin in soil. Hydrolysis of the esther linkage is the principal degradation route and leads to the formation of 3-phenoxybenzoic acid (PBA) and cyclopropanecarboxylic acid derivatives principally, 3-(2,2-dichlorovinyl)-2,2-dimethyl cyclopropanecarboxylic acid (DCVA) . Cypermethrin also photodegrades rapidly on soil surfaces to many byproducts, with half-lives of 8-16 days . Many photoreactions are involved in photodegradation and the photodegradation rates are closely correlated with the organic matter content of the soil . As with hydrolysis, the principal photoproducts of cypermethrin are PBA and DCVA with >15% recovery of each after 32 days of irradiation . Under aerobic conditions, these metabolites may undergo further breakdown to CO2 at a much slower rate. The persistence of the metabolites is unknown.
Cypermethrin displays low water solubility, hence is hydrophobic. Cypermethrin is a non-polar pesticide and readily adsorbed onto the soil surface and bound there. Very little cypermethrin insecticide would move through the soil profile, although all of the degradation products are more mobile than the parent product. The degradates PBA and DCVA are organic acids which are often mobile in soil. The carbon content of the soil greatly affects the amount of chemical that is adsorbed. Cypermethrin was found to have an average Koc of 6.1 x 104 cm3/g for five different soil types indicating that cypermethrin is immobile in soil. The major metabolites, on the other hand, are very polar, and move readily through the soil. These organic acids varied in their mobility from intermediate (in silty clay or loamy sand) to mobile (in silty clay loam) . For PBA and DCVA, a low pH suppressed ionization, thus increasing adsorption and decreasing mobility in more acidic soils. Therefore, these metabolites would be fairly mobile in neutral to alkaline soils
Microbes play a significant role in the degradation of cypermethrin. Cypermethrin degrades more slowly under anaerobic and waterlogged conditions. The anaerobic half-life reported at <14 days is similar to the half-life in aerobic soils ranging from 6-20 days but the major metabolite, PBA, does not continue to break down anaerobically . The chemical also degrades more slowly in sterilized versus natural soils which illustrates the importance of microorganisms (Chapman et al., 1981). In sterile aerobic soils, the half-life was 20 to 25 weeks .
Cypermethrin is relatively non-persistent in soils with the typical half-life in sandy soils of 2-4 weeks. Increased cypermethrin persistence was observed in soil with high organic matter, high clay content, reduced microbial activity and anaerobic conditions.
Water: The water solubility of cypermethrin is very low, 4 ppb at 200 C. Cypermethrin is extremely hydrophobic and will quickly move from an aqueous solution to suspended particulates . Thus, relatively small amounts of suspended matter in natural bodies of water may remove a significant amount of cypermethrin from the aqueous phase. Soils and sediment are the main environmental reservoirs for cypermethrin.
Cypermethrin hydrolyses slowly in water at pH 7 and below, with hydrolysis being more rapid at pH 9. Under normal environmental temperatures and pH, cypermethrin is stable to hydrolysis with a half-life of >50 days. It is also stable to photolysis with a half-life of >100 days. In sterile solution in sunlight, cypermethrin photodegrades slowly, with <10% lost in 32 days . In darkness, cypermethrin was fairly stable with 88.7 and 95.6% recovery after 10 days in river water and distilled water, respectively . Rapid degradation occurred with a half-life of about 5 days in river water, which is three to four times faster than degradation in distilled water. This suggests indirect photolysis involving naturally occurring substances that result in enhanced photodegradation.
When photodegradation of cypermethrin occurs, the major photoproducts produced are DCVA and PBA, with the a small amount of 3-phenoxybenzaldehyde as a minor photoproduct.
The partition coefficient of cypermethrin is very high (Kow=3.98 x106), consequently it binds strongly onto organic matter .Because of its strong affinity for soil, cypermethrin may be carried away to nearby water bodies in suspended sediment by rain and irrigation. Yet, once the pesticide is adsorbed to soil particles, bioavailability is reduced, diminishing the toxicological risk to aquatic animals . In pond experiments, fish have survived in pond water that contained apparently lethal concentrations of cypermethrin (5 ppb) because the chemical was sorbed onto suspended solids
Ecotoxicity:
Bird LD50: mallard duck >4640 mg/kg
Bird LC50 (dietary): mallard duck, bobwhite quail >20000 ppm
Fish LC50 996 h): rainbow trout 0.0018 mg/l
Daphnia magna LC50: 0.0002 mg/l
Cypermethrin is practically non-toxic to birds, but is very highly toxic to fish and aquatic invertebrates. This is mainly because it is metabolised and eliminated significantly more slowly by fish than by mammals or birds
Cypermethrin has been shown to inhibit ATPase enzymes involved in movement of ions against a concentration gradient which are regulated by active transport. This action is especially critical to fish and aquatic insects where ATPase enzymes provide the energy necessary to active transport, and are very important at sites of oxygen exchange. ATPase inhibition and disruption of active transport, possibly affect ion movement and the ability to maintain ion balance, and disrupt respiratory surfaces, indicating that cypermethrin is inherently more toxic to aquatic organisms.
In vertebrates and invertebrates, cypermethrin acts mainly on the nervous system. Cypermethrin is both a stomach poison and a contact insecticide. In the peripheral nervous system of the frog, its primary action is to induce noticeably repetitive activity and produce trains of nerve impulses as a result of altering ion permeability of nerve membranes . These long-lasting trains can cause hundreds to thousands of repetitive nerve impulses in the sense organs. This repetitive activity is induced by pyrethroid damage to the voltage-dependent sodium channel, causing sodium channels to stay open much longer than normal.
Cypermethrin is highly toxic to bees.
CYPERMETHRIN:
CYPERMETHRIN, ZETA-:
CYPERMETHRIN, THETA-:
CYPERMETHRIN, BETA-:
CYPERMETHRIN, ALPHA-:
■ 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
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	Residual monomers	Formaldehyde

Hazard Alert Code Key:	EXTREME	HIGH	MODERATE	LOW

Certain cleaning products, polishes, waxes, air fresheners	Limonene, alpha-pinene, terpinolene, alpha-terpineol, linalool, linalyl acetate and other terpenoids, longifolene and other sesquiterpenes	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	Styrene	Formaldehyde, benzaldehyde
Environmental tobacco smoke	Styrene, acrolein, nicotine	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
Perfumes, colognes, essential oils (e.g. lavender, eucalyptus, tea tree)	Limonene, alpha-pinene, linalool, linalyl acetate, terpinene-4-ol, gamma-terpinene	Formaldehyde, 4-AMC, acetone, 4-hydroxy-4-methyl-5-hexen-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 Helath Perspectives, Vol 114, October 2006.
CYPERMETHRIN:
CYPERMETHRIN, ZETA-:
CYPERMETHRIN, THETA-:
CYPERMETHRIN, BETA-:
CYPERMETHRIN, ALPHA-:
■ DO NOT discharge into sewer or waterways.
CYPERMETHRIN:
CYPERMETHRIN, ZETA-:
CYPERMETHRIN, ALPHA-:
■ The material is classified as an ecotoxin* because the Fish LC50 (96 hours) is less than or equal to 0.1 mg/l
* Classification of Substances as Ecotoxic (Dangerous to the Environment)
Appendix 8, Table 1
Compiler's Guide for the Preparation of International Chemical Safety Cards: 1993 Commission of the European Communities.
CYPERMETHRIN:
/53#R57
CYPERMETHRIN, ALPHA-:

■ log Pow (Verschueren 1983):	4.47

/53
log Kow: 4.47-6.3
CYPERMETHRIN, BETA-:
CYPERMETHRIN, THETA-:
CYPERMETHRIN, ZETA-:

Ecotoxicity

Ingredient	Persistence: Water/Soil	Persistence: Air	Bioaccumulation	Mobility
cypermethrin	HIGH	No data	MED	LOW
cypermethrin, alpha-	HIGH	No data	MED	LOW
cypermethrin, beta-		No data		
cypermethrin, theta-		No data		
cypermethrin, zeta-	HIGH	No data	MED	LOW

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. 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.
- Consult manufacturer for recycling options or consult local or regional waste management authority for disposal if no suitable treatment or disposal facility can be identified.
- Dispose of by: Burial in a licenced land-fill or Incineration in a licenced apparatus (after admixture with suitable combustible material)
- Decontaminate empty containers. Observe all label safeguards until containers are cleaned and destroyed.

Section 14 - TRANSPORTATION INFORMATION

Hazard Alert Code Key:	EXTREME	HIGH	MODERATE	LOW

Labels Required: TOXIC
HAZCHEM: None (ADG6)
Land Transport UNDG:

Class or division:	6.1	Subsidiary risk:	None
UN No.:	3349	UN packing group:	I

Shipping Name:PYRETHROID PESTICIDE, SOLID, TOXIC (contains cypermethrin)

Air Transport IATA:

ICAO/IATA Class:	6.1	ICAO/IATA Subrisk:	None
UN/ID Number:	3349	Packing Group:	I
Special provisions:	A3		

Shipping Name: PYRETHROID PESTICIDE, SOLID, TOXIC *(CONTAINS CYPERMETHRIN)

Maritime Transport IMDG:

IMDG Class:	6.1	IMDG Subrisk:	None
UN Number:	3349	Packing Group:	I
EMS Number:	F-A,S-A	Special provisions:	61 274
Limited Quantities:	None		

Shipping Name: PYRETHROID PESTICIDE, SOLID, TOXIC(contains cypermethrin)

Section 15 - REGULATORY INFORMATION

POISONS SCHEDULE
S7

REGULATIONS
cypermethrin (CAS: 52315-07-8,69865-47-0,86752-99-0,86753-92-6,88161-75-5,97955-44-7,137497-61-1,139203-31-9,142443-95-6,146909-55-9,186554-45-0,67375-30-8,65731-84-2,71697-59-1) is found on the following regulatory lists;
"Australia Hazardous Substances","Australia Inventory of Chemical Substances (AICS)","Australia New Zealand Food Standards Code - Maximum Residue Limits (Australia only) - Schedule 3 - Chemical Groups","Australia Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP) - Schedule 6","Australia Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP) - Schedule 7","OSPAR Substances removed from the List of Substances of Possible Concern","WHO Guidelines for Drinking-water Quality - Chemicals excluded from guideline value derivation"
Regulations for ingredients
cypermethrin, alpha- (CAS: 67375-30-8) is found on the following regulatory lists;
"Australia Hazardous Substances","Australia Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP) - Schedule 5","Australia Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP) - Schedule 6","Australia Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP) - Schedule 7","OSPAR Substances removed from the List of Substances of Possible Concern"
cypermethrin, beta- (CAS: 65731-84-2) is found on the following regulatory lists;
"Australia Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP) - Schedule 6"
cypermethrin, theta- (CAS: 71697-59-1) is found on the following regulatory lists;
"Australia Hazardous Substances","Australia New Zealand Food Standards Code - Maximum Residue Limits (Australia only) - Schedule 3 - Chemical Groups","Australia Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP) - Schedule 2","Australia Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP) - Schedule 5"
cypermethrin, zeta- (CAS: 52315-07-8) is found on the following regulatory lists;
"Australia Hazardous Substances","Australia Inventory of Chemical Substances (AICS)","Australia New Zealand Food Standards Code - Maximum Residue Limits (Australia only) - Schedule 3 - Chemical Groups","Australia Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP) - Schedule 6","Australia Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP) - Schedule 7","OSPAR Substances removed from the List of Substances of Possible Concern","WHO Guidelines for Drinking-water Quality - Chemicals excluded from guideline value derivation"

Section 16 - OTHER INFORMATION

Ingredients with multiple CAS Nos

Ingredient Name	CAS
cypermethrin	52315-07-8, 69865-47-0, 86752-99-0, 86753-92-6, 88161-75-5, 97955-44-7, 137497-61-1, 139203-31-9, 142443-95-6, 146909-55-9, 186554-45-0, 67375-30-8, 65731-84-2, 71697-59-1

■ Classification of the preparation and its individual components has drawn on official and authoritative sources as well as independent review by the Chemwatch Classification committee using available literature references.
A list of reference resources used to assist the committee may be found at:
www.chemwatch.net/references.

■ The (M)SDS is a Hazard Communication tool and should be used to assist in the Risk Assessment. Many factors determine whether the reported Hazards are Risks in the workplace or other settings. Risks may be determined by reference to Exposures Scenarios. Scale of use, frequency of use and current or available engineering controls must be considered.

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