

Resmethrin

sc-202312

Material Safety Data Sheet



The Power is Question

Hazard Alert Code
Key:

EXTREME

HIGH

MODERATE

LOW

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME

Resmethrin

STATEMENT OF HAZARDOUS NATURE

CONSIDERED A HAZARDOUS SUBSTANCE ACCORDING TO OSHA 29 CFR 1910.1200.

NFPA



SUPPLIER

Company: Santa Cruz Biotechnology, Inc.

Address:

2145 Delaware Ave

Santa Cruz, CA 95060

Telephone: 800.457.3801 or 831.457.3800

Emergency Tel: CHEMWATCH: From within the US and
Canada: 877-715-9305

Emergency Tel: From outside the US and Canada: +800 2436
2255 (1-800-CHEMCALL) or call +613 9573 3112

PRODUCT USE

Resmethrin is used mainly for the control of household and public health insects. Formulations are generally in the form of emulsifiable concentrates. may also be prepared with synergists.

SYNONYMS

C22-H26-O3, "cyclopropanecarboxylic acid, 2, 2-dimethyl-3-(2-methylpropenyl)-", "cyclopropanecarboxylic acid, 2, 2-dimethyl-3-(2-methylpropenyl)-", (5-benzyl-3-furyl)methylester, (5-benzyl-3-furyl)methylester, 5-benzyl-3-furylmethyl(+/-)cis-trans-chrysanthemate, 5-benzyl-3-furylmethyl(+/-)cis-trans-chrysanthemate, "(5-benzyl-3-furyl)methyl-2, 2-dimethyl-3-(2-methylpropenyl)-", "(5-benzyl-3-furyl)methyl-2, 2-dimethyl-3-(2-methylpropenyl)-", cyclopropanecarboxylate, "dimethyl 3-(2-methyl-1-propenyl)cyclopropanecarboxylate", "dimethyl 3-(2-methyl-1-propenyl)cyclopropanecarboxylate", Chryson, Chryson, ENT-27474, FMC-17370, For-Syn, Nia-17370, NRDC-104, NSC-195022, OMS-1206, Premgard, Pynosect, Pyretherm, SBP-1382, "S.B. Penick 1382", Synthrin, pyrethroid/pyrethrum/pyrethrin

Section 2 - HAZARDS IDENTIFICATION

CANADIAN WHMIS SYMBOLS



EMERGENCY OVERVIEW

RISK

Harmful by inhalation, in contact with skin and if swallowed.

Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS

SWALLOWED

- Accidental ingestion of the material may be harmful; animal experiments indicate that ingestion of less than 150 gram may be fatal or may produce serious damage to the health of the individual.
- Rats fed resmethrin in the diet at levels up to 6000 mg/kg for 14 days showed tremor and reduced body weight at levels of 1500 mg/kg and mortalities at the highest levels. The maximum no-observed-adverse-effect dietary level was 188 mg/kg.

EYE

- Although the material is not thought to be an irritant, direct contact with the eye may cause transient discomfort characterized by tearing or conjunctival redness (as with windburn). Slight abrasive damage may also result. The material may produce foreign body irritation in certain individuals.

SKIN

- Skin contact with the material may be harmful; systemic effects may result following absorption.
- The material is not thought to be a skin irritant (as classified using animal models). Abrasive damage however, may result from prolonged exposures. Good hygiene practice requires that exposure be kept to a minimum and that suitable gloves be used in an occupational setting.
- 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.
- No significant resmethrin-related dermal effects were observed when applied twice weekly for 3 weeks (0.247 mg/cm²) to the skin of rabbits.

INHALED

- Inhalation of vapors, aerosols (mists, fumes) or dusts, generated by the material during the course of normal handling, may be harmful.
- The material is not thought to produce respiratory irritation (as classified using animal models). Nevertheless inhalation of dusts, or fume, especially for prolonged periods, may produce respiratory discomfort and occasionally, distress.
- 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.
- Rats and rabbits inhaling aerosolised resmethrin for 5 h/day on 5 consecutive days at levels of 2.9-3.2 mg active ingredient/litre air showed rapid breathing and nasal discharge. There were no compound-related effects on body-weight and histopathological findings.
- This material, like natural pyrethrins, may cause central stimulation with nausea, vomiting, stomach upset, diarrhea, hypersensitivity, inco-ordination, tremors, muscle paralysis, convulsion, coma and respiratory failure. There may be aggressive behavior, tremor and weakness. Synthetic pyrethrins, unlike natural species, rarely cause allergic responses in humans. The above symptoms are sometimes collectively called "Type I Syndrome".

CHRONIC HEALTH EFFECTS

- Limited evidence suggests that repeated or long-term occupational exposure may produce cumulative health effects involving organs or biochemical systems.

There is some evidence that inhaling this product is more likely to cause a sensitization reaction in some persons compared to the general population.

There is limited evidence that, skin contact with this product is more likely to cause a sensitization reaction in some persons compared to the general population.

Long term exposure to high dust concentrations may cause changes in lung function i.e. pneumoconiosis; caused by particles less than 0.5 micron penetrating and remaining in the lung. Prime symptom is breathlessness; lung shadows show on X-ray.

Chronic poisoning by natural pyrethrins may result in convulsion, tetanic paralysis, rapid and uneven heart beat, liver and kidney damage, or death.

The natural pyrethrins may produce hypersensitivity, especially following previous sensitising exposure. In general, repeated exposures over 2 or 3 years are required to elicit a response and involve exposure to pyrethrum rather than its individual components (including pyrethrins). The sesquiterpene lactone (pyrethrosin) and the pyrethrum glycoproteins account for the immediate and delayed hypersensitivity seen in guinea pigs following a single injection of ground chrysanthemum in Freud's adjuvant. Mild erythematic vesicular dermatitis (with papules), pruritus, localized oedema (particularly of the face, lips and eyelids), rhinitis, tachycardia, pallor and sweating are the most common syndromes. An initial skin sensitisation can progress to marked dermal oedema and skin cracking. Pyrethrum dermatitis appears to increase in hot weather or under conditions where heavy perspiration is produced. The active ingredients of pyrethrum (except pyrethrin II) are inactive in patch tests. Those patients allergic to ragweed pollen are particularly sensitive to pyrethrin.

Rats fed on a diet of pyrethrins for 5000 ppm for 2 years showed some signs of tissue damage including liver lesions, bile duct proliferation and focal necrosis of the liver cells. A no-effect level of 1000 ppm found in animal experiments correspond to a daily dose of 3600 mg/man.

Resmethrin fed to rats at levels up to 5000 mg/kg over 112 weeks was determined not to be oncogenic. The no-observed-adverse-effect-level of 500 mg/kg for toxic effects was considered to be the lowest effect level for hypertrophy of hepatocytes which was not considered a definite toxic.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

HAZARD RATINGS

	Min	Max	
Flammability:	1		
Toxicity:	2		
Body Contact:	2		
Reactivity:	1		
Chronic:	2		

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



NAME	CAS RN	%
resmethrin	10453-86-8	>98
contains		
bioresmethrin	28434-01-7	

Section 4 - FIRST AID MEASURES

SWALLOWED

-
- IF SWALLOWED, REFER FOR MEDICAL ATTENTION, WHERE POSSIBLE, WITHOUT DELAY.
- Where Medical attention is not immediately available or where the patient is more than 15 minutes from a hospital or unless instructed otherwise:
 - For advice, contact a Poisons Information Center or a doctor.
 - Urgent hospital treatment is likely to be needed.
 - If conscious, give water to drink.
 - INDUCE vomiting with fingers down the back of the throat, ONLY IF CONSCIOUS. Lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration.

NOTE: Wear a protective glove when inducing vomiting by mechanical means.

- 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.

EYE

- 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.
 - If pain persists or recurs seek medical attention.
 - 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.

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 sensitizing 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

Vapor Pressure (mmHg):	11.251 x 10 ⁻⁷ -30C
Upper Explosive Limit (%):	Not applicable.
Specific Gravity (water=1):	1.050 @ 20 C
Lower Explosive Limit (%):	Not applicable.

EXTINGUISHING MEDIA

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

FIRE FIGHTING

-
- Alert Emergency Responders and tell them location and nature of hazard.
- Wear breathing apparatus plus protective gloves for fire only.
- 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.

GENERAL FIRE HAZARDS/HAZARDOUS COMBUSTIBLE PRODUCTS

- Solid which exhibits difficult combustion or is difficult to ignite.
- 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 may burn rapidly and fiercely if ignited.
- 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.

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

FIRE INCOMPATIBILITY

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

PERSONAL PROTECTION

Glasses:

Chemical goggles.

Gloves:

Respirator:

Type A-P Filter of sufficient capacity

Section 6 - ACCIDENTAL RELEASE MEASURES

MINOR SPILLS

- 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.

Environmental hazard - contain spillage.

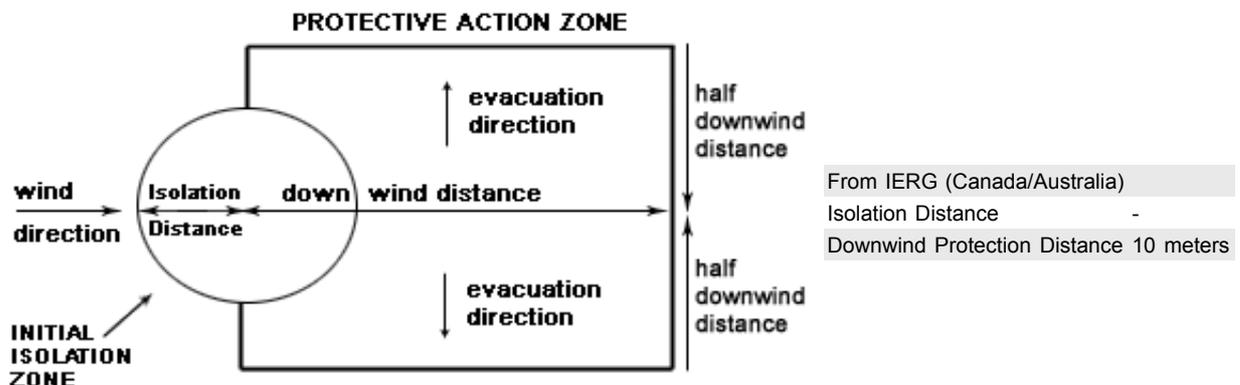
MAJOR SPILLS

- Environmental hazard - contain spillage.

Moderate hazard.

- CAUTION: Advise personnel in area.
- Alert Emergency Responders and tell them location and nature of hazard.
- Control personal contact by wearing protective clothing.
- Prevent, by any means available, spillage from entering drains or water courses.
- Recover product wherever possible.
- IF DRY: Use dry clean up procedures and avoid generating dust. Collect residues and place in sealed plastic bags or other containers for disposal. IF WET: Vacuum/shovel up and place in labelled containers for disposal.
- ALWAYS: Wash area down with large amounts of water and prevent runoff into drains.
- If contamination of drains or waterways occurs, advise emergency services.

PROTECTIVE ACTIONS FOR SPILL



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.

ACUTE EXPOSURE GUIDELINE LEVELS (AEGL) (in ppm)

AEGL 1: The airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

AEGL 2: The airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.

AEGL 3: The airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.

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.
- 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.

RECOMMENDED STORAGE METHODS

-
- Polyethylene or polypropylene container.
- Check all containers are clearly labelled and free from leaks.

STORAGE REQUIREMENTS

- Observe manufacturer's storing and handling recommendations.

SAFE STORAGE WITH OTHER CLASSIFIED CHEMICALS



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

Source	Material	TWA ppm	TWA mg/m ³	STEL ppm	STEL mg/m ³	Peak ppm	Peak mg/m ³	TWA F/CC	Notes
Canada - Alberta Occupational Exposure Limits	resmethrin (Turpentine and selected monoterpenes)	20	111						
US - Oregon Permissible Exposure Limits (Z3)	resmethrin (Inert or Nuisance Dust: (d) Total dust)		10						*
US OSHA Permissible Exposure Levels (PELs) - Table Z3	resmethrin (Inert or Nuisance Dust: (d) Respirable fraction)		5						

US OSHA Permissible Exposure Levels (PELs) - Table Z3	resmethrin (Inert or Nuisance Dust: (d) Total dust)	15	
US - Hawaii Air Contaminant Limits	resmethrin (Particulates not otherwise regulated - Total dust)	10	
US - Hawaii Air Contaminant Limits	resmethrin (Particulates not otherwise regulated - Respirable fraction)	5	
US - Oregon Permissible Exposure Limits (Z3)	resmethrin (Inert or Nuisance Dust: (d) Respirable fraction)	5	*
US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants	resmethrin (Particulates not otherwise regulated Respirable fraction)	5	
US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants	resmethrin (Particulates not otherwise regulated (PNOR)(f)-Respirable fraction)	5	
US - Michigan Exposure Limits for Air Contaminants	resmethrin (Particulates not otherwise regulated, Respirable dust)	5	
Canada - Alberta Occupational Exposure Limits	bioresmethrin (Turpentine and selected monoterpenes)	20	111
Canada - Alberta Occupational Exposure Limits	cisresmethrin (Turpentine and selected monoterpenes)	20	111
US - Oregon Permissible Exposure Limits (Z3)	(-)-trans-resmethrin (Inert or Nuisance Dust: (d) Total dust)	10	*
US OSHA Permissible Exposure Levels (PELs) - Table Z3	(-)-trans-resmethrin (Inert or Nuisance Dust: (d) Respirable fraction)	5	
US OSHA Permissible Exposure Levels (PELs) - Table Z3	(-)-trans-resmethrin (Inert or Nuisance Dust: (d) Total dust)	15	
US - Hawaii Air Contaminant Limits	(-)-trans-resmethrin (Particulates not otherwise regulated - Total dust)	10	
US - Hawaii Air Contaminant Limits	(-)-trans-resmethrin (Particulates not otherwise regulated - Respirable fraction)	5	
US - Oregon Permissible Exposure Limits (Z3)	(-)-trans-resmethrin (Inert or Nuisance Dust: (d) Respirable fraction)	5	*
US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants	(-)-trans-resmethrin (Particulates not otherwise regulated Respirable fraction)	5	
US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants	(-)-trans-resmethrin (Particulates not otherwise regulated (PNOR)(f)- Respirable fraction)	5	
US - Michigan Exposure Limits for Air Contaminants	(-)-trans-resmethrin (Particulates not otherwise regulated, Respirable dust)	5	

MATERIAL DATA

(-)-TRANS-RESMETHRIN:

BIORESMETHRIN:

CISRESMETHRIN:

RESMETHRIN:

■ 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.

RESMETHRIN:

An acceptable daily intake (ADI) was established by the US EPA at 0.125 mg/kg per day. Food additive tolerance has been established by the US EPA permitting resmethrin residues up to 3 ppm, in or on food commodities.

BIORESMETHRIN:

An acceptable daily intake (ADI) was established by the US EPA at 0.125 mg/kg per day. Food additive tolerance has been established by the US EPA permitting resmethrin residues up to 3 ppm, in or on food commodities.

(-)-TRANS-RESMETHRIN:

An acceptable daily intake (ADI) was established by the US EPA at 0.125 mg/kg per day. Food additive tolerance has been established by the US EPA permitting resmethrin residues up to 3 ppm, in or on food commodities.

PERSONAL PROTECTION



Consult your EHS staff for recommendations

Eye

- Safety glasses with side shields.
- Chemical goggles.
- Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them. DO NOT wear contact lenses.

Hands/Feet

Wear chemical protective gloves, eg. PVC.

Wear safety footwear or safety gumboots, eg. Rubber.

NOTE: The material may produce skin sensitization in predisposed individuals. Care must be taken, when removing gloves and other protective equipment, to avoid all possible skin contact.

Suitability and durability of glove type is dependent on usage. Important factors in the selection of gloves include: such as:

- frequency and duration of contact,
- chemical resistance of glove material,
- glove thickness and
- dexterity

Select gloves tested to a relevant standard (e.g. Europe EN 374, US F739).

- When prolonged or frequently repeated contact may occur, a glove with a protection class of 5 or higher (breakthrough time greater than 240 minutes according to EN 374) is recommended.
- When only brief contact is expected, a glove with a protection class of 3 or higher (breakthrough time greater than 60 minutes according to EN 374) is recommended.
- Contaminated gloves should be replaced.

Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturiser is recommended.

Other

- Overalls.
- P.V.C. apron.
- Barrier cream.
- Skin cleansing cream.
- Eye wash unit.
- 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

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 ppm (volume)	Maximum Protection Factor	Half-face Respirator	Full-Face Respirator
1000	10	A-1 P	-
1000	50	-	A-1 P
5000	50	Airline*	-
5000	100	-	A-2 P
10000	100	-	A-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.

Use appropriate NIOSH-certified respirator based on informed professional judgement. In conditions where no reasonable estimate of exposure can be made, assume the exposure is in a concentration IDLH and use NIOSH-certified full face pressure demand SCBA with a minimum service life of 30 minutes, or a combination full facepiece pressure demand SAR with auxiliary self-contained air supply. Respirators provided only for escape from IDLH atmospheres shall be NIOSH-certified for escape from the atmosphere in which they will be used.

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.
- 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

Air contaminants generated in the workplace possess varying "escape" velocities which, in turn, determine the "capture velocities" of fresh circulating air required to effectively 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 favorable 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 meters 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

PHYSICAL PROPERTIES

Solid.

Does not mix with water.

Sinks in water.

State	Divided solid	Molecular Weight	338.45
Melting Range (°F)	109.4- 118.4	Viscosity	Not Applicable
Boiling Range (°F)	356 (0.01 mm Hg)	Solubility in water (g/L)	Immiscible
Flash Point (°F)	Not applicable.	pH (1% solution)	Not applicable.
Decomposition Temp (°F)	Not Available	pH (as supplied)	Not applicable
Autoignition Temp (°F)	Not available.	Vapor Pressure (mmHg)	11.251 x 10 ⁻⁷ -30C
Upper Explosive Limit (%)	Not applicable.	Specific Gravity (water=1)	1.050 @ 20 C
Lower Explosive Limit (%)	Not applicable.	Relative Vapor Density (air=1)	Not Applicable
Volatile Component (%vol)	Negligible	Evaporation Rate	Not Applicable

APPEARANCE

Waxy, colourless solid; does not mix with water (solubility <1 mg/lit). Soluble in methanol (81 g/kg), hexane (220 g/kg), xylene (>1 kg/kg), kerosene 910%). A synthetic pyrethroid which chemically it is an ester of chrysanthemic acid. It is a racemic mixture of 4 optical isomers. The [1R, trans]-isomer is called bioresmethrin and the [1R,cis]-isomer is cismethrin

Section 10 - CHEMICAL STABILITY

CONDITIONS CONTRIBUTING TO INSTABILITY

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

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 strong acids, bases.

Avoid reaction with oxidizing agents.

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

Section 11 - TOXICOLOGICAL INFORMATION

resmethrin

TOXICITY AND IRRITATION

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

TOXICITY	IRRITATION
Oral (rat) LD50: 1244 mg/kg	Nil Reported
Dermal (rat) LD50: >3040 mg/kg	
Oral (mouse) LD50: 99 mg/kg	
Dermal (rabbit) LD50: 2500 mg/kg	

■ For resmethrin:

Acute effects: Resmethrin is moderately toxic by ingestion and slightly toxic through the skin . Dermal exposure may lead to numbness, itching, burning, tingling sensations. Symptoms of exposure by any route may include incoordination, twitching, loss of bladder control, and seizures . Resmethrin may cause eye irritation It failed to cause allergic skin reactions in guinea pigs, but may cause skin irritation

Chronic effects: In a chronic feeding study with rats, the lowest dose tested (500 ppm or 25 mg/kg/day) caused liver enlargement. At 2,500 ppm (125 mg/kg/day), there were pathological liver changes in addition to increased liver weights. Doses of 5,000 ppm (250 mg/kg/day) caused increased thyroid weight and thyroid cysts. The NOEL in a chronic feeding study with dogs was 10 mg/kg/day . In a 90-day inhalation study with rats, 0.1 mg/l, the lowest dose tested, produced behavioral changes, decreased blood glucose levels in males, and decreased body weights and increased serum urea levels in females

Reproductive Effects: A 3-generation study with rats showed a slight increase in premature stillbirths and a decrease in pup weight at 25 mg/kg, the lowest dose tested.

Teratogenic Effects: No birth defects were observed in the offspring of rabbits given doses as high as 100 mg/kg . Skeletal aberrations were seen in the offspring of rats given doses higher than 40 mg/kg/day.

Mutagenic Effects: Resmethrin was not mutagenic in a test performed with the bacterium, Salmonella typhimurium .

Carcinogenic Effects: No evidence of tumor formation was observed in a 2-year rat feeding study with doses as high as 250 mg/kg/day, nor in an 85-week study with mice given doses as high as 50 mg/kg/day .

Organ Toxicity: Pyrethroids may cause adverse effects on the central nervous system. Long-term feeding studies have shown increased liver and kidney weights and adverse changes in liver tissues in test animals. However, EPA reports that resmethrin was not neurotoxic to rats at doses of 62.5 mg/kg for 32 weeks, 250 mg/kg for 30 days, or 632 mg/kg for 7 days . In a 2-year feeding study with rats fed up to 250 mg/kg of resmethrin, increases in liver weight and liver lesions occurred at 125 mg/kg . Increased liver weights occurred in dogs fed 30 mg/kg/day for 180 days. The NOEL in this study was 10 mg/kg/day.

Fate in Humans and Animals: When oral doses of 10 mg/kg radio-labeled resmethrin were given to laying hens, 90% of the dose was eliminated in urine and feces within 24 hours In another study with hens given the same treatment, radioactive residues were low in hens sacrificed 12 hours after the treatment, with the highest levels found in the liver and kidneys. Low levels of radioactivity were found in the hens' eggs, with levels peaking on 1 day after treatment in the whites and 4 to 5 days after treatment in the yolks.

ADI: 0.1 mg/kg/day

NOEL: 10 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
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Section 12 - ECOLOGICAL INFORMATION

Refer to data for ingredients, which follows:

BIORESMETHRIN:

CISRESMETHRIN:

(-)-TRANS-RESMETHRIN:

RESMETHRIN:

■ DO NOT discharge into sewer or waterways.

■ 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
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, 4OPA, 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-ol, 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.

■ Synthetic pyrethroids are examples of optimized insecticidal activity, selectivity and tailored environmental persistence. Through modifications of both acid and alcohol portions of the ester, compounds of desired residual activity have been synthesized whilst maintaining a biodegradable ester linkage. These compounds are generally very toxic to crustaceans and fish in laboratory bioassays. Under field conditions, however the residues are tightly bound in sediment, and ingested residues are readily metabolized. Their toxicity in natural systems are generally less than laboratory test data might indicate. They are generally non-persistent in the environment.

■ for resmethrin:

Environmental fate:

Resmethrin breaks down in the presence of light and humidity. Its half-life in the environment is 15 minutes. Degradation end-products reported for resmethrin are chrysanthemic acid, benzaldehyde, benzyl alcohol, benzoic acid, phenylacetic acid, and various esters.

Breakdown of Chemical in Surface Water: In pond waters and in laboratory degradation studies, pyrethroid concentrations decrease rapidly due to sorption to sediment, suspended particles and plants. Microbial and photodegradation also occur.

Ecotoxicity:

Acute Bird LD50: Californian quail >2000 mg/kg (slightly toxic)

Fish LC50: mosquito fish 0.007 ppm (highly toxic); bluegill sunfish 0.75-2.6 ug/l; rainbow trout 0.28-2.4 ug/l.

The LC50 for resmethrin synergised with piperonyl butoxide in red swamp crawfish, *Procambarus clarkii*, is 0.00082 ppm

Bee LD50: 0.063 ug/bee (highly toxic).

■ 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.

BIORESMETHRIN:

CISRESMETHRIN:

RESMETHRIN:

■ Very toxic to aquatic organisms.

BIORESMETHRIN:

RESMETHRIN:

■ 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.

RESMETHRIN:

■ Fish LC50 (96hr.) (mg/l):	2.75.0E- 06
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/53

Degradation Biological: by soil microflora 2 days

BIORESMETHRIN:

/53

CISRESMETHRIN:

(-)-TRANS-RESMETHRIN:

■ Toxic to aquatic organisms.

Ecotoxicity

Ingredient resmethrin	Persistence: Water/Soil HIGH	Persistence: Air	Bioaccumulation LOW	Mobility LOW
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Section 13 - DISPOSAL CONSIDERATIONS

Disposal Instructions

All waste must be handled in accordance with local, state and federal regulations.

! Puncture containers to prevent re-use and bury at an authorized landfill.

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 equipment to enter drains. Collect all wash water for treatment before disposal.

- Recycle wherever possible.
- Consult manufacturer for recycling options or consult Waste Management Authority for disposal if no suitable treatment or disposal facility can be identified.
- Dispose of by: Burial in a licensed land-fill or Incineration in a licensed apparatus (after admixture with suitable combustible material)
- Decontaminate empty containers. Observe all label safeguards until containers are cleaned and destroyed.

Section 14 - TRANSPORTATION INFORMATION



DOT:

Symbols:	G	Hazard class or Division:	9
Identification Numbers:	UN3077	PG:	III
Label Codes:	9	Special provisions:	8, 146, 335, B54, IB8, IP3, N20, T1, TP33
Packaging: Exceptions:	155	Packaging: Non-bulk:	213
Packaging: Exceptions:	155	Quantity limitations: Passenger aircraft/rail:	No limit
Quantity Limitations: Cargo aircraft only:	No limit	Vessel stowage: Location:	A
Vessel stowage: Other:	None		

Hazardous materials descriptions and proper shipping names:

Environmentally hazardous substance, solid, n.o.s

Air Transport IATA:

ICAO/IATA Class:	9	ICAO/IATA Subrisk:	9
UN/ID Number:	3077	Packing Group:	III
Special provisions:	A97		

Shipping Name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. *(CONTAINS RESMETHRIN)

Maritime Transport IMDG:

IMDG Class:	9	IMDG Subrisk:	None
UN Number:	3077	Packing Group:	III
EMS Number:	F-A,S-F	Special provisions:	274 909 944
Limited Quantities:	5 kg		

Shipping Name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.(contains resmethrin)

Section 15 - REGULATORY INFORMATION

resmethrin (CAS: 10453-86-8) is found on the following regulatory lists;

"Canada Domestic Substances List (DSL)", "US - California Proposition 65 - Carcinogens", "US - California Proposition 65 - Priority List for the Development of MADLs for Chemicals Causing Reproductive Toxicity", "US - California Proposition 65 - Reproductive Toxicity", "US - Maine Chemicals of High Concern List", "US EPCRA Section 313 Chemical List", "US List of Lists - Consolidated List of Chemicals Subject to the Emergency Planning and Community Right-to-Know Act (EPCRA) and Section 112(r) of the Clean Air Act"

Regulations for ingredients

bioresmethrin (CAS: 28434-01-7) is found on the following regulatory lists;

"Canada - Saskatchewan Environmental Persistent or Chronic Hazardous Substances", "US - California Occupational Safety and Health Regulations (CAL/OSHA) - Hazardous Substances List", "US - Massachusetts Oil & Hazardous Material List", "US - Pennsylvania - Hazardous Substance List", "US CWA (Clean Water Act) - Reportable Quantities of Designated Hazardous Substances", "US Department of Transportation (DOT) List of Hazardous Substances and Reportable Quantities - Hazardous Substances Other Than Radionuclides", "US List of Lists - Consolidated List of Chemicals Subject to the Emergency Planning and Community Right-to-Know Act (EPCRA) and Section 112(r) of the Clean Air Act"

cisresmethrin (CAS: 35764-59-1) is found on the following regulatory lists;

"Canada - Saskatchewan Environmental Persistent or Chronic Hazardous Substances", "US - California Occupational Safety and Health Regulations (CAL/OSHA) - Hazardous Substances List", "US - Massachusetts Oil & Hazardous Material List", "US - Pennsylvania - Hazardous Substance List", "US CWA (Clean Water Act) - Reportable Quantities of Designated Hazardous

Substances","US Department of Transportation (DOT) List of Hazardous Substances and Reportable Quantities - Hazardous Substances Other Than Radionuclides","US List of Lists - Consolidated List of Chemicals Subject to the Emergency Planning and Community Right-to-Know Act (EPCRA) and Section 112(r) of the Clean Air Act"

(-)-trans-resmethrin (CAS: 33911-28-3) is found on the following regulatory lists;

"Canada - Saskatchewan Environmental Persistent or Chronic Hazardous Substances","US - California Occupational Safety and Health Regulations (CAL/OSHA) - Hazardous Substances List","US - Massachusetts Oil & Hazardous Material List","US - Pennsylvania - Hazardous Substance List","US CWA (Clean Water Act) - Reportable Quantities of Designated Hazardous Substances","US Department of Transportation (DOT) List of Hazardous Substances and Reportable Quantities - Hazardous Substances Other Than Radionuclides","US List of Lists - Consolidated List of Chemicals Subject to the Emergency Planning and Community Right-to-Know Act (EPCRA) and Section 112(r) of the Clean Air Act"

Section 16 - OTHER INFORMATION

LIMITED EVIDENCE

- Cumulative effects may result following exposure*.
 - Possible respiratory and skin sensitizer*.
- * (limited evidence).

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■ Classification of the mixture 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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