

# Perfluoro-1,2-dimethylcyclobutane

sc-279958



The Power is Question

Material Safety Data Sheet

Hazard Alert Code Key:

EXTREME

HIGH

MODERATE

LOW

## Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

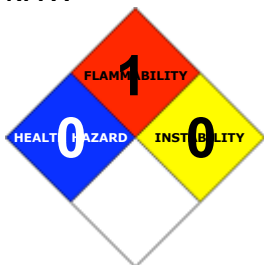
### PRODUCT NAME

Perfluoro-1,2-dimethylcyclobutane

### STATEMENT OF HAZARDOUS NATURE

CONSIDERED A HAZARDOUS SUBSTANCE ACCORDING TO OSHA 29 CFR 1910.1200.

### NFPA



### SUPPLIER

Santa Cruz Biotechnology, Inc.  
2145 Delaware Avenue  
Santa Cruz, California 95060  
800.457.3801 or 831.457.3800

### EMERGENCY

ChemWatch  
Within the US & Canada: 877-715-9305  
Outside the US & Canada: +800 2436 2255  
(1-800-CHEMCALL) or call +613 9573 3112

### SYNONYMS

C6-F12, "cyclobutane, 1, 1, 2, 2, 3, 4-hexafluoro-3, 4-bis(trifluoromethyl)-", "hexafluoro-1, 2-bis(trifluoromethyl)cyclobutane", "cyclobutane hexafluoro-1, 2-bis(trifluoromethyl)-", "perfluoro-1, 2-dimethylcyclobutane", perfluorodimethylcyclobutane, "Vertrel 245"

## Section 2 - HAZARDS IDENTIFICATION

### CHEMWATCH 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

### CANADIAN WHMIS SYMBOLS



## EMERGENCY OVERVIEW

### RISK

### POTENTIAL HEALTH EFFECTS

### ACUTE HEALTH EFFECTS

#### SWALLOWED

■ Although ingestion is not thought to produce harmful effects, the material may still be damaging to the health of the individual following ingestion, especially where pre-existing organ (e.

g.

#### EYE

■ Although the liquid is not thought to be an irritant, direct contact with the eye may produce transient discomfort characterized by tearing or conjunctival redness (as with windburn).

#### SKIN

■ Skin contact is not thought to have harmful health effects, however the material may still produce health damage following entry through wounds, lesions or abrasions.

■ There is some evidence to suggest that this material can cause inflammation of the skin on contact in some persons.

■ Fluorocarbons remove natural oils from the skin, causing irritation, dryness and sensitivity.

■ 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

■ The material is not thought to produce respiratory irritation (as classified using animal models).

Nevertheless inhalation of vapors, fumes or aerosols, especially for prolonged periods, may produce respiratory discomfort and occasionally, distress.

■ Inhalation of vapours may cause drowsiness and dizziness.

This may be accompanied by narcosis, reduced alertness, loss of reflexes, lack of coordination and vertigo.

■ Inhalation of vapors or aerosols (mists, fumes), generated by the material during the course of normal handling, may be damaging to the health of the individual.

■ Inhalation hazard is increased at higher temperatures.

■ Material is highly volatile and may quickly form a concentrated atmosphere in confined or unventilated areas.

Vapor is heavier than air and may displace and replace air in breathing zone, acting as a simple asphyxiant.

■ Exposure to fluorocarbons can produce non-specific flu-like symptoms such as chills, fever, weakness, muscle pain, headache, chest discomfort, sore throat and dry cough with rapid recovery.

High concentrations can cause irregular heartbeats and a stepwise reduction in lung capacity.

■ Acute intoxication by halogenated aliphatic hydrocarbons appears to take place over two stages.

Signs of a reversible narcosis are evident in the first stage and in the second stage signs of injury to organs may become evident, a single organ alone is (almost) never involved.

#### CHRONIC HEALTH EFFECTS

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

There has been some concern that this material can cause cancer or mutations but there is not enough data to make an assessment.

Fluorocarbons can cause an increased risk of cancer, spontaneous abortion and birth defects.

## Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

NAME	CAS RN	%
1,1,2,2,3,4-hexafluoro-3,4-bis(trifluoromethyl)cyclobutane	2994-71-0	>98

## Section 4 - FIRST AID MEASURES

#### SWALLOWED

· If swallowed do NOT induce vomiting. · If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration. · Avoid giving milk or oils. · Avoid giving alcohol.

#### 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.

#### SKIN

■ If skin contact occurs: · Immediately remove all contaminated clothing, including footwear · Flush skin and hair with running water (and soap if available).

#### INHALED

· If fumes or combustion products are inhaled remove from contaminated area. · Lay patient down. Keep warm and rested.

#### NOTES TO PHYSICIAN

■ Treat symptomatically.

for intoxication due to Freons/ Halons;

A: Emergency and Supportive Measures

· Maintain an open airway and assist ventilation if necessary

· Treat coma and arrhythmias if they occur. Avoid (adrenaline) epinephrine or other sympathomimetic amines that may precipitate ventricular arrhythmias. Tachyarrhythmias caused by increased myocardial sensitization may be treated with propranolol, 1-2 mg IV or esmolol 25-100 microgm/kg/min IV.

## Section 5 - FIRE FIGHTING MEASURES

Vapor Pressure (mmHg):	376.081 (25 C)
Upper Explosive Limit (%):	Not available
Specific Gravity (water=1):	1.67
Lower Explosive Limit (%):	Not available

### EXTINGUISHING MEDIA

- Foam.
- Dry chemical powder.

### FIRE FIGHTING

- Alert Emergency Responders and tell them location and nature of hazard.
- Wear full body protective clothing with breathing apparatus.

### GENERAL FIRE HAZARDS/HAZARDOUS COMBUSTIBLE PRODUCTS

- Combustible.
  - Slight fire hazard when exposed to heat or flame.
- Combustion products include: carbon dioxide (CO<sub>2</sub>), hydrogen fluoride, other pyrolysis products typical of burning organic material. Contains low boiling substance: Closed containers may rupture due to pressure buildup under fire conditions. May emit poisonous fumes. May emit corrosive fumes.

### 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 AX Filter of sufficient capacity

## Section 6 - ACCIDENTAL RELEASE MEASURES

### MINOR SPILLS

- Remove all ignition sources.
- Clean up all spills immediately.

### MAJOR SPILLS

- Moderate hazard.
- Clear area of personnel and move upwind.
- Alert Emergency Responders and tell them location and nature of hazard.

## Section 7 - HANDLING AND STORAGE

### PROCEDURE FOR HANDLING

- Contains low boiling substance:  
Storage in sealed containers may result in pressure buildup causing violent rupture of containers not rated appropriately.
- Check for bulging containers.
- Vent periodically.
- DO NOT allow clothing wet with material to stay in contact with skin.
- Avoid all personal contact, including inhalation.
- Wear protective clothing when risk of exposure occurs.

### RECOMMENDED STORAGE METHODS

- DO NOT use aluminum or galvanized containers.
- Metal can or drum
- Packing as recommended by manufacturer.

### STORAGE REQUIREMENTS

- Store in original containers.
- Keep containers securely sealed.
- No smoking, naked lights or ignition sources.
- 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.

## Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

### EXPOSURE CONTROLS

The following materials had no OELs on our records

- 1,1,2,2,3,4-hexafluoro-3,4-bis(trifluoromethyl)cyclobutane: CAS:2994-71-0

### PERSONAL PROTECTION



#### RESPIRATOR

- type ax filter of sufficient capacity.

#### EYE

- Safety glasses with side shields.
- Chemical goggles.

#### HANDS/FEET

- Wear chemical protective gloves, eg. PVC.

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.

- Neoprene gloves.

#### OTHER

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

### ENGINEERING CONTROLS

- Local exhaust ventilation usually required. If risk of overexposure exists, wear an approved respirator.

## Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

### PHYSICAL PROPERTIES

Liquid.

Does not mix with water.

Sinks in water.

State	Liquid	Molecular Weight	300.05
Melting Range (°F)	-26	Viscosity	Not available
Boiling Range (°F)	113	Solubility in water (g/L)	Partly miscible
Flash Point (°F)	None	pH (1% solution)	Not applicable.
Decomposition Temp (°F)	Not available.	pH (as supplied)	Not applicable
Autoignition Temp (°F)	Not available	Vapor Pressure (mmHg)	376.081 (25 C)
Upper Explosive Limit (%)	Not available	Specific Gravity (water=1)	1.67
Lower Explosive Limit (%)	Not available	Relative Vapor Density (air=1)	>1
Volatile Component (%vol)	Not available	Evaporation Rate	Not available

### APPEARANCE

Colourless, odourless liquid; does not mix well with water (<25 ppm).

## Section 10 - CHEMICAL STABILITY

### CONDITIONS CONTRIBUTING TO INSTABILITY

- Presence of incompatible materials.
- Product is considered stable.

### STORAGE INCOMPATIBILITY

■ For saturated perfluorocarbons:

- Standard oxidation-reduction potentials do not apply to PFCs. The materials are unaffected by electrochemical reactions and do not dissociate in aqueous media.
- They are essentially already fully oxidised and are unaffected by standard oxidizing agents such as permanganates, chromates, etc. The only known oxidation takes place only at high temperatures by thermal decomposition.
- Likewise, the materials are only reduced under extreme conditions, requiring reducing agents such as elemental sodium
- Avoid magnesium, aluminium and their alloys, brass and steel.
- The most potentially reactive of this class, the perfluorinated tertiary amines and the quite analogous perfluorinated ethers, are similarly unreactive. Fluorinated tert-amines do not form salts or complexes with strong acids and are not attacked by most oxidizing or reducing agents.
- Avoid strong bases.

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

## Section 11 - TOXICOLOGICAL INFORMATION

1,1,2,2,3,4-hexafluoro-3,4-bis(trifluoromethyl)cyclobutane

### TOXICITY AND IRRITATION

1,1,2,2,3,4-HEXAFLUORO-3,4-BIS(TRIFLUOROMETHYL)CYCLOBUTANE:

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

TOXICITY	IRRITATION
Oral (rat) LD50: >25000 mg/kg *	Nil Reported
Inhalation (rat) LC50: 550000 ppm/4h * * DuPont	
Dermal (rabbit) LD50: >17000 mg/kg *	

#### ■ For perfluorinated carbons (PFCs):

PFCs are inert fluids composed of a complex combination of organic compounds resulting from the distillation of electrochemically fluorinated (ECF) compounds. This class consists of branched, linear and cyclic perfluorinated hydrocarbons having carbon numbers predominantly in the range of C5-C18 and boiling in the range of approximately 25 C-255 C (77 F-491 F). Perfluorinated amine and ether compounds may also be present

Acute oral and inhalation toxicity tests with perfluoroalkanes show no toxicity at any dose tested, and even extremely high-dose intraperitoneal injection resulted in no lethality. In contrast, perfluoroalkenes (such as octafluorocyclopentene, perfluoroisobutylene, hexafluoropropene) have shown evidence of inhalation toxicity, in some cases, extreme.

**PFCs are among the least toxic of all known organic chemicals. PFCs don't oxidise or hydrolyse. They have no functional reactive groups. PFCs owe their low toxicity to the combination of the following properties:**

- Chemical inertness
- Low solubility in biological media (blood, cell membranes, etc.)
- High volatility
- Resistance to biological activation (reductive and oxidative metabolism)

Because PFCs are chemically inert, if inhaled and absorbed they do not react chemically with any biological molecules; they simply partition between blood and various organs and tissues.

**As PFCs have limited ability to dissolve in biological media, they do not reach appreciable concentrations in the tissues of air-exposed animals. As PFCs are highly volatile chemicals and have high air-blood partition coefficients, any fluorochemical remaining after exposure will be rapidly eliminated in the breath. Consequently, all such PFCs have:**

- Very high rodent LC50s (very low acute toxicity)
- Very high cardiac sensitisation EC50s (very low toxicity)

In fact, most PFCs do not induce narcosis (sleep) or cardiac sensitisation at maximum achievable concentration (saturation). Inhalation exposure at levels up to 50,000 ppm for thirteen weeks produced no effects in rats, nor did oral exposure for thirty days at 2,000 mg/kg/day.

All PFCs that have undergone evaluation by the ACGIH or WEEL committees in the US have been granted an exposure guideline of 1000 ppm (8-hr TWA). NASA has evaluated the toxicity information associated with PFCs including those that can be used as heat transfer agents and fire extinguishing agents in spacecraft and has established a Space Maximum Allowable Concentration (SMAC) of 11,000 ppm for up to 180 days (24 hours/day)

PFCs are neutral molecules and because they are maximally fluorinated, they cannot undergo biological oxidation-reduction reactions to form reactive aldehydes, acid fluorides, radicals or acids that have been associated with several types of toxicity.

Genetic toxicity: As PFCs are not reactive directly with biological tissue and PFCs cannot form reactive metabolites, these fluorochemicals have tested negative in bacterial mutagenicity assays. Ames testing showed no genotoxicity.

Hydrofluoroethers and hydrofluoropolyethers are highly fluorinated ethers having properties intermediate between the perfluoroethers and hydrocarbon ethers. They are low in toxicity, nonflammable, with densities of 1.4-1.7 g/cm<sup>3</sup>, surface tensions of 13-16 dyn/cm and low kinematic viscosity. The hydrofluoropolyethers are used as heat-transfer fluids. The hydrofluoroethers are used as heat-transfer fluids as well as precision cleaning solvents and solvents for specialty applications such as coating deposition.

Perfluorinated compounds are potent peroxisome proliferators and were found to induce 8-hydroxydeoxyguanosine in the liver of treated rats.

The material may produce peroxisome proliferation. Peroxisomes are single, membrane limited, cytoplasmic organelles that are found in the cells of animals, plants, fungi and protozoa. Peroxisome proliferators include certain hypolipidaemic drugs, phthalate ester plasticisers, industrial solvents, herbicides, food flavours, leukotriene D4 antagonists and hormones. Numerous studies in rats and mice have demonstrated the hepatocarcinogenic effects of peroxisome proliferators, and these compounds have been unequivocally established as carcinogens. However it is generally conceded that compounds inducing proliferation in rats and mice have little, if any, effect on human liver except at very high doses or extreme conditions of exposure.

## Section 12 - ECOLOGICAL INFORMATION

No data

### Ecotoxicity

Ingredient	Persistence: Water/Soil	Persistence: Air	Bioaccumulation	Mobility
1,1,2,2,3,4-hexafluoro-3,4-bis(trifluoromethyl)cyclobutane	No Data Available	No Data Available		

## Section 13 - DISPOSAL CONSIDERATIONS

### Disposal Instructions

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

† Legislation addressing waste disposal requirements may differ by country, state and/ or territory. Each user must refer to laws operating in their area. In some areas, certain wastes must be tracked.

A Hierarchy of Controls seems to be common - the user should investigate:

- Reduction
- Reuse
- Recycling
- Disposal (if all else fails)

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

DO NOT allow wash water from cleaning equipment to enter drains. Collect all wash water for treatment before disposal.

- Recycle wherever possible or consult manufacturer for recycling options.
- Consult Waste Management Authority for disposal.

## Section 14 - TRANSPORTATION INFORMATION

NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS: DOT, IATA, IMDG

## Section 15 - REGULATORY INFORMATION

**1,1,2,2,3,4-hexafluoro-3,4-bis(trifluoromethyl)cyclobutane (CAS: 2994-71-0) is found on the following regulatory lists;**

"Canada Non-Domestic Substances List (NDSL)", "US Toxic Substances Control Act (TSCA) - Inventory"

## Section 16 - OTHER INFORMATION

ND

Substance CAS Suggested codes 1, 1, 2, 2, 3, 4- hexafluoro- 3, 4- 2994- 71- 0 N; R51/53 bis(trifluoromethyl)cyclobutane

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■ 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](http://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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