

Information on Vikane* Gas Fumigant

For Fire Departments, Hazardous Materials Crews and other Emergency Response Teams

NOTE: In case of an emergency endangering life or property involving Vikane, call collect Dow AgroSciences 517-636-4400

1. INTRODUCTION:

Vikane gas fumigant was developed by The Dow Chemical Company as a structural fumigant for control of dry-wood termites. Vikane gas fumigant is currently labelled for control of a wide range of pests, including wood-destroying beetles, cockroaches, and rodents, infesting buildings, furnishings, construction materials, and vehicles (not including aircraft). Vikane gas fumigant is registered by the EPA under registration number 62719-4.

NOTE: Vikane gas fumigant is a RESTRICTED USE PESTICIDE.

2. PHYSICAL PROPERTIES:

Vikane gas fumigant is an inorganic chemical composed of 99% sulfuryl fluoride CAS# 002699-79-8 and 1% inert ingredients. Sulfuryl fluoride has the following physical properties:

COLOR AND ODOR: None (a slight sulfur odor which may be detected at high concentrations of sulfuryl fluoride is caused by inert ingredients)

MOLECULAR WEIGHT: 102

VAPOR DENSITY: Sulfuryl fluoride is approximately 3.5 times heavier than air.

BOILING POINT: -67°F; sulfuryl fluoride is in a gaseous state under normal environmental conditions.

GAS SOLUBILITY (77°F, 1 ATM): 750 ppm by weight in water which is in equilibrium with air saturated with sulfuryl fluoride.

FLASH POINT: Not combustible; Temperatures exceeding 400°C (752°F) will cause sulfuryl fluoride to decompose to form hydrogen fluoride and sulfur dioxide.

3. DERMAL TOXICITY:

Sulfuryl fluoride has low lipid solubility and is essentially nonirritating to skin. Laboratory studies have demonstrated no ill effects in animals after dermal exposure to Vikane. In handbooks on hazardous materials, Vikane is often classified with sulfuric acid or hydrofluoric acid and is inaccurately described as causing severe acid burns to skin. However, Vikane as either liquid or gas has not been documented to cause acid burns to skin. Liquid Vikane contacting eyes or skin may cause freeze damage as it rapidly evaporates.

4. INHALATION TOXICITY:

Inhalation is the critical route of exposure to sulfuryl fluoride, an odorless, toxic gas. The initial concentration of Vikane introduced into structures for drywood termite control is generally less than 16 oz/1000 cubic feet, which equals 3850 ppm.

ACUTE INHALATION: LC₅₀ values for laboratory rats exposed to various concentrations of Vikane for fixed time periods.

Gender	Exposure time (hr)	LC ₅₀ (ppm)
male	4	1122
female	4	991
male	1	3730
female	1	3021

Time to incapacitation of rats exposed to various concentrations of Vikane

ppm	Time (minutes)
4,000	42
10,000	16
20,000	10
40,000	6

The above exposures produced 100% mortality: all rats were dead or moribund within three hours after the end of the exposure.

SUBCHRONIC INHALATION: In 13-week studies, rats exposed six hours/day, five days/week to 30 ppm Vikane showed no adverse effects. A concentration of 100 ppm produced no effects other than mottled teeth.

The current TLV and STEL for sulfuryl fluoride are:

ACGIH TLV and OSHA PEL: 5 ppm for eight hours/day, five days/week for the life of a working individual
STEL (Shortterm exposure limit) (ACGIH): 10 ppm (15 minute time-weighted average)

REPRODUCTIVE STUDY: There were no treatment related effects on reproductive or fertility indices, reproductive organs or offspring survival in test animals from a two generation exposure to 150 ppm of sulfuryl fluoride.

TERATOLOGY STUDY: There were no teratological effects on rats or rabbits at the highest dose of Vikane tested: 225 ppm.

GENOTOXICOLOGICAL STUDY: The results of the chromosomal aberration, gene mutation, or DNA studies showed no adverse genotoxic effects from exposure to sulfuryl fluoride.

5. PROTECTIVE EQUIPMENT:

EYE PROTECTION: Fumigators are required to wear a face shield or goggles when releasing fumigant from the cylinder. *This is to prevent freeze damage to the eye by liquid contact.*

PROTECTIVE CLOTHING: *Skin contact with the liquid may cause freeze damage* if the liquid is confined to the skin. *Rubber gloves can confine liquid to the skin, and should not be used by fumigators when releasing Vikane from the cylinder.* After the Vikane is released and is in the gas form, skin contact is not considered a problem.

RESPIRATORY PROTECTION: Fumigators are required to wear a NIOSH or MSHA approved, positive-pressure self-contained breathing apparatus (SCBA) when entering areas where concentrations of Vikane exceed 5 ppm, or areas where concentrations are unknown. Fumigators are also required to use either an Interscan or Miran gas analyzer to confirm concentrations of Vikane of 5 ppm or less before permitting reoccupation of structures after fumigation.

The Interscan is the most commonly used clearance detector used by fumigators using Vikane. Its detection limits range from 0-50 ppm for sulfuryl fluoride. The Interscan operates by drawing an air sample through a furnace, which converts sulfuryl fluoride to sulfur dioxide (SO₂). The SO₂ is passed through an SO₂ sensor; the sensor output is registered on a direct-reading dial as ppm sulfuryl fluoride. The Interscan requires monthly calibration to ensure accurate readings. The unit is manufactured by Interscan Corporation, P.O. Box 2496, Chatsworth, CA 91311.

6. FIRST AID TREATMENT:

IF ON SKIN: If Vikane is projected onto a small area of the skin, wash the area with water. Any damage to the skin would result from freezing, not from acid burns. If clothing gets wet with liquid Vikane, immediately remove the clothing from skin contact and aerate.

IF IN EYES: If Vikane is projected into the eyes, flush the eyes with water for five minutes. Obtain medical assistance. Any damage to the eyes will result from freezing.

IF INHALED: Humans exposed to high concentrations (>1000 ppm) of Vikane may experience any of the following symptoms:

Respiratory irritation

Nausea

Abdominal pain

Central nervous system (CNS) depression

Slow or garbled speech

Slow body movements

Numbness of extremities

Dulling of awareness

Survival of humans exposed to Vikane is dependent upon the concentration of Vikane and the duration of exposure. Humans can survive exposure to high concentrations of Vikane, even following convulsions, if the exposure has been brief.

If a person potentially exposed to Vikane shows any of the above symptoms or unusual behavior, you should:

- Immediately take the individual to fresh, uncontaminated air and keep him at rest
- Help the individual maintain body temperature
- Check breathing and heartbeat
 - If breathing stops, start artificial respiration
 - If breathing is difficult, give oxygen
 - If heartbeat stops, start cardiopulmonary resuscitation
- Immediately have someone obtain medical assistance, or transport the affected individual to a medical facility and notify ahead that emergency medical treatment will be needed.

7. INFORMATION FOR PHYSICIANS:

The prediction of possible effects of exposure to Vikane on human beings is based in part on observations of laboratory animals. On this basis, people exposed to Vikane will probably show little evidence of intoxication at first, unless the concentration was >400 ppm. CNS depression with slow speech and gait will generally be the first symptoms noted.

There is no known antidote for overexposure to Vikane. Keep individuals overexposed to Vikane at bed rest for at least 24 hours. Clinical observations are essential and should be directed at pulmonary, hepatic, and renal systems. Treatment is based on the clinical judgement of the physician and the individual reaction of the patient. A post mortem finding in one fatality attributed to Vikane was pulmonary edema, with death attributed to cardiorespiratory failure. Convulsions may ensue with respiratory arrest being the terminal event. Assisted respiration may be necessary.

8. FIRE FIGHTING:

GENERAL INFORMATION: Vikane is not combustible. However, in temperatures exceeding approximately 400°C (752°F), Vikane will degrade to form hydrogen fluoride (HF) and sulfur dioxide. Theoretically, the number of oz of HF/1000 cubic feet produced during a fire in a structure containing Vikane would equal 0.4 x number of oz Vikane/1000 cubic feet¹. *Nonetheless, amounts of HF actually produced during fires involving Vikane may be insignificant because Vikane rapidly degasses from structures.*

CYLINDERS OF Vikane: Vikane is packaged as a gas under pressure in cylinders, thus cylinders contain both gas and liquid. Cylinders containing Vikane are designed not to explode in high temperatures. A fusible plug in the cylinder valve body melts at 158-165°F. Vikane released through this opening will cool and resolidify the lead plug. In fires, the lead plug may intermittently melt and solidify, resulting in erratic release of the fumigant.

USE OF WATER: Evolution of hazardous materials during a fire can be minimized by use of water. Water will scrub out part of the HF and SO₂ formed by decomposition of Vikane fumigant in the flame. Water also can be used to cool cylinders of Vikane and prevent discharge of the product caused by melted fusible plugs. Avoid runoff into waterways if possible. The toxicity of Vikane in water for fish is unknown .

PROTECTIVE CLOTHING (for fires involving cylinders of Vikane): Self-contained breathing apparatus and encapsulating protective suits should be worn when fighting fires in atmospheres containing potentially high concentrations of Vikane. Protective suit material should be compatible with exposure to hydrofluoric acid.

9. FIRES IN STRUCTURES UNDER FUMIGATION WITH VIKANE:

The label for Vikane requires the fumigant to be released from **outside** the area to be fumigated. Therefore, it is very unlikely a cylinder of Vikane will be found inside a structure under fumigation. The label does provide for special exceptions where this practice is not possible.

WARNING SIGNS: By Federal law, a warning sign must be placed at each entrance to the structure under fumigation. Some state laws require additional placarding. The signs must contain information including the accepted common name of the fumigant, and the name, address, and day and night telephone numbers of the company performing the fumigation.

FANS: The label for Vikane requires the use of electric fans to provide forced air circulation for facilitating rapid dispersion of the fumigant during introduction of the fumigant.

WARNING AGENT: Chloropicrin is used to aid in vacating a structure. Five to ten minutes prior to introducing Vikane, chloropicrin is poured over cotton in a shallow dish placed in the air stream of a fan. Chloropicrin is a noncombustible liquid and is not soluble in water. At temperatures exceeding 112°C (233°F), chloropicrin will degrade to form hydrochloric acid, phosgene, and oxides of nitrogen such as NO₂ and NO. The concentration of chloropicrin used during fumigation with Vikane is 1 fluid oz/10,000-15,000 cubic feet, which equals 17-26 ppm. Due to the small amount of chloropicrin present during fumigations, the amount of decomposition products of chloropicrin formed during a fire would be insignificant.

PROTECTIVE CLOTHING: Self-contained breathing apparatus and normal "turn-out" gear should be worn when fighting fires in structures under fumigation with Vikane.

10. PACKAGING AND DISTRIBUTION OF VIKANE:

Vikane gas fumigant is packaged for fumigators in a standardized container: a white, pressed steel tank 4 ft long and 10 inches in diameter. Each cylinder contains 125 lbs of 99% pure sulfuryl fluoride.

Vikane is made and packaged only by Dow AgroSciences at one location in California. Cylinders of Vikane, 12 to a pallet, are transported via truck or ship to distribution centers in the continental U.S. and Hawaii. Vikane is not transported in bulk by railcar.

11. DEALING WITH LEAKS INVOLVING VIKANE:

Damaged tanks, an unusual sulfide-type smell, frost on a cylinder, or a hissing sound indicate possible leakage of Vikane from a cylinder. In an open environment, Vikane dissipates very rapidly. Nonetheless, a person should not enter the area immediately downwind of a suspected leaking cylinder or an opened tarp on a fumigated structure unless he is wearing a self-contained breathing apparatus. *Always wear a SCBA when entering an environment where the concentration of Vikane is not known.*

An Interscan gas analyzer will confirm the presence or absence of Vikane. Fumigators, distributors, or Dow AgroSciences representatives for Vikane have access to Interscans; contact these individuals for their assistance if emergency use of an Interscan is necessary.

¹In temperatures exceeding approximately 400°C (752°F), each mole (102 gm) of sulfuryl fluoride will degrade to form 2 moles (40 gm) of hydrogen fluoride (HF).