

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 Dow AgroSciences at
1-800-992-5994.

1. INTRODUCTION:

Vikane* gas fumigant was developed by The Dow Chemical Company as a structural fumigant for control of drywood termites. Vikane gas fumigant is currently labeled 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. SULFURYL FLUORIDE PHYSICAL PROPERTIES:

Vikane gas fumigant is an inorganic chemical composed of 99.8% sulfuryl fluoride CAS# 002699-79-8 and 0.2% 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 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. Sulfuryl fluoride is relatively non-reactive as a gas.
- **FLASH POINT:** Not combustible; Temperatures exceeding 752°F (400°C) 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.

Time to incapacitation of rats exposed to various concentrations of Vikane¹

Gender	Exposure time (hr)	LC ₅₀ (ppm)	ppm	Time (minutes)
male	4	1122	4,000	42
female	4	991	10,000	16
male	1	3730	20,000	10
female	1	3021	40,000	6

¹These 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 significant 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 (Short-term 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: While some *in vitro* studies gave positive results consistent with exposure to fluoride ions, the available *in vivo* data for sulfuryl fluoride indicate no mutagenic or carcinogenic potential. While some *in vitro* studies gave positive results consistent with exposure to fluoride ions, the available *in vivo* data for sulfuryl fluoride indicate no mutagenic or carcinogenic potential.

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 for sulfuryl fluoride range are from 0-50 ppm. 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, 21700 Nordhoff Street, P.O. Box 2496, Chatsworth, CA 91311. 818-882-2331 or 800-458-6153.

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: Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Call a poison control center or doctor for treatment advice.

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 752°F (400°C), 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 feet².

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.

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

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 233°F (112°C), 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 compressed gas container: a white, pressed steel tank 4 ft long and 10 inches in diameter. Each single wall cylinder contains 125 lbs. of 99.8% pure sulfuryl fluoride. No additional gas is used to pressurize the cylinder. Each *full* cylinder contains 200-300 pounds of pressure per square inch. (See the table below for range of pressures for various temperatures.)

Temperature °F	°C	Pressure (PSIA) ³	Temperature °F	°C	Pressure (PSIA) ³
0	-17.8	71	80	26.7	264
10	-12.2	86	90	32.2	303
20	-6.7	103	100	37.8	346
30	-1.1	123	110	43.3	393
40	4.4	145	120	48.9	445
50	10.0	170	130	54.4	550
60	15.6	198	140	60.0	635
70	21.1	229	150	65.6	730

³Pounds per Square Inch Absolute.

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 shipped to distribution centers in the continental U.S. and Hawaii. Vikane is not transported in bulk by railcar. These cylinders are equipped with a 1.030" right hand thread, 14 thread per inch, straight thread fitting. This is comparable to a ¾" pipefitting (pipefitting is not the same as a hose fitting).

11. DEALING WITH LEAKS INVOLVING VIKANE:

If you believe a cylinder may be leaking Vikane gas fumigant, immediately clear the area (100'). 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 (SCBA). *Always wear a SCBA when entering an environment where the concentration of Vikane is not known.*

CHECKING FOR LEAKS: Instruments for Gas Detection (Sulfuryl fluoride sensitivity range): TIF (> 50 ppm), Interscan (0-50 ppm), Miran (0-150 ppm). Fumigators, distributors, or Dow AgroSciences representatives for Vikane have access to Interscan analyzers; contact these individuals for their assistance if emergency use of an Interscan is necessary. Move leaking or damaged cylinder outdoors or to an isolated location, observing strict safety precautions. Work upwind if possible. If leak is detected at a fumigation site, empty the leaking Vikane into the fumigated structure.



Dow AgroSciences LLC
9330 Zionsville Road
Indianapolis, IN 46268-1054

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Vikane is a federally Restricted Use Pesticide.
Always read and follow label directions.