Dow AgroSciences LLC encourages and expects you to read and understand the entire (M)SDS, as there is important information throughout the document. We expect you to follow the precautions identified in this document unless your use conditions would necessitate other appropriate methods or actions.

## 1. Product and Company Identification

**Product Name**
VIKANE* Gas Fumigant

**COMPANY IDENTIFICATION**
Dow AgroSciences LLC
A Subsidiary of The Dow Chemical Company
9330 Zionsville Road
Indianapolis, IN 46268-1189
USA

Customer Information Number: 800-992-5994
SDSQuestion@dow.com

**EMERGENCY TELEPHONE NUMBER**

**24-Hour Emergency Contact:** 800-992-5994
**Local Emergency Contact:** 352-323-3500

## 2. Hazards Identification

### Emergency Overview
**Color:** Colorless
**Physical State:** Gas
**Odor:** Odorless
**Hazards of product:**

DANGER! May be fatal if inhaled. Causes respiratory tract irritation. Harmful if swallowed. May cause frostbite. Isolate area. Keep upwind of spill. Stay out of low areas. Contents under pressure.

### OSHA Hazard Communication Standard
This product is a “Hazardous Chemical” as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

### Potential Health Effects
**Eye Contact:** No hazard from gas. Liquid may cause frostbite.
**Skin Contact:** Essentially nonirritating to skin. Liquid may cause frostbite upon skin contact.
**Skin Absorption:** Prolonged skin contact is unlikely to result in absorption of harmful amounts.

**Inhalation:** Vapor concentrations are attainable which may be fatal with single exposure. Excessive exposure may cause severe irritation to upper respiratory tract (nose and throat) and lungs. For narcotic effects: Relevant data not available.
**Ingestion:** Moderate toxicity if swallowed. Swallowing is unlikely because of the physical state.
**Aspiration hazard:** Based on physical properties, not likely to be an aspiration hazard.
**Effects of Repeated Exposure:** In animals, effects have been reported on the following organs: Central nervous system. Kidney. Lung. Respiratory tract. Thyroid. Observations in animals include: Convulsions. Tremors. May cause fluorosis of teeth and bones.
**Birth Defects/Developmental Effects:** Has been toxic to the fetus in laboratory animals at doses toxic to the mother.

## 3. Composition Information

| Component | CAS # | Amount |
|---|---|---|
| Sulfuryl Fluoride | 2699-79-8 | 99.8 % |
| 1,2-Dichloroethane | 107-06-2 | 0.04 % |
| Balance | Not available | 0.16 % |

## 4. First-aid measures

### Description of first aid measures

**General advice:** First Aid responders should pay attention to self-protection and use the recommended protective clothing (chemical resistant gloves, splash protection). If potential for exposure exists refer to Section 8 for specific personal protective equipment.
**Inhalation:** Move person to fresh air. If person is not breathing, call an emergency responder or ambulance, then give artificial respiration; if by mouth to mouth use rescuer protection (pocket mask etc). Call a poison control center or doctor for treatment advice. If breathing is difficult, oxygen should be administered by qualified personnel. If the person is not breathing and has no pulse, consider cardiopulmonary resuscitation (CPR); use pocket resuscitation mask, bag valve mask etc., to avoid risk of poisoning rescuer. To prevent pulmonary edema have the person inhale 5 shots of an aerosol corticosteroid metered dose inhaler (if available), such as beclomethasone or fluticasone, etc., every 10 minutes until the person is evaluated by a physician.
**Skin Contact:** Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. Call a poison control center or doctor for treatment advice. In case of frostbite, immediately flush skin with plenty of water for 15 minutes. Seek medical attention. Suitable emergency safety shower facility should be immediately available.
**Eye Contact:** In case of frostbite, immediately flush eyes with water; remove contact lenses, if present, after the first 5 minutes, then continue flushing eyes for at least 15 minutes. Obtain medical attention promptly, preferably from an ophthalmologist. Suitable emergency eye wash facility should be immediately available.
**Ingestion:** Call a poison control center or doctor immediately for treatment advice. Have person sip a glass of water if able to swallow. Do not induce vomiting unless told to do so by the poison control center or doctor. Never give anything by mouth to an unconscious person.

### Most important symptoms and effects, both acute and delayed

Aside from the information found under Description of first aid measures (above) and Indication of immediate medical attention and special treatment needed (below), no additional symptoms and effects are anticipated.

### Indication of immediate medical attention and special treatment needed

Maintain adequate ventilation and oxygenation of the patient. Sulfuryl fluoride is a gas which has no warning properties such as odor or eye irritation. The prediction of possible human effects is based in part on observations made on laboratory animals. Treat for frostbite if present (eyes, skin) with gentle rewarming by water irrigation for at least 15 minutes. It is predicted that persons exposed to sulfuryl fluoride will show little evidence of intoxication at first, unless the concentration is very high (greater than 400 ppm). Early symptoms of exposure to sulfuryl fluoride are respiratory irritation and central nervous system depression. Excitation may follow. Slowed movement, reduced awareness, and slow or garbled speech may be noted. It is essential to keep such an individual at bed rest for at least 24

hours. Clinical observations should be directed at the pulmonary, hepatic, and renal systems. Prolonged exposure can produce lung irritation, pulmonary edema, nausea, and abdominal pain. Repeated exposure to high concentrations can result in significant lung and kidney damage. Convulsions may ensue with respiratory arrest being the terminal event. Assisted respiration may be necessary. Clinical observation is essential. There is no known antidote for overexposure to sulfuryl fluoride. May cause asthma-like (reactive airways) symptoms. Bronchodilators, expectorants, antitussives and corticosteroids may be of help. Respiratory symptoms, including pulmonary edema, may be delayed. Persons receiving significant exposure should be observed 24-48 hours for signs of respiratory distress. Consider administering a complete aerosol corticosteroid metered dose inhaler (100-150 shots) or equivalent as initial preventive treatment for incipient pulmonary edema. Consider administering 250-1000 mg prednisolone IV on the first day of treatment. Treat for frostbite, if present. No specific antidote. Treatment of exposure should be directed at the control of symptoms and the clinical condition of the patient. Have the Safety Data Sheet, and if available, the product container or label with you when calling a poison control center or doctor, or going for treatment.
Excessive exposure may aggravate preexisting asthma and other respiratory disorders (e.g. emphysema, bronchitis, reactive airways dysfunction syndrome).

## 5. Fire Fighting Measures

### Suitable extinguishing media
This material does not burn. If exposed to fire from another source, use suitable extinguishing agent for that fire.

### Special hazards arising from the substance or mixture
**Hazardous Combustion Products:** Fire conditions may cause this product to decompose. Refer to section 10 - Thermal Decomposition.
**Unusual Fire and Explosion Hazards:** Container may rupture from gas generation in a fire situation.

### Advice for firefighters
**Fire Fighting Procedures:** Keep people away. Isolate fire and deny unnecessary entry. Stay upwind. Keep out of low areas where gases (fumes) can accumulate. Use water spray to cool fire exposed containers and fire affected zone until fire is out and danger of reignition has passed. Fight fire from protected location or safe distance. Consider the use of unmanned hose holders or monitor nozzles. Immediately withdraw all personnel from the area in case of rising sound from venting safety device or discoloration of the container. Move container from fire area if this is possible without hazard. Contain fire water run-off if possible. Fire water run-off, if not contained, may cause environmental damage. Review the “Accidental Release Measures” and the “Ecological Information” sections of this (M)SDS.
**Special Protective Equipment for Firefighters:** Wear positive-pressure self-contained breathing apparatus (SCBA) and protective fire fighting clothing (includes fire fighting helmet, coat, trousers, boots, and gloves). If protective equipment is not available or not used, fight fire from a protected location or safe distance.

## 6. Accidental Release Measures

**Personal precautions, protective equipment and emergency procedures:** Isolate area. Keep personnel out of low areas. Keep upwind of spill. Ventilate area of leak or spill. Use appropriate safety equipment. For additional information, refer to Section 8, Exposure Controls and Personal Protection.

**Environmental precautions:** Prevent from entering into soil, ditches, sewers, waterways and/or groundwater. See Section 12, Ecological Information.
**Methods and materials for containment and cleaning up:** Isolate area until gas has dispersed. Small spills: Knock down and dilute vapors with water fog or spray. Apply vapor suppression foams until spill can be cleaned up. Use non-sparking tools in cleanup operations. Large spills: Contact Dow AgroSciences for clean-up assistance. See Section 13, Disposal Considerations, for additional information.

## 7. Handling and Storage

### Handling

**General Handling:** Keep out of reach of children. Avoid contact with eyes, skin, and clothing. Do not swallow. Avoid breathing vapor. Wash thoroughly after handling. Keep container closed. Use with adequate ventilation. See Section 8, EXPOSURE CONTROLS AND PERSONAL PROTECTION.

### Storage

Store in a dry place. Store in original container. Keep container tightly closed when not in use. Do not store near food, foodstuffs, drugs or potable water supplies.

## 8. Exposure Controls / Personal Protection

### Exposure Limits

| Component | List | Type | Value |
|---|---|---|---|
| **Sulfuryl Fluoride** | ACGIH | TWA | 5 ppm BEI |
| | ACGIH | STEL | 10 ppm BEI |
| | OSHA Table Z-1 | PEL | 20 mg/m3 5 ppm |

RECOMMENDATIONS IN THIS SECTION ARE FOR MANUFACTURING, COMMERCIAL BLENDING AND PACKAGING WORKERS. APPLICATORS AND HANDLERS SHOULD SEE THE PRODUCT LABEL FOR PROPER PERSONAL PROTECTIVE EQUIPMENT AND CLOTHING.
A BEI notation following the exposure guideline refers to a guidance value for assessing biological monitoring results as an indicator of the uptake of a substance from all routes of exposures.

### Personal Protection

**Eye/Face Protection:** For handling the gas, wear safety glasses (with side shields). When contact with the liquid (condensed gas) is possible, wear chemical goggles.
**Skin Protection:** Wear clean, body-covering clothing.

> **Hand protection:** Chemical protective gloves should not be needed when handling this material. Consistent with general hygienic practice for any material, skin contact should be minimized.

**Respiratory Protection:** Respiratory protection should be worn when there is a potential to exceed the exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, use an approved respirator. When respiratory protection is required, use an approved positive-pressure self-contained breathing apparatus or positive-pressure airline with auxiliary self-contained air supply. For emergency conditions, use an approved positive-pressure self-contained breathing apparatus. In confined or poorly ventilated areas, use an approved self-contained breathing apparatus or positive pressure air line with auxiliary self-contained air supply.
**Ingestion:** No precautions necessary due to the physical properties of the material.

### Engineering Controls

**Ventilation:** Use engineering controls to maintain airborne level below exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, use only in enclosed systems or with local exhaust ventilation. Exhaust systems should be designed to move the air away from the source of vapor/aerosol generation and people working at this point. Lethal concentrations may exist in areas with poor ventilation.

## 9. Physical and Chemical Properties

| | |
|---|---|
| **Appearance** | |
| **Physical State** | Gas |
| **Color** | Colorless |
| **Odor** | Odorless |
| **Odor Threshold** | Odorless |

| | |
|---|---|
| **pH** | Not applicable |
| **Melting Point** | -137 °C (-215 °F) Estimated. |
| **Freezing Point** | Not applicable |
| **Boiling Point (760 mmHg)** | -54 °C (-65 °F) *EC Method A2* . |
| **Flash Point - Closed Cup** | Not applicable |
| **Evaporation Rate (Butyl Acetate = 1)** | Not applicable |
| **Flammability (solid, gas)** | No |
| **Flammable Limits In Air** | **Lower**: Not applicable<br>**Upper**: Not applicable |
| **Vapor Pressure** | 16,000 hPa @ 20 °C |
| **Vapor Density (air = 1)** | 3.5 @ 20 °C |
| **Specific Gravity (H2O = 1)** | 1.35 |
| **Solubility in water (by weight)** | 1.04 g/l 20°C, Unbuffered |
| **Partition coefficient, n-octanol/water (log Pow)** | 0.41 *Estimated.* |
| **Autoignition Temperature** | Not applicable |
| **Decomposition Temperature** | No test data available |
| **Kinematic Viscosity** | Not applicable |

## 10. Stability and Reactivity

### Reactivity
No dangerous reaction known under conditions of normal use.
### Chemical stability
Thermally stable at recommended temperatures and pressures.

### Possibility of hazardous reactions
Polymerization will not occur.
**Conditions to Avoid:** Exposure to elevated temperatures can cause product to decompose. Generation of gas during decomposition can cause pressure in closed systems.

**Incompatible Materials:** Avoid contact with: Strong bases.
### Hazardous decomposition products
Decomposition products can include and are not limited to: Hydrogen fluoride. Sulfur oxides. Toxic gases are released during decomposition.

## 11. Toxicological Information

### Acute Toxicity
**Ingestion**
As product: Single dose oral LD50 has not been determined.
**Dermal**
The dermal LD50 has not been determined.
**Inhalation**
LC50, 4 h, Rat 991 - 1,122 ppm
### Eye damage/eye irritation
No hazard from gas. Liquid may cause frostbite.
### Skin corrosion/irritation
Essentially nonirritating to skin. Liquid may cause frostbite upon skin contact.
### Sensitization
**Skin**
No relevant data found.
**Respiratory**
No relevant data found.

### Repeated Dose Toxicity
In animals, effects have been reported on the following organs: Central nervous system. Kidney. Lung. Respiratory tract. Thyroid. Observations in animals include: Convulsions. Tremors. May cause fluorosis of teeth and bones.

### Chronic Toxicity and Carcinogenicity
Did not cause cancer in laboratory animals.

**Carcinogenicity Classifications:**

| Component | List | Classification |
|---|---|---|
| **1,2-Dichloroethane** | NTP | Anticipated carcinogen. |
| | IARC | Possibly carcinogenic to humans.; 2B |

### Developmental Toxicity
Has been toxic to the fetus in laboratory animals at doses toxic to the mother. Did not cause birth defects in laboratory animals.

### Reproductive Toxicity
In animal studies, did not interfere with reproduction.

### Genetic Toxicology
In vitro genetic toxicity studies were negative in some cases and positive in other cases. Animal genetic toxicity studies were negative in some cases and positive in other cases.

## 12. Ecological Information

### Toxicity

**Fish Acute & Prolonged Toxicity**
LC50, zebra fish (Brachydanio rerio), static, 96 h: 0.89 mg/l
**Aquatic Invertebrate Acute Toxicity**
EC50, water flea Daphnia magna, static, 48 h, immobilization: 0.62 mg/l
**Aquatic Plant Toxicity**
EyC50, green alga Pseudokirchneriella subcapitata (formerly known as Selenastrum capricornutum), static, Growth inhibition (cell density reduction), 96 h: 3.05 mg/l
EbC50, green alga Pseudokirchneriella subcapitata (formerly known as Selenastrum capricornutum), static, biomass growth inhibition, 72 h: 0.58 mg/l
ErC50, green alga Pseudokirchneriella subcapitata (formerly known as Selenastrum capricornutum), static, Growth rate inhibition, 72 h: 1.13 mg/l
**Toxicity to Above Ground Organisms**
LC50, Honey bee (Apis mellifera): 6.5 mg/l

### Persistence and Degradability

No relevant data found.

### Bioaccumulative potential
**Bioaccumulation:** Bioconcentration potential is low (BCF < 100 or Log Pow < 3).
**Partition coefficient, n-octanol/water (log Pow):** 0.41 Estimated.

### Mobility in soil
**Mobility in soil:** Potential for mobility in soil is very high (Koc between 0 and 50).
**Partition coefficient, soil organic carbon/water (Koc):** 6 Estimated.

## 13. Disposal Considerations

If wastes and/or containers cannot be disposed of according to the product label directions, disposal of this material must be in accordance with your local or area regulatory authorities. This information presented below only applies to the material as supplied. The identification based on characteristic(s)

or listing may not apply if the material has been used or otherwise contaminated. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste identification and disposal methods in compliance with applicable regulations. If the material as supplied becomes a waste, follow all applicable regional, national and local laws.

## 14. Transport Information

### DOT Non-Bulk
**Proper Shipping Name:** SULFURYL FLUORIDE
**Hazard Class:** 2.3 **ID Number:** UN2191

### DOT Bulk
**Proper Shipping Name:** SULFURYL FLUORIDE
**Hazard Class:** 2.3 **ID Number:** UN2191

### IMDG
**Proper Shipping Name:** SULFURYL FLUORIDE
**Hazard Class:** 2.3 **ID Number:** UN2191
**EMS Number:** F-C,S-U
**Marine pollutant.: Yes**

### ICAO/IATA
FORBIDDEN ON BOTH PASSENGER AND CARGO AIRCRAFT PER IATA DUE TO INHALATION HAZARD
**Additional Information**

MARINE POLLUTANT

POISON - INHALATION HAZARD, Zone D

*This information is not intended to convey all specific regulatory or operational requirements/information relating to this product. Additional transportation system information can be obtained through an authorized sales or customer service representative. It is the responsibility of the transporting organization to follow all applicable laws, regulations and rules relating to the transportation of the material.*

## 15. Regulatory Information

### OSHA Hazard Communication Standard
This product is a “Hazardous Chemical” as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

### Superfund Amendments and Reauthorization Act of 1986 Title III (Emergency Planning and Community Right-to-Know Act of 1986) Sections 311 and 312

| | |
|---|---|
| **Immediate (Acute) Health Hazard** | Yes |
| **Delayed (Chronic) Health Hazard** | Yes |
| **Fire Hazard** | No |
| **Reactive Hazard** | No |
| **Sudden Release of Pressure Hazard** | Yes |

**Superfund Amendments and Reauthorization Act of 1986 Title III (Emergency Planning and Community Right-to-Know Act of 1986) Section 313**
This product contains the following substances which are subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and which are listed in 40 CFR 372.

| Component | CAS # | Amount |
|---|---|---|
| Sulfuryl Fluoride | 2699-79-8 | 99.8% |

**Pennsylvania (Worker and Community Right-To-Know Act): Pennsylvania Hazardous Substances List and/or Pennsylvania Environmental Hazardous Substance List:**
The following product components are cited in the Pennsylvania Hazardous Substance List and/or the Pennsylvania Environmental Substance List, and are present at levels which require reporting.

| Component | CAS # | Amount |
|---|---|---|
| Sulfuryl Fluoride | 2699-79-8 | 99.8% |

**Pennsylvania (Worker and Community Right-To-Know Act): Pennsylvania Special Hazardous Substances List:**
The following product components are cited in the Pennsylvania Special Hazardous Substance List, and are present at levels which require reporting.

| Component | CAS # | Amount |
|---|---|---|
| 1,2-Dichloroethane | 107-06-2 | 0.04% |

**Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) Section 103**
To the best of our knowledge, this product does not contain chemicals at levels which require reporting under this statute.

**California Proposition 65 (Safe Drinking Water and Toxic Enforcement Act of 1986)**
This product contains no listed substances known to the State of California to cause cancer, birth defects or other reproductive harm, at levels which would require a warning under the statute.

**US. Toxic Substances Control Act**
All components of this product are on the TSCA Inventory or are exempt from TSCA Inventory requirements under 40 CFR 720.30

## 16. Other Information

### Hazard Rating System

| NFPA | Health | Fire | Reactivity |
|---|---|---|---|
| | 3 | 0 | 1 |

### Revision

Identification Number: 50104 / 1016 / Issue Date 10/11/2011 / Version: 5.0
DAS Code: XRM-5162
Most recent revision(s) are noted by the bold, double bars in left-hand margin throughout this document.

### Legend

| | |
|---|---|
| N/A | Not available |
| W/W | Weight/Weight |
| OEL | Occupational Exposure Limit |
| STEL | Short Term Exposure Limit |
| TWA | Time Weighted Average |
| ACGIH | American Conference of Governmental Industrial Hygienists, Inc. |
| DOW IHG | Dow Industrial Hygiene Guideline |
| WEEL | Workplace Environmental Exposure Level |
| HAZ_DES | Hazard Designation |
| Action Level | A value set by OSHA that is lower than the PEL which will trigger the need for activities such as exposure monitoring and medical surveillance if exceeded. |

*Dow AgroSciences LLC urges each customer or recipient of this (M)SDS to study it carefully and consult appropriate expertise, as necessary or appropriate, to become aware of and understand the data contained in this (M)SDS and any hazards associated with the product. The information herein is provided in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is given. Regulatory requirements are subject to change and may differ between various locations. It is the buyer's/user's responsibility to ensure that his activities comply with all federal, state, provincial or local laws. The information presented here pertains only to the product as shipped. Since conditions for use of the product are not under the control of the manufacturer, it is the buyer's/user's duty to determine the conditions necessary for the safe use of this product. Due to the proliferation of sources for information such as manufacturer-specific (M)SDSs, we are not and cannot be responsible for (M)SDSs obtained from any source other than ourselves. If you have obtained an (M)SDS from another source or if you are not sure that the (M)SDS you have is current, please contact us for the most current version.*