MATERIAL SAFETY DATA SHEET

SECTION 1. PRODUCT IDENTIFICATION

PRODUCT NAME: 50 wt.% Deoxo-Fluor™ in THF
CHEMICAL NAME: Bis-(2-methoxyethyl) aminosulfur Trifluoride in Tetrahydrofuran
CA INDEX NAME: Sulfur, trifluoro [2-methoxy-N-(2-methoxyethyl) ethanaminato-κ N]-, (T-4) in Tetrahydrofuran
MANUFACTURER: Air Products and Chemicals, Inc.
7201 Hamilton Boulevard
Allentown, PA 18195-1501

PRODUCT INFORMATION: 1-800-752-1597 or www.airproducts.com
MSDS NUMBER: 0626
REVISION: 0
EFFECTIVE DATE: October 2002

SECTION 2. COMPOSITION / INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS #</th>
<th>Wt. %</th>
<th>OSHA TWA</th>
<th>ACGIH -TWA</th>
<th>ACGIH -STEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bis-(2-methoxyethyl) aminosulfur Trifluoride</td>
<td>202289-38-1</td>
<td>50</td>
<td>Not</td>
<td>Not</td>
<td>Not</td>
</tr>
<tr>
<td>Tetrahydrofuran</td>
<td>109-99-9</td>
<td>50</td>
<td>200 ppm</td>
<td>200 ppm</td>
<td>250 ppm</td>
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</tbody>
</table>

Note: Deoxo-Fluor™ Fluorinating Reagent reacts with water and with water vapor, generating hydrogen fluoride. ACGIH recommends a 3 ppm Ceiling limit for hydrogen fluoride in air.

SECTION 3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW
Highly flammable, toxic, corrosive to skin, water-reactive liquid. Direct skin or eye contact can cause severe burns. Harmful by inhalation and ingestion. Reacts with water, forming hydrogen fluoride. Keep away from moisture.

EMERGENCY TELEPHONE NUMBERS
(800) 523-9374 in Continental U.S., Canada and Puerto Rico
(610) 481-7711 other locations

POTENTIAL HEALTH EFFECTS INFORMATION:
EYE CONTACT: Corrosive to the eyes.
INGESTION: Toxic if ingested.
INHALATION: Toxic if inhaled.
SKIN CONTACT: Corrosive to the skin.
CARCINOGENICITY: Unknown
SECTION 4. FIRST AID

Prompt medical attention is required in all cases of exposure to this product. Effects may be delayed.

EYE CONTACT: While holding eyelids open, flush eyes with water until calcium gluconate solution is available. Seek medical treatment immediately. Trained personnel should administer 1% calcium gluconate solution by continuous drip.

INGESTION: Do not induce vomiting. Dilute acid by drinking water, several ounces of Milk of Magnesia, milk, Mylanta, or several vials of calcium gluconate. Gastric lavage with lime (calcium oxide) water may be performed by a physician.

INHALATION: Move exposed personnel to uncontaminated area. Seek prompt medical attention. If not breathing, give artificial respiration. Mouth to mouth resuscitation is not recommended. If breathing is difficult, give oxygen. Continue with administration of oxygen while waiting for medical attention. If airway obstruction occurs the placement of an artificial airway, by an emergency medical technician, may be necessary. Trained personnel should administer 2.5% calcium gluconate by nebulizer with patient in sitting position.

SKIN CONTACT: Flush with copious amounts of water until treatment is available. Remove contaminated clothing. With gloved hand apply 2.5% calcium gluconate gel to the burn area. An alternative treatment is immersion in an iced solution of 0.2% Hyamine 1622 (benzethonium chloride) or 0.13% Zephiran (benzalkonium chloride). If immersion is impractical, soaked compresses of the same solution should be applied to the area. Immersion or compresses must be used continuously for two hours. Compresses should be changed every two minutes. Burns covering an area greater than eight square inches require immediate treatment by a physician. A physician should be consulted for all exposures.

NOTES TO PHYSICIAN: If pain persists after above topical treatments, it may be necessary to inject 5% aqueous calcium gluconate beneath, around and into the burn area. This will more likely be necessary in the treatment of extensive burns or small burns where treatment has been delayed.

The patient should be observed for clinical symptoms of hypocalcemia following ingestion or inhalation or following extensive burns. Serum calcium, potassium and magnesium determinations must be performed immediately and periodically to monitor for hypocalcemia and electrolyte imbalance. EKGs should be done immediately and periodically to monitor for arrhythmias, hypocalcemia and hyperkalemia.

If additional information is needed call the Air Products’ emergency number (Section 3) or consult the Air Products’ Safetygram 29 “Treatment Protocol for Hydrofluoric Acid Burns.”

SECTION 5. FIRE AND EXPLOSION

FLASH POINT: ~ -17°C (1°F)  AUTOIGNITION: ~ 321°C (610°F)  FLAMMABLE RANGE: 2% - 11% (vol.)

EXTINGUISHING MEDIA: Carbon Dioxide or dry chemical. Do not use water.

HAZARDOUS COMBUSTION PRODUCTS: Hydrogen fluoride, carbon monoxide, sulfur oxides and organic amines.

SPECIAL FIRE FIGHTING INSTRUCTIONS: Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Combustion products are highly corrosive.
SECTION 6. ACCIDENTAL RELEASE MEASURES
Evacuate the area. Eliminate all sources of ignition. All equipment used when handling this product must be grounded. Do not touch or walk through spilled material. Wear self-contained breathing apparatus, splash suit, rubber boots, and heavy rubber gloves. **Do not use water.** Stop leak if you can do it without risk. Prevent entry into waterways, sewers, basements or confined areas. Cover spill with dry, powdered limestone (calcium carbonate), sand, or soda ash. Use clean non-sparking tools to collect absorbed material. Place in covered (not sealed) Teflon containers and transport outdoors. Neutralize material prior to disposal (see Section 13. Disposal Considerations). After material pickup is complete, ventilate area and wash spill site with a dilute caustic solution, such as bicarbonate.

SECTION 7. HANDLING AND STORAGE
**STORAGE:** Product must be packaged and stored in a moisture free environment, away from heat, sparks, open flame and strong oxidizing agents. Product should be isolated from the ambient air by using a dry, inert atmosphere, such as nitrogen or argon. Package container must be Teflon™. Vapor space above stored liquid may be flammable/explosive unless blanketed with inert gas.

**HANDLING:** Keep container tightly closed when not in use. Extinguish all ignition sources. Wear recommended personal protective equipment. Containers must be properly grounded before beginning transfer. All electrical equipment should be grounded and conform to applicable electric codes and regulatory requirements. Work in an inert, moisture-free atmosphere, such as a glove box. Use only non-sparking tools. When using heat baths with this material do not use silicone oil as the heat transfer fluid. Fluorinated oils or high boiling hydrocarbon oils make acceptable heat transfer fluids. Deoxo-Fluor reacts violently with silicone oil, which may result in a fire.

SECTION 8. PERSONAL PROTECTION/ EXPOSURE CONTROLS
**ENGINEERING CONTROLS:**
Electrical equipment should be grounded and conform to applicable electrical code.

**VENTILATION:** Provide local exhaust or general room ventilation to minimize exposure to vapors. Both local exhaust and good general room ventilation must be provided not only to control exposure but also to prevent formation of flammable mixtures.

**RESPIRATORY PROTECTION:**
**EMERGENCY USE:** Half-face respiration with acid gas cartridge during clean up or Self Contained Breathing Apparatus (SCBA) during emergency situations.

**PROTECTIVE GLOVES:** Wear chemical resistant gloves and splash suit. Wash equipment after use.

**EYE PROTECTION:** Wear safety goggles and face shield (8 inch minimum).

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES
**APPEARANCE, ODOR AND STATE:** Yellow to brown liquid at room temperature, which may fume slightly in moist air. Ether-like odor. (May also have sharp, acidic odor associated with the resulting formation of hydrogen fluoride.)

**MOLECULAR WEIGHT:** 108.7 (Average)

**BOILING POINT:** THF 65°C (149°F)  
Deoxo-Fluor™ decomposition > 72°C (162 °F)

**FREEZING POINT/ MELTING POINT:** Unknown

**VAPOR PRESSURE (AT 20°C):** 106 mmHg

**SPECIFIC GRAVITY (AT 20°C):** 1.02

**SOLUBILITY:** Reacts violently with water.
SECTION 10. STABILITY AND REACTIVITY

CHEMICAL STABILITY: Stable at room temperature in the absence of moisture. However, refrigeration to (0°-4°C) is recommended for long term storage (over months).

CONDITIONS TO AVOID: Heat, sparks, open flame, other ignition sources, and oxidizing conditions. Avoid contact with moisture. Avoid elevated temperatures. Pure Deoxo-Fluor has been shown to undergo decomposition, which may be rapid, when heated above 100 °C in a confined vessel.

INCOMPATIBILITY (Materials to Avoid): WATER, aqueous acids, aqueous bases, silicone oil, oxidizers.

REACTIVITY: Reacts with alcohols, aldehydes, ketones strong oxidizers, and carboxylic acids. Reacts violently with water to form hydrogen fluoride. Reacts with silicone oil, which may result in a fire.

A) HAZARDOUS DECOMPOSITION PRODUCTS: Toxic gases: hydrogen fluoride, sulfur oxyfluorides and sulfur oxides.

B) HAZARDOUS POLYMERIZATION: Not known to occur.

Preliminary test data indicate explosive behavior under certain test conditions.

SECTION 11. TOXICOLOGICAL INFORMATION

The toxicological properties of this product have not been fully investigated.

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS #</th>
<th>LD₅₀</th>
<th>LC₅₀</th>
<th>Test Animal/Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bis-(2-methoxyethyl) aminosulfur Trifluoride</td>
<td>202289-38-1</td>
<td>&lt;200 mg/Kg</td>
<td>N/A</td>
<td>Rat/Single Dose (Oral)</td>
</tr>
<tr>
<td>Tetrahydrofuran</td>
<td>109-99-9</td>
<td>-</td>
<td>21,000 ppm</td>
<td>Rat/3 hr. (Inhl)</td>
</tr>
</tbody>
</table>

DOT Test for Skin Corrosivity: Product is corrosive.

SECTION 12. ECOLOGICAL INFORMATION

The ecological effects of this product have not been fully investigated.

SECTION 13. DISPOSAL CONSIDERATIONS

WASTE DISPOSAL METHOD: Do not return unused product or empty container to supplier. To the Deoxo-Fluor reagent or residues of the reagent in containers etc., that are to be disposed of, add THF to result in an approximately 20% by volume solution of the Deoxo-Fluor reagent in THF. Externally cool the solution to about 0°C and then slowly add in small portions a 2 molar equivalent of methanol, with stirring. Neutralize the resulting solution by the addition of aqueous sodium bicarbonate until carbon dioxide evolution ceases and the resulting mixture is neutral or slightly basic. The neutralization reaction is vigorous; proper precautions must be taken. Proper personal protective equipment (i.e., acid suit, rubber gloves, face shield) is required. Neutralization procedure must be done in an area with adequate forced ventilation. Empty containers should be rinsed with acetonitrile prior to disposal. The resulting neutralized product mixture and its' containers should be disposed of in accordance with federal, state, and local regulations.

SECTION 14. TRANSPORTATION

DOT/IMO SHIPPING NAME: Flammable liquid, toxic corrosive, n.o.s., PG II, UN 3286

HAZARD CLASS: 3

IDENTIFICATION NUMBER: UN 3286

SHIPPING LABEL(S): 3, 6.1, 8

PACKING GROUP: Packing Group II

NAERG: #131
SECTION 15. REGULATORY INFORMATION

U.S. FEDERAL REGULATIONS:

EPA - ENVIRONMENTAL PROTECTION AGENCY
TSCA: Toxic Substance Control Act
All components of this product are listed or are exempt from listing on the TSCA inventory.
Compounds used solely as a pharmaceutical intermediate and are exempt from TSCA’s Pre-Manufacturing Notification Requirement (40 CFR 720.3 (e)(6)).

Reportable Quantity: Not established

SARA TITLE III: Superfund Amendment and Reauthorization Act
SECTION 302/304: Requires emergency planning on threshold planning quantities (TPQ) and release reporting based on reportable quantities (RQ) of EPA’s extremely hazardous substances (40 CFR Part 355).
Extremely Hazardous Substances: Not applicable

SECTION 311/312: Require submission of material safety data sheets (MSDSs) and chemical inventory reporting with identification of EPA defined hazard classes (40 CFR Part 370). The hazard classes for this product are:
IMMEDIATE HEALTH: Yes PRESSURE: No
ACUTE: Yes REACTIVITY: Yes
DELAYED HEALTH: Unknown FIRE: Yes

SECTION 313: Requires submission of annual reports of release of toxic chemicals that appear in 40 CFR 372.
Required reporting under Section 313: No

STATE REGULATIONS:
Proposition 65: This product does NOT contain any listed substance which the State of California requires under this statute.

This material, by definition, is a VOC (Volatile Organic Compound).

SECTION 16. OTHER INFORMATION

No other information available.