

MATERIAL  
SAFETY  
DATA SHEET

<b>PRODUCT NAME</b> Fluorine	<b>CAS#</b> 7782-41-4
<b>TRADE NAME AND SYNONYMS</b> Fluorine	<b>DOT I.D. NO.</b> UN 1045
<b>CHEMICAL NAME AND SYNONYMS</b> Fluorine	<b>DOT HAZARD CLASS</b> Division 2.3 (Poison Gas)
<b>ISSUE DATE AND REVISIONS</b> Revised March 2007	<b>FORMULA</b> F <sub>2</sub>

### HEALTH HAZARD DATA

<b>EMERGENCY OVERVIEW</b> Fluorine is a pale yellow gas with a sharp odor that ignites most organic materials and many metals. It is the strongest oxidizing agent, which reacts violently with water.
<b>SYMPTOMS OF EXPOSURE</b> Corrosive and irritating to the upper and lower respiratory tracts, skin and eyes. It hydrolyzes very rapidly yielding hydrofluoric acid so that skin burns and mucosal irritation are like that from exposure to that acid. Symptoms include lacrymation, cough, labored breathing and excessive salivary and sputum formation. Excessive irritation of the lungs causes acute pneumonitis and pulmonary edema which would be fatal. Hydrofluoric acid dermal burns exhibit severe pain, redness, possible swelling and early necrosis.
<b>TOXICOLOGICAL PROPERTIES</b> Fluorine is highly toxic, which is irritating and corrosive to all living tissues. Toxic level exposure to dermal tissue causes hydrofluoric acid burns and skin lesions resulting in necrosis and eventual scarring. Burns are progressive while any residual active fluorides remain. Chemical pneumonitis and pulmonary edema result from exposure to the lower respiratory tract and deep lung. Residual pulmonary malfunction might also occur. Burns of the eye result in lesions and possible loss of vision. Extended low level systemic absorption of fluorine may cause fluorosis, an abnormal calcification pattern of the skeletal system.  Fluorine is not listed in the IARC, NTP or by OSHA as a carcinogen or potential carcinogen.
<b>RECOMMENDED FIRST AID TREATMENT</b>  PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE TO FLUORINE. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS. <u>Inhalation:</u> Conscious persons should be assisted to an uncontaminated area and inhale fresh air. Quick removal from the contaminated area is most important. Unconscious persons should be moved to an uncontaminated area, given assisted respiration and supplemental oxygen. Further treatment should be symptomatic and supportive. <u>Contacts:</u> Flush contaminated area with copious quantities of water.

### HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES

Fluorine is the most powerful oxidizing agent known. It reacts with virtually all inorganic and organic substances. Some of the inert gases and some perfluorinated organic compounds in their pure form are not oxidized by fluorine. The reaction of metals with fluorine is relatively slow at room temperature, but becomes vigorous and self-sustaining if the temperature is elevated.

### PHYSICAL DATA

BOILING POINT -306.6°F	LIQUID DENSITY AT BOILING POINT 1502 kg/m <sup>3</sup>
VAPOR PRESSURE @ 70°F Above the critical temp. of -200.9°F	GAS DENSITY AT 70°F, 1 atm 1.57 kg/m <sup>3</sup>
SOLUBILITY IN WATER Reacts violently	FREEZING POINT -363.5°F
EVAPORATION RATE N/A	SPECIFIC GRAVITY (AIR=1) 1.31 @ 70°F
APPEARANCE AND ODOR Pale yellow gas, choking ozone-like odor.	

### FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used) N/A	AUTO IGNITION TEMPERATURE N/A
EXTINGUISHING MEDIA N/A	FLAMMABLE LIMITS % BY VOLUME LEL N/A UEL N/A
SPECIAL FIRE FIGHTING PROCEDURES Fires with fluorine as the oxidizer can only be extinguished by shutting off the source of fluorine. Do not use water, chemicals, carbon dioxide or other extinguishing media; these will only add more fuel to the fire.	
UNUSUAL FIRE AND EXPLOSION HAZARDS Combustion products from a fire with fluorine as an oxidizer are generally extremely toxic and reactive. These products usually include hydrogen fluoride and oxygen difluoride.	

### REACTIVITY DATA

STABILITY	CONDITIONS TO AVOID	
Unstable		N/A
Stable	X	
INCOMPATIBILITY (Materials to avoid) Incompatible with ALL materials except certain perfluorinated hydrocarbons and some metals which have been "passivated".		
HAZARDOUS POLYMERIZATION	HAZARDOUS THERMAL DECOMPOSITION PRODUCTS	
May Occur		None
Will Not Occur	X	

### SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED Evacuate all personnel from affected area. Wear Self-Contained Breathing Apparatus and protective clothing.
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**WASTE DISPOSAL METHOD**

Waste disposal must be in accordance with appropriate Federal, State, and local regulations. For emergency disposal assistance, contact HSG for specific advice.

### SPECIAL PROTECTION INFORMATION

<b>RESPIRATORY PROTECTION (Specify type)</b> Positive pressure air line with mask or self-contained breathing apparatus should be available for emergency use.	
<b>VENTILATION</b> Hood with forced ventilation.	<b>SPECIAL</b> N/A
<b>MECHANICAL (Gen.)</b> N/A	<b>OTHER</b> N/A
<b>LOCAL EXHAUST</b> To prevent accumulation above the TWA (0.1 Molar ppm).	
<b>PROTECTIVE GLOVES</b> Plastic or rubber	
<b>EYE PROTECTION</b> Safety goggles or glasses, face shield	
<b>OTHER PROTECTIVE EQUIPMENT</b> Safety shoes, safety shower, eyewash "fountain" and neoprene apron.	

### SPECIAL PRECAUTIONS\*

<b>SPECIAL LABELING INFORMATION</b> DOT Shipping Name: Fluorine, Compressed DOT Shipping Label: Poison Gas, Oxidizer	DOT Hazard Class: Division 2.3 I.D. No.: UN 1045
<b>SPECIAL HANDLING RECOMMENDATIONS</b> Use only in well-ventilated areas. Valve protection caps must remain in place unless cylinder is secured with valve outlet piped to use point. Do not drag, slide or roll cylinders. Use a suitable hand truck for cylinder movement. Use a pressure-reducing regulator when connecting cylinder to lower pressure (<500 psig) piping or system. Do not heat cylinder by any means to increase the discharge rate of product from the cylinder. Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder.	
<b>SPECIAL STORAGE RECOMMENDATIONS</b> Protect cylinders from physical damage. Store in cool, dry, well-ventilated area away from heavy traffic areas and emergency exits. Do not allow the temperature where cylinders are stored to exceed 125°F. Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. Full and empty cylinders should be segregated. Use a "first in - first out" inventory system to prevent full cylinders being stored for excessive periods of time. Isolate fluorine from other flammable products.	
<b>OTHER RECOMMENDATIONS OR PRECAUTIONS</b> Keep equipment meticulously dry. Many of the metal fluorides are water soluble so that the passive film corrosion protection may be destroyed if wetted with water. Compressed gas cylinders should not be refilled except by qualified producers of compressed gases.	

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