

HYDROGEN FLUORIDE

HFx

CAUTIONARY RESPONSE INFORMATION

Common Synonyms Hydrofluoric acid, anhydrous	Liquid or Gas	Colorless	Sharp, irritating odor
Sinks and mixes with water. Poisonous vapor is produced and slowly rises. Boiling point is 67°F.			
<p style="color: red; margin: 0;">Evacuate. Keep people away. AVOID CONTACT WITH LIQUID AND VAPOR. Wear chemical protective suit including self-contained breathing apparatus. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.</p>			
Fire	Not flammable. Flammable gas may be produced on contact with metals. Wear chemical protective suit including self-contained breathing apparatus.		
Exposure	<p>CALL FOR MEDICAL AID.</p> <p>VAPOR POISONOUS IF INHALED. Irritating to eyes, nose and throat. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.</p> <p>LIQUID POISONOUS IF SWALLOWED. Will burn skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.</p>		
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

<p>1. CORRECTIVE RESPONSE ACTIONS</p> <p>Dilute and disperse Stop discharge Chemical and Physical Treatment: Neutralize Do not add water to undissolved material</p>	<p>2. CHEMICAL DESIGNATIONS</p> <p>2.1 CG Compatibility Group: Not listed. 2.2 Formula: HF 2.3 IMO/UN Designation: 2.0/1052 2.4 DOT ID No.: 1052 2.5 CAS Registry No.: 7664-39-3 2.6 NAERG Guide No.: 125 2.7 Standard Industrial Trade Classification: 52241</p>
<p>3. HEALTH HAZARDS</p>	
<p>3.1 Personal Protective Equipment: Acid-resistant hat, safety goggles, face shield, jacket, overalls, gauntlet-type gloves, and boots. The goggles and face shield must have plastic lenses. There must be a shower and an eye wash. Observe all precautions contained in the Manufacturing Chemists' Association Chemical Safety Data Sheet SD-25.</p> <p>3.2 Symptoms Following Exposure: Serious and painful burns of eyes, skin and respiratory tract; pulmonary edema.</p> <p>3.3 Treatment of Exposure: INGESTION: have victim drink water or milk; do NOT induce vomiting. SKIN: flush with water; consult physician. EYES: flush with water for at least 15 min.; consult physician.</p> <p>3.4 TLV-STEL: Not listed. 3.5 TLV-TWA: Not listed. 3.6 TLV-Ceiling: 3 ppm as F</p> <p>3.7 Toxicity by Ingestion: Oral LD₅₀ = 80 mg/kg (guinea pig)</p> <p>3.8 Toxicity by Inhalation: Currently not available.</p> <p>3.9 Chronic Toxicity: Currently not available</p> <p>3.10 Vapor (Gas) Irritant Characteristics: Vapors cause severe irritation of eye and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.</p> <p>3.11 Liquid or Solid Characteristics: Severe skin irritant. Causes second-and third-degree burns on short contact; very injurious to the eyes.</p> <p>3.12 Odor Threshold: 0.03 mg/m³</p> <p>3.13 IDLH Value: 30 ppm as F</p> <p>3.14 OSHA PEL-TWA: 3 ppm as F 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: Not listed. 3.17 EPA AEGL: Not listed</p>	

4. FIRE HAZARDS

- 4.1 **Flash Point:**
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic and irritating vapors are generated when heated.
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** Not flammable
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not flammable
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Dissolves with liberation of heat.
- 5.2 **Reactivity with Common Materials:** Will attack glass, concrete and certain metals, especially those containing silica, such as cast iron. Will attack natural rubber, leather, and many organic materials. May generate flammable hydrogen gas in contact with some metals.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water; apply powdered limestone, slaked lime, soda ash, or sodium bicarbonate.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**
60 ppm*/fish/lethal/fresh water
*Time period not specified
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**
Bioaccumulation: 0
Damage to living resources: 2
Human Oral hazard: (2)
Human Contact hazard: II
Reduction of amenities: XX

7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99-99.97%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Safety relief
- 7.5 **IMO Pollution Category:** D
- 7.6 **Ship Type:** Data not available
- 7.7 **Barge Hull Type:** Currently not available

8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material
- 8.2 **49 CFR Class:** 8
- 8.3 **49 CFR Package Group:** I
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	4
Flammability (Red).....	0
Instability (Yellow).....	0
- 8.6 **EPA Reportable Quantity:** 100 pounds
- 8.7 **EPA Pollution Category:** B
- 8.8 **RCRA Waste Number:** U134
- 8.9 **EPA FWPCA List:** Not listed

9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 20.01
- 9.3 **Boiling Point at 1 atm:** 67.1°F = 19.5°C = 292.7°K
- 9.4 **Freezing Point:** -134°F = -92.2°C = 181.0°K
- 9.5 **Critical Temperature:** 447.1°F = 230.6°C = 503.8°K
- 9.6 **Critical Pressure:** 1100 psia = 74.8 atm = 7.58 MN/m²
- 9.7 **Specific Gravity:** 0.992 at 19°C (liquid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** 0.7
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.399
- 9.12 **Latent Heat of Vaporization:** 145 Btu/lb = 80.5 cal/g = 3.37 X 10⁵ J/kg
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** -1322 Btu/lb = -734.6 cal/g = -30.76 X 10⁵ J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 54.7 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** High

NOTES

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9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
0	65.219	18	0.836		N		N
5	64.980	20	0.836		O		O
10	64.740	22	0.836		T		T
15	64.500	24	0.836				
20	64.250	26	0.836		P		P
25	64.009	28	0.836		E		E
30	63.770	30	0.836		R		R
35	63.530	32	0.836		T		T
40	63.280	34	0.836		I		I
45	63.040	36	0.836		N		N
50	62.800	38	0.836		E		E
55	62.550	40	0.836		N		N
60	62.310	42	0.836		T		T
65	62.070	44	0.836				
		46	0.836				
		48	0.836				
		50	0.836				
		52	0.836				
		54	0.836				
		56	0.836				
		58	0.836				
		60	0.836				
		62	0.836				
		64	0.836				
		66	0.836				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M	-75	0.331	-75	0.00160	0	0.348
	I	-70	0.397	-70	0.00190	25	0.348
	S	-65	0.474	-65	0.00224	50	0.348
	C	-60	0.563	-60	0.00263	75	0.348
	I	-55	0.667	-55	0.00307	100	0.348
	B	-50	0.786	-50	0.00358	125	0.348
	L	-45	0.923	-45	0.00415	150	0.348
	E	-40	1.079	-40	0.00479	175	0.348
		-35	1.258	-35	0.00552	200	0.348
		-30	1.461	-30	0.00634	225	0.348
		-25	1.690	-25	0.00725	250	0.348
		-20	1.950	-20	0.00827	275	0.348
		-15	2.242	-15	0.00940	300	0.348
		-10	2.569	-10	0.01065	325	0.348
		-5	2.936	-5	0.01204	350	0.348
		0	3.346	0	0.01357	375	0.348
		5	3.801	5	0.01525	400	0.348
		10	4.308	10	0.01710	425	0.348
		15	4.868	15	0.01912	450	0.348
		20	5.488	20	0.02133	475	0.348
		25	6.171	25	0.02374	500	0.348
		30	6.923	30	0.02635	525	0.348
						550	0.348
						575	0.348
						600	0.348