

## **STANDARD OPERATING PROCEDURE**

### **Safe Use of Hydrofluoric Acid (HF)**

Hydrofluoric acid, a solution of hydrogen fluoride gas (HF) in water, is one of the most corrosive and dangerous chemicals encountered in the laboratory. Exposure to HF can cause severe tissue damage and even death. Deaths have been reported from concentrated acid burns (involving  $\geq 50\%$  HF solutions) to as little as 2.5% of body surface area. In lower concentrations, symptoms may be delayed. The following special safety precautions are necessary when using this chemical, regardless if using diluted or concentrated HF.

#### **SAFETY DATA SHEET (SDS):**

Review carefully the attached Safety Data Sheet (or the Safety Data Sheet on the manufacturer's web site) before working with Hydrofluoric Acid.

#### **CEMS:**

Go to Chemical Environmental Management System (CEMS) <http://cems.uta.edu> to locate Hydrofluoric Acid in your laboratory.

#### **TRAINING:**

Complete online Hazard Communication and Waste Management training and receive Site Specific training from your PI/Lab Manager/Chemical Owner which includes reviewing the hazards of Hydrofluoric Acid (HF), safety precautions, and emergency procedures. Fill out the attached Site Specific training form and submit to [ehsafety@uta.edu](mailto:ehsafety@uta.edu).

#### **ENGINEERING CONTROLS AND SAFETY EQUIPMENT:**

Plan the operation to eliminate risk of Hydrofluoric Acid (HF) splash/spray. Ensure the nearest emergency safety shower/eye wash is accessible and has been tested within the last 12 months. Ensure laboratory fume hood has been tested within last 12 months and is functioning properly.

#### **FIRST AID:**

Ensure 2.5% Calcium Gluconate gel (intended for dermal exposures) is available in the laboratory and not expired. It is used in responding to Hydrofluoric Acid exposure to the body, mitigating or preventing the related pain and potential tissue burns and bone damage. Calcium gluconate combines with hydrofluoric acid to neutralize the powerful fluoride ion. Familiarize yourself with FIRST AID MEASURES described in the attached Safety Data Sheet.

**Remember: all HF burns or exposure should be referred to a hospital after washing and starting initial first-aid procedures with Calcium Gluconate gel.**

### **PERSONAL PROTECTIVE EQUIPMENT (PPE):**

Check PPE for damage before using. Wear appropriate PPE, which minimally includes:

- Goggles and face shield.
- Butyl rubber or neoprene gloves (consider double gloving).
- Lab coat and neoprene long-sleeve apron.
- Closed-toe shoes.

### **WORK PRACTICES:**

- Work in the fume hood with the sash opened as little as possible.
- Purchase and use the smallest quantities of HF necessary.
- Establish designated area for HF use and post sign “Hydrofluoric Acid Use Area.” Also post sign on lab door when in use.
- Do not work alone; others present in the laboratory must be familiar with the operation’s hazards and emergency procedures.
- Add acid to water, not water to acid.
- Do not use glass, ceramic, or other incompatible containers with HF.
- Ensure secondary containment and segregation of incompatible chemicals.
- Store HF solutions below eye level.

## SAFETY DATA SHEET

Version .  
Revision Date 1/21/2 2  
Print Date /3 /2 2

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : Hydrofluoric acid

Product Number :  
Brand : SIGALD  
CAS-No. : 7 4-3 -3

**1.2 Relevant identified uses of the substance or mixture and uses advised against**

Identified uses : Laboratory chemicals, Synthesis of substances

**1.3 Details of the supplier of the safety data sheet**

Company : Sigma-Aldrich Inc.  
3 Spruce Street  
ST. LOUIS MO 31 3  
UNITED STATES

Telephone : +1 314 771- 7  
Fax : +1 32 - 2

**1.4 Emergency telephone number**

Emergency Phone # : +1-7 3- 27-3 7

**SECTION 2: Hazards identification****2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Acute toxicity, Oral (Category 2), H3  
Acute toxicity, Inhalation (Category 2), H33  
Acute toxicity, Dermal (Category 1), H31  
S in corrosion (Category 1B), H314  
Serious eye damage (Category 1), H31

For the full text of the H-Statements mentioned in this Section, see Section 1 .

**2.2 GHS Label elements, including precautionary statements**

Pictogram



Signal word : Danger

Hazard statement(s)  
H3 + H31 + H33 : Fatal if swallowed, in contact with skin or if inhaled.

H314	Causes severe skin burns and eye damage.
Precautionary statement(s)	
P2	Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
P2 2	Do not get in eyes, on skin, or on clothing.
P2 4	Wash skin thoroughly after handling.
P27	Do not eat, drink or smoke when using this product.
P271	Use only outdoors or in a well-ventilated area.
P2	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P2 4	Wear respiratory protection.
P3 1 + P31 + P33	IF SWALLOWED: Immediately call a POISON CENTER/doctor. Rinse mouth.
P3 1 + P33 + P331	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P3 2 + P3 + P31	IF ON SKIN: Gently wash with plenty of soap and water. Immediately call a POISON CENTER or doctor / physician.
P3 3 + P3 1 + P3 3	IF ON SKIN (other): Take off immediately all contaminated clothing. Rinse skin with water/shower.
P3 4 + P34 + P31	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER/doctor.
P3 + P3 1 + P33 + P31	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/doctor.
P3 2	Take off contaminated clothing and wash before reuse.
P4 3 + P233	Store in a well-ventilated place. Keep container tightly closed.
P4	Store locked up.
P 1	Dispose of contents/ container to an approved waste disposal plant.

**2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none**

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**SECTION 3: Composition/information on ingredients**

**3.2 Mixtures**

Formula : HF  
Molecular weight : 20.1 g/mol

Component	Classification	Concentration
<b>Hydrofluoric acid</b>		
CAS-No. 74-34-3	Acute Tox. 2; Acute Tox. 1; Skin Cor. 1A; Eye Dam. 1; H302, H314, H315, H317, H318, H319, H330, H332, H334, H335, H336, H410	>= 3% - < 100%
EC-No. 231-34-3		
Index-No. - 3- -1		

For the full text of the H-Statements mentioned in this Section, see Section 1.

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**SECTION 4: First aid measures**

**4.1 Description of first aid measures**

**General advice**

Consult a physician. Show this safety data sheet to the doctor in attendance. Hydrofluoric acid (HF) requires immediate and specialized first aid and medical treatment.

Symptoms may be delayed up to 24 hours depending on the concentration of HF. After decontamination with water, further damage can occur due to penetration/absorption of the fluoride ion. Treatment should be directed toward binding the fluoride ion as well as the effects of exposure. Skin exposures can be treated with a 2.5% calcium gluconate gel repeated until burning ceases. More serious skin exposures may require subcutaneous calcium gluconate except for digital areas unless the physician is experienced in this technique, due to the potential for tissue injury from increased pressure. Absorption can readily occur through the subungual areas and should be considered when undergoing decontamination. Prevention of absorption of the fluoride ion in cases of ingestion can be obtained by giving milk, chewable calcium carbonate tablets or Milk of Magnesia to conscious victims. Conditions such as hypocalcemia, hypomagnesemia and cardiac arrhythmias should be monitored for, since they can occur after exposure. Move out of dangerous areas.

#### **If inhaled**

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

#### **In case of skin contact**

Take off contaminated clothing and shoes immediately. Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

#### **In case of eye contact**

Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician. Continue rinsing eyes during transport to hospital.

#### **If swallowed**

Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

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

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

### **4.3 Indication of any immediate medical attention and special treatment needed**

No data available

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## **SECTION 5: Firefighting measures**

### **5.1 Extinguishing media**

#### **Suitable extinguishing media**

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

### **5.2 Special hazards arising from the substance or mixture**

Hydrogen fluoride

### **5.3 Advice for firefighters**

Wear self-contained breathing apparatus for firefighting if necessary.

### **5.4 Further information**

No data available

## SECTION 6: Accidental release measures

- 6.1 Personal precautions, protective equipment and emergency procedures**  
Wear respiratory protection. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.  
For personal protection see section 12.
- 6.2 Environmental precautions**  
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.
- 6.3 Methods and materials for containment and cleaning up**  
Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal.
- 6.4 Reference to other sections**  
For disposal see section 13.

## SECTION 7: Handling and storage

- 7.1 Precautions for safe handling**  
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.  
For precautions see section 2.2.
- 7.2 Conditions for safe storage, including any incompatibilities**  
Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.  
Storage class (TRGS 11): 1.1A: Combustible, acute toxic Cat. 1 and 2 / very toxic hazardous materials
- 7.3 Specific end use(s)**  
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

## SECTION 8: Exposure controls/personal protection

### 8.1 Control parameters

#### Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Hydrofluoric acid	7664-39-3	TWA	2 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Upper Respiratory Tract Irritation Lower Respiratory Tract Irritation Eye Irritation Skin Irritation Fluorosis Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Danger of cutaneous absorption		
		C	2 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Upper Respiratory Tract Irritation Lower Respiratory Tract Irritation Eye Irritation		

		S in irritation Fluorosis Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Danger of cutaneous absorption		
		TWA	3 ppm 2. mg/m3	USA. NIOSH Recommended Exposure Limits
		C	ppm mg/m3	USA. NIOSH Recommended Exposure Limits
		1 minute ceiling value		
		See Table Z-2		
		TWA	3 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.2 -1		
		PEL	.4 ppm .33 mg/m3	California permissible exposure limits for chemical contaminants (Title , Article 1 7)
		S in		
		STEL	1 ppm . 3 mg/m3	California permissible exposure limits for chemical contaminants (Title , Article 1 7)
		S in		
		TWA	3 ppm	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1 1 .1
		STEL 6	ppm	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1 1 .1

### Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Hydrofluoric acid	7 4-3 -3	Fluoride	2 mg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
	Remar s	Prior to shift (1 hours after exposure ceases)			
		Fluoride	3 mg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
		End of shift (As soon as possible after exposure ceases)			

## 8.2 Exposure controls

### Appropriate engineering controls

Avoid contact with s in, eyes and clothing. Wash hands before breas and immediately after handling the product.

## Personal protective equipment

### Eye/face protection

Tightly fitting safety goggles. Faceshield ( 1/2-inch minimum). Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166 (EU).

### Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact

Material: Chloroprene

Minimum layer thickness: 0.2 mm

Breath-through time: > 4 min

Material tested: Camapren® (KCL 722 / Aldrich Z 774 3, Size M)

Splash contact

Material: Nature latex/chloroprene

Minimum layer thickness: 0.2 mm

Breath-through time: 1 min

Material tested: Lapren® (KCL 700 / Aldrich Z 774 3, Size M)

data source: KCL GmbH, D-3 124 Eichenzell, phone +49 (0) 73 33 33 33, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

### Body Protection

Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific work place.

### Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 143 7) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

### Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

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## SECTION 9: Physical and chemical properties

### 9.1 Information on basic physical and chemical properties

- |                    |                   |
|--------------------|-------------------|
| a) Appearance      | Form: liquid      |
| b) Odour           | No data available |
| c) Odour Threshold | No data available |
| d) pH              | No data available |

- |   |                      |
|---|----------------------|
| e) Melting point/freezing point                 | No data available    |
| f) Initial boiling point and boiling range      | No data available    |
| g) Flash point                                  | ( )No data available |
| h) Evaporation rate                             | No data available    |
| i) Flammability (solid, gas)                    | No data available    |
| j) Upper/lower flammability or explosive limits | No data available    |
| k) Vapour pressure                              | No data available    |
| l) Vapour density                               | No data available    |
| m) Relative density                             | No data available    |
| n) Water solubility                             | No data available    |
| o) Partition coefficient: n-octanol/water       | No data available    |
| p) Auto-ignition temperature                    | No data available    |
| q) Decomposition temperature                    | No data available    |
| r) Viscosity                                    | No data available    |
| s) Explosive properties                         | No data available    |
| t) Oxidizing properties                         | No data available    |

## 9.2 Other safety information

No data available

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## SECTION 10: Stability and reactivity

### 10.1 Reactivity

No data available

### 10.2 Chemical stability

Stable under recommended storage conditions.

### 10.3 Possibility of hazardous reactions

No data available

### 10.4 Conditions to avoid

No data available

### 10.5 Incompatible materials

Strong oxidizing agents

### 10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Hydrogen fluoride

Other decomposition products - No data available

In the event of fire: see section

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## SECTION 11: Toxicological information

### 11.1 Information on toxicological effects

#### Acute toxicity

No data available

Inhalation: No data available

Dermal: No data available

No data available

#### Skin corrosion/irritation

No data available

#### Serious eye damage/eye irritation

No data available

#### Respiratory or skin sensitisation

No data available

#### Germ cell mutagenicity

No data available

#### Carcinogenicity

IARC: No component of this product present at levels greater than or equal to .1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No component of this product present at levels greater than or equal to .1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to .1% is on OSHA's list of regulated carcinogens.

#### Reproductive toxicity

No data available

#### Specific target organ toxicity - single exposure

No data available

#### Specific target organ toxicity - repeated exposure

No data available

#### Aspiration hazard

No data available

#### Additional Information

RTECS: Not available

Fluoride ion can reduce serum calcium levels possibly causing fatal hypocalcemia., Material can cause severe burns and blistering which may not be immediately painful or visible. The full extent of tissue damage may not exhibit itself for 12-24 hours after exposure., Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin., necrosis of the skin

Stomach - Irregularities - Based on Human Evidence

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## SECTION 12: Ecological information

### 12.1 Toxicity

No data available

### 12.2 Persistence and degradability

No data available

### 12.3 Bioaccumulative potential

No data available

### 12.4 Mobility in soil

No data available

### 12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

### 12.6 Other adverse effects

No data available

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## SECTION 13: Disposal considerations

### 13.1 Waste treatment methods

#### Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

#### Contaminated packaging

Dispose of as unused product.

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## SECTION 14: Transport information

### DOT (US)

UN number: 17      Class: ( .1)      Packaging group: II  
Proper shipping name: Hydrofluoric acid  
Reportable Quantity (RQ): 2    lbs  
Poison Inhalation Hazard: No

### IMDG

UN number: 17      Class: ( .1)      Packaging group: II      EMS-No: F-A, S-B  
Proper shipping name: HYDROFLUORIC ACID

### IATA

UN number: 17      Class: ( .1)      Packaging group: II  
Proper shipping name: Hydrofluoric acid

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## SECTION 15: Regulatory information

### SARA 302 Components

The following components are subject to reporting levels established by SARA Title III, Section 312:

	CAS-No.	Revision Date
Hydrofluoric acid	7 4-3 -3	2 7- 7- 1

### **SARA 313 Components**

The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Hydrofluoric acid	7 4-3 -3	2 7- 7- 1

### **SARA 311/312 Hazards**

Acute Health Hazard, Chronic Health Hazard

### **Massachusetts Right To Know Components**

No components are subject to the Massachusetts Right to Know Act.

### **Pennsylvania Right To Know Components**

	CAS-No.	Revision Date
Water	7732-1 -	
Hydrofluoric acid	7 4-3 -3	2 7- 7- 1

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## **SECTION 16: Other information**

### **Further information**

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