Standard Operating Procedures

Strong Corrosives – Strong Acids (SA) & Acutely Toxic Chemicals (ATC)

Hydrofluoric Acid

Print a copy and insert into your laboratory SOP binder.

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<th>Department:</th>
<th>Chemistry</th>
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<tr>
<td>Date SOP was written:</td>
<td>June 18, 2013</td>
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<tr>
<td>Date SOP was approved by PI/lab supervisor:</td>
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<tr>
<td>Principal Investigator:</td>
<td>Name: Richmond Sarpong</td>
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<td></td>
<td>Signature: __________________________</td>
</tr>
<tr>
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<td>Name: Rebecca Murphy</td>
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<td>Lab Phone: 510-643-2485</td>
</tr>
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<td>Emergency Contact:</td>
<td>Name: Richmond Sarpong</td>
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<td></td>
<td>Phone Number: 626-644-2407</td>
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<tr>
<td>Location(s) covered by this SOP:</td>
<td>Latimer Hall: 834, 836, 837, 838, 839, 842, 847, 849, 907</td>
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1 - Purpose

This SOP covers the precautions and safe handling procedures for the use of Hydrofluoric Acid in the Sarpong group, which include the following uses:

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2 - Physical & Chemical Properties/Definition of Chemical Group

CAS#: 7664-39-3
Molecular Formula: HF
Form: liquid
Color: colorless
Melting point/freezing point: -118.5°F (-83.6°C)
Boiling point: 67.1°F (19.5°C)
Vapor pressure: no data available
Density: 1.16 g/cm³ at 20 °C (68 °F)
Flash point: no data available
Lower explosion limit: no data available
Upper explosion limit: no data available
Odor: no data available
Odor Threshold: no data available

3 - Potential Hazards/Toxicity

GHS Classification
Acute toxicity, Oral (Category 2)
Acute toxicity, Inhalation (Category 2)
Acute toxicity, Dermal (Category 1)
Skin corrosion (Category 1A)
Serious eye damage (Category 1)

GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)
H300 + H310 Fatal if swallowed or in contact with skin
H314 Causes severe skin burns and eye damage.
H330 Fatal if inhaled.

Precautionary statement(s)
P260 Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
P264 Wash hands thoroughly after handling.
P280 Wear protective gloves/ protective clothing/ eye protection/ face protection.
P284 Wear respiratory protection.
P302 + P350 IF ON SKIN: Gently wash with plenty of soap and water.
P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P310 Immediately call a POISON CENTER or doctor/ physician.

Cal/OSHA Permissible Exposure Limits (PEL): 0.4 ppm (0.33 mg/m³) – 8 hour TWA; 1 ppm (0.83 mg/m³) – STEL (Hydrogen Fluoride, as F) with Skin Notation

4 - Engineering Controls

Use the engineering controls listed below unless other lab-specific information is included in the Protocol/Procedure section.

- A laboratory type fume hood with the sash position closed as much as possible;
- A glove box for pyrophorics and water reactive chemicals. Glove boxes may also be required for other chemicals, such as regulated carcinogens and particularly hazardous substances;
• Supplemental protective equipment like a blast shield, where appropriate, to protect from explosions when using peroxide formers, pyrophorics, water reactives, and potentially explosive chemicals.

5 - Personal Protective Equipment
For additional information on PPE requirements, go to:
http://ceehs.berkeley.edu/section5#Personnel_Protective_Equipment_Required_in_College_Laboratories

Use the PPE listed below unless other lab-specific information is included in the Protocol/Procedure section.

Eye and Face Protection
ANSI-approved safety glasses with side shields or chemical splash goggles must be worn at all times when handling chemicals in the lab.

Skin and Body Protection
1. Gloves are required when handling hazardous chemicals.
   a. Specific glove type recommendations are provided in the Protocol/Procedure section.
   b. Inspect gloves prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Wash and dry hands after handling chemicals, before breaks, and at the end of the workday.
   c. For additional information on glove selection, go to:

2. Lab coats are required when handling hazardous chemicals in the lab.
   a. Nomex 3A flame-resistant lab coats are required when working with pyrophorics (H250) and explosives (H200, H201, H202, H203)
   b. Flame resistant lab coats (Nomex or other material) should be worn when working with materials such as Category 1 or 2 flammable liquids (H224 and H225).

3. Cotton-based, non-synthetic clothing (including long pants; no skin exposed below the waist) should be worn.

4. Closed-toe and closed-heel shoes are required in the lab.

Respiratory Protection
Respiratory protection is normally not required for UC Berkeley laboratory activities. Any lab personnel considering the use of a respirator must contact EH&S for a workplace assessment. Respirator users will be provided with specific instructions if a respirator is deemed necessary by EH&S.

6 - First Aid Procedures and Medical Emergencies
Notify supervisor and EH&S immediately. Follow up with a call to 510-642-9090 to report the incident.

Life Threatening Emergency, After Hours, Weekends and Holidays – Call 911 or go to the nearest emergency room. Note: All serious injuries must be reported to EH&S within 8 hours. Follow up with a call to 510-642-9090 to report the incident.

Assess the extent of danger. If you cannot assess the conditions of the environment well enough to be sure of your own safety, do not enter the area. If possible, help contaminated or injured persons. Obtain medical attention for the individual as soon as possible by calling 911. Provide a copy of the appropriate SDS to the emergency responders or physician, as needed.

If inhaled
Move into fresh air. Go to the Occupational Health Facility (Tang Health Center) and after hours, go to the nearest emergency room. If person is not breathing, call 911 and give artificial respiration. If unconscious, call 911.

In case of skin contact

Immediately flush with flowing water for no less than 15 minutes; remove any jewelry or clothing as necessary to facilitate clearing of any residual materials. Wash off with soap and plenty of water for 15 minutes. If skin contact requires medical assistance, go to the Occupational Health Facility (Tang Health Center) and after hours, go to the nearest emergency room. If this is a large or serious injury, call 911.

In case of eye contact

Rinse thoroughly with plenty of water using an eyewash station for at least 15 minutes, occasionally lifting the upper and lower eyelids. Remove contact lenses if possible. Call 911.

If swallowed

Call 911. Do not induce vomiting unless directed otherwise by the SDS. Never give anything by mouth to an unconscious person. Rinse mouth with water. Go to the Occupational Health Facility (Tang Health Center) and after hours, go to the nearest emergency room.

Needle stick/puncture exposure

Wash the affected area with antiseptic soap and warm water for 15 minutes. For mucous membrane exposure such as eyes, mouth and/or nose, flush the affected area for 15 minutes using an eyewash station. Go to the Occupational Health Facility (Tang Health Center) and after hours, go to the nearest emergency room.

All needle stick/puncture exposures must be reported to EH&S within 8 hours. Follow up with a call to 510-642-9090 to report the incident.

7 - Special Handling and Storage Requirements

Lab-specific information on handling and storage may be included in the Protocol/Procedure section.

Working alone - Certain extremely hazardous operations should not be performed if the PI or Lab Safety Contact(s) are not present. Never work alone with extremely hazardous materials/operations. See the Protocol/Procedure section below for specific prohibitions (if any) on working alone.

Precautions for safe handling

- Avoid contact with skin and eyes. Avoid formation of vapors, dusts, mists and aerosols.
- Use appropriate exhaust ventilation.
- Use appropriate personal protective equipment.
- Remove incompatible chemicals from immediate work area.
- Keep flammable, pyrophoric, potentially explosive and water reactive chemicals away from sources of ignition
- Use care when preparing chemical solutions.

Conditions for safe storage

- Keep quantities to a minimum.
- Keep containers tightly closed and in a cool, dry and well-ventilated location.
- Keep in proper storage cabinets and shelving. Use lowest shelve possible.
- Assure chemicals are properly labeled.
- Segregate incompatible chemicals.
- Store carcinogens in a designated area.
• Provide secondary containment for chemicals in accordance with the ccEHS "Chemical Hygiene Plan": [http://ccejss.berkeley.edu/section5#Chemical_Handling_Storage_and_Transportation](http://ccejss.berkeley.edu/section5#Chemical_Handling_Storage_and_Transportation)

8 - Chemical Spill

**Spill** – Assess the extent of danger; if necessary request help by calling 911 and 510-642-9090. If you cannot assess the conditions of the environment well enough to be sure of your own safety, do not enter the area. If possible help contaminated or injured persons. Evacuate the spill area. Avoid breathing vapors from spill. If possible, confine the spill to a small area using a spill kit or absorbent material. Keep others from entering contaminated area (e.g., use caution tape, barriers, etc.).

**Minor Spill** – In the event of a minor spill, if there is no potential for hazardous chemical exposure, report the spill to 510-642-9090 and proceed to clean it, if you are trained. Use appropriate personal protective equipment and clean-up material for chemical spilled. Double bag spill waste in clear plastic bags, label and take to the next chemical waste pick-up location.

Call 510-642-9090 to report the spill to ccEHSS and for assistance.

**Major Spill** – Any hazardous chemical spill that involves chemical exposure, any chemical spill that due to size and/or hazard requires capabilities beyond your training, or any chemical spill that gives the perception (because of odor, for example) that there has been a hazardous release

Call 911 and 510-642-9090 to report the spill to ccEHSS and for assistance.

9 - Cleaning and Decontamination

Lab-specific information on decontamination may be included in the Protocol/Procedure section.

• Wearing proper PPE, laboratory work surfaces should be cleaned at the end of each work day.
• Dispose of contaminated materials in accordance with hazardous waste disposal guidelines referenced below.
• Decontaminate all equipment before removing from a designated area.

10 - Hazardous Waste Disposal

**Label Waste**

Label all containers with the label provided at: [http://ehs.berkeley.edu/hm/279-new-hazardous-waste-program-hwp.html](http://ehs.berkeley.edu/hm/279-new-hazardous-waste-program-hwp.html).

See the EH&S Fact Sheet, “Hazardous Waste Management” for general instructions on procedures for disposing of hazardous waste.

**Dispose of Waste**

• Dispose of regularly generated chemical waste within 6 months.
• Call EH&S with questions.

11 - Safety Data Sheet (SDS) Location

SDS can be accessed online at [http://ucmsds.com](http://ucmsds.com)
12 - Protocol/Procedure – Hydrofluoric Acid

| Preparation | Users of HF should familiarize themselves of the information in the EHS publication on HF (http://ehs.berkeley.edu/images/ehs/pubs/40hf.pdf). A copy of this should be posted in any area where HF is handled. HF can cause serious, painful burns of the skin. Specialized first aid and medical treatment is required immediately. Hydrofluoric acid differs from other acids because the fluoride ion readily penetrates the skin, causing destruction of deep tissue layers. Unlike other acids which are rapidly neutralized, this process may continue for days if left untreated. Burns larger than 25 square inches (160 square cm) may result in serious systemic toxicity. **Work within sight and/or hearing of at least one other person who is familiar with the hazards and written procedures.** Set up a designated area for HF use and post a warning sign during use. Post a sign at the door to the room when HF is in use. Make sure everyone in the lab knows that hydrofluoric acid is being used. Maintain the smallest amount necessary for ongoing work. Use in the smallest practical quantities for the experiment being performed. Only use plastic lab equipment for manipulating HF solutions Eliminate incompatible materials from the potential spill area (glass, silica). Make sure that calcium gluconate gel is accessible in the lab. Calcium gluconate gel must be applied quickly (even if burns have not been felt) to be effective. Know the location of the nearest sink, eyewash, safety shower, vial of calcium gluconate gel, and phone before beginning work. |
| Chemical Storage and Disposal | **Storage:** HF must always be stored in plastic (Nalgene / polypropylene) containers. DO NOT store HF in glass bottles/containers. Store in corrosive/acid storage cabinet within a secondary containment (Nalgene/ polypropylene tray or tub). Do not store in the top most shelf of the storage cabinet. Note: In general, do not store chemicals at or above eye level. Ensure the container is tightly closed at all times. Do not store with oxides, organic chemicals, bases or metals. Carefully carry the stock bottle in a rubber maid bottle carrier/Nalgene secondary container to the wet bench/chemical fume hood and pour out desired amount into a smaller container. Place stock bottle back in corrosive chemical storage cabinet with cap tightly closed. **Disposal:** Collect all HF liquid waste in labeled plastic containers. **BE SURE NOT TO MIX HF-alcohol waste with HF-nitric acid waste. The result will be explosive!** Store hazardous waste in closed plastic containers, in secondary containment, and in a designated location. Do not store |
### Lab-specific Information

Be sure to review the MSDS for any fluoride compounds before using them to determine if they might produce HF in your chemical reaction. If so, handle them as you would handle HF, described in this procedure. HF is a weak but corrosive acid typically used to remove silicon dioxide and other semiconductor oxides to produce clean surfaces.

Examine the contents of the HF exposure kit. It should include nitrile gloves (in good condition) and calcium gluconate in an unopened plastic dispensing unit. **NO HF WORK MAY BE DONE** if the kit is not in working order, if the calcium gluconate gel is expired, or if the user does not know how to use the kit properly. Spill kit should also have clear easy to read instructions on how to use.

### NOTE: Calcium Gluconate Gel

Calcium gluconate gel is a topical antidote for HF skin exposure. Calcium gluconate works by combining with HF to form insoluble calcium fluoride, thus preventing the extraction of calcium from tissues and bones. Keep calcium gluconate gel nearby whenever you’re working with HF. Calcium gluconate can be ordered through scientific supply companies. Calcium gluconate has a limited shelf life and should be stored in a refrigerator if possible and replaced with a fresh supply after its expiration date has passed. Use disposable exam gloves to apply calcium gluconate gel. Even after applying calcium gluconate, it is essential that a medical evaluation be made.

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<th>Procedure/Use</th>
<th>Scale</th>
<th>Engineering Controls/Equipment</th>
<th>PPE (eye, face, gloves, clothing)</th>
<th>Procedure Steps and Special Precautions for this Procedure</th>
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</table>
| 1. Creating stock solutions (from concentrated HF). | Up to 500 mL of 0.1 N HF | All work with 5% or more concentrated HF must be performed in a fume hood. More dilute solutions may be prepared with caution on a lab bench in a room with good general ventilation. **All exposure to or contact** | **Eye protection:** Wear ANSI approved chemical goggles not safety glasses.  
**Face protection:** Face shield when handling concentrated HF.  
**Gloves:** Typically, medium weight (11 mil minimum) or heavy weight (18 mil minimum) Viton, nitrile, or natural rubber gloves | Use plastic or Teflon labware when preparing HF solutions because HF readily etches glass and concentrated solutions can corrode metal. Teflon is hydrophobic so it helps to minimize spills of HF solutions.  
Be sure to have a pipette and a container ready. Determine the volume of solution you need before dispensing acid. Transfer |
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with HF should receive immediate first aid and medical evaluation, even if the injury appears minor or no pain is felt. HF can produce delayed effects and serious tissue damage without necessarily producing pain.

are worn when working with HF, depending on concentration and volume of HF used. Immediately change gloves if they become contaminated with HF.

**Clothing:** Wear fire/flame resistant lab coat (100% cotton based); cotton based clothing/attire; full length pants or equivalent; and close-toed and close-heeled shoes. Use a chemical splash apron made out of natural rubber, neoprene, or Viton when handling concentrated HF.

concentrated hydrofluoric acid into a temporary beaker to make handling easier.

Measure out the required amount of water needed for the solution. Using the pipette, slowly add the appropriate amount of acid to the water until the desired concentration is reached.

Line work surfaces with plastic-backed absorbent paper and/or a containment tray of compatible material.

Once work with HF is complete, decontaminate the area by wiping it down with a 10% sodium carbonate (Na₂CO₃, also known as soda ash) solution.

Store stock solutions in acid cabinet with concentrated HF.
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| 2. Use of (stock) solutions of HF | Up to 500 mL of solution | Preparation of solutions over 5% HF (10:1 HF or more concentrated) by weight should always be done in a fume hood. More dilute solutions may be prepared with caution on a lab bench in a room with good general ventilation.  
All exposure to or contact with HF should receive immediate first aid and medical evaluation, even if the injury appears minor or no pain is felt. HF can produce delayed effects and serious tissue damage without necessarily producing pain. | Eye protection: Wear ANSI approved safety glasses when handling dilute solutions of HF.  
Face protection: Wear a face shield when handling concentrated HF solutions (>47% by weight).  
Gloves: Wear disposable rubber, nitrile, or neoprene gloves when handling dilute solutions. Some users prefer to wear two pairs of disposable gloves. Wear reusable butyl gloves when handling concentrated solutions (>70% HF by weight). Be sure to wear disposable nitrile gloves beneath to guard against leaks.  
Clothing: Wear fire/flame resistant lab coat (100% cotton based); cotton based clothing/attire; full length pants or equivalent; and close-toed and close-heeled shoes. Wear a plastic apron when handling concentrated solutions (>47% HF by weight). | Use plastic or Teflon labware when preparing HF solutions because HF readily etches glass and concentrated solutions can corrode metal. Teflon is hydrophobic so it helps to minimize spills of HF solutions.  
Determine amount of solution you need before dispensing acid.  
Measure out the required amount of water needed for the solution.  
Using a pipette, slowly add the appropriate amount of acid until desired concentration is reached.  
Immediately change gloves if they become contaminated with HF. |
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<td>3. Use as an etchant for etching semiconductors such as silicon wafers</td>
<td>Up to 200 mL of dilute hydrofluoric acid solution per etching</td>
<td>All etches and dilutions should be performed in a well-ventilated hood. All equipment should be Nalgene or Teflon based, including tweezers. All exposure to or contact with HF should receive immediate first aid and medical evaluation, even if the injury appears minor or no pain is felt. HF can produce delayed effects and serious tissue damage without necessarily producing pain.</td>
<td><strong>Eye protection</strong>: Wear ANSI approved tight-fitting safety goggles or safety glasses with side shields. <strong>Face protection</strong>: Wear a face shield. <strong>Gloves</strong>: Wear butyl or butyl/Viton outer gloves and nitrile inner gloves when handling hydrofluoric acid. For small amount of HF (&lt; 50 mL), double nitrile gloves can be used but must be changed immediately if splashed or thought to be contaminated. <strong>Clothing</strong>: Wear fire/flame resistant lab coat (100% cotton based); cotton based clothing/attire; full length pants or equivalent; and close-toed and close-heeled shoes.</td>
<td>Line work surfaces with plastic-backed absorbent paper and/or a containment tray of compatible material. Fill Teflon dish with a small amount of HF solution. Immerse sample in HF for desired time with plastic tweezers. Rinse sample into HF waste with DI water. Rinse all equipment into HF waste. Once work with HF is complete, decontaminate the area by wiping it down with a 10% sodium carbonate (Na₂CO₃, also known as soda ash) solution.</td>
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<td>4. Use in cleaving protecting groups.</td>
<td>No more than 100 mL (commercially available 48% diluted aqueous solution) to be used for each individual reaction. Please adjust as appropriate for your lab.</td>
<td>Work with hydrofluoric acid should never be performed alone. All work using hydrofluoric acid must be performed in a ventilated fume hood. Reactions should not be run in glassware as hydrofluoric acid will etch glass. Proper containers are required. Eliminate ignition sources such as open flames, hot surfaces, steam baths, static electricity, and operation of mechanical and electrical equipment that is not intrinsically safe. Ensure proper grounding and avoid creating static electricity. Be sure to ground metal containers when transferring flammable liquids.</td>
<td><strong>Eye protection:</strong> Wear ANSI tight-fitting safety goggles or safety glasses with side shields. <strong>Face protection:</strong> Wear goggles or full-faced shield with goggles <strong>Gloves:</strong> Nitrile gloves (double gloved) for dilute hydrofluoric acid solutions and heavy nitrile or neoprene gloves for handling concentrated solutions. Extended contact should never occur. <strong>Clothing:</strong> Wear fire/flame resistant lab coat (100% cotton based); an acid resistant apron; cotton based clothing/attire; full length pants or equivalent; and close-toed, close-heeled shoes.</td>
<td>Gaseous hydrogen fluoride can be released upon heating hydrofluoric acid so appropriate temperature control must be implemented. Gaseous hydrogen can be emitted upon reaction between hydrofluoric acid and some metals and thus adequate ventilation (pressure bubbler on Schlenk manifold, or an equilibrating balloon) has to be used to prevent dangerous over pressurization. After the reaction is completed, an adequate amount of dilute base (such as sodium hydroxide) should be added slowly to the solution so as to completely neutralize the reaction. The aqueous waste from these reactions should be kept under basic conditions and not exposed to any acid.</td>
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<tr>
<td>5. Dilution with water for a cleaning solution</td>
<td>&lt;100 mL Please adjust as appropriate for your lab.</td>
<td>All work must be performed in a ventilated fume hood. Eliminate materials from the work area that are incompatible with hydrofluoric acid All exposure to or contact with HF should receive immediate first aid and medical evaluation, even if the injury appears minor or no pain is felt. HF can produce delayed effects and serious tissue damage without necessarily producing pain.</td>
<td><strong>Eye protection:</strong> Wear ANSI approved tight-fitting safety goggles or safety glasses with side shields. <strong>Face protection:</strong> Wear a face shield when handling concentrated HF solutions (&gt;47% by weight). <strong>Gloves:</strong> Use two layers of nitrile gloves. Immediately change gloves if they become contaminated with HF. <strong>Clothing</strong> Wear fire/flame resistant lab coat (100% cotton based); cotton based clothing/attire; full length pants or equivalent; and close-toed and close-heeled shoes. Use a chemical splash apron made out of natural rubber, neoprene, or Viton when handling concentrated HF.</td>
<td>Use plastic or Teflon labware when preparing HF solutions because HF readily etches glass and concentrated solutions can corrode metal. Teflon is hydrophobic so it helps to minimize spills of HF solutions. Ensure that all equipment is clean and free from incompatible materials, and that there is no glass that will be in contact with the hydrofluoric acid Measure out desired volume of hydrofluoric acid such that the diluted concentration is less than 10% HF Slowly add the appropriate amount of acid to the water until the desired concentration is reached. Once addition is complete, dispose of any residual HF acid as hazardous waste.</td>
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**Notes**

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Sarpong Group Notes for Hydrofluoric Acid

Hydrofluoric acid (HF) is a highly corrosive liquid and is a contact poison. It should be handled with extreme care (i.e., beyond what is generally required to handle other mineral acids). Owing to its low dissociation constant, HF as a neutral lipid-soluble molecule penetrates tissue more rapidly than typical mineral acids. Because of the ability of hydrofluoric acid to penetrate tissue, poisoning can occur readily through exposure of skin or eyes, or when inhaled or swallowed. Symptoms of exposure to hydrofluoric acid may not be immediately evident. HF interferes with nerve function, meaning that burns may not initially be painful. Accidental exposures can go unnoticed, delaying treatment and increasing the extent and seriousness of the injury.

HF is a calcium seeker. A person can’t sense when it comes in contact with the skin. But, it dissolves the calcium in the bone. HF burns are not evident until a day later. If not stored, handled and disposed of properly, HF can pose a serious threat to the health and safety of laboratory personnel, emergency responders and waste handlers. Hence, it is important to thoroughly understand the properties of HF and follow all safety protocols to properly store and handle HF.

Uses: HF is used to etch glass. A 5% to 9% hydrofluoric acid gel is also commonly used to etch all ceramic dental restorations to improve bonding. For similar reasons, dilute hydrofluoric acid is a component of household rust stain remover and in car washes in "wheel cleaner" compounds. Because of its ability to dissolve iron oxides as well as silica-based contaminants, hydrofluoric acid is used in pre-commissioning boilers that produce high-pressure steam. Because of its ability to dissolve oxides, hydrofluoric acid is useful for dissolving rock samples (usually powdered) prior to analysis. The ability of hydrofluoric acid to dissolve metal oxides is the basis of several applications. It removes oxide impurities from stainless steel, a process called ‘pickling’, and silicon wafers in the semiconductor industry.

Potential Hazards/Toxicity
HF removes calcium from body in the affected area (Targets the bone).

Target Organs - Liver, Kidney

Potential Health Effects

Inhalation Toxic if inhaled. Material is extremely destructive to the tissue of the mucous membranes and upper respiratory tract.

Skin May be fatal if absorbed through skin. Causes skin burns.

Eyes Causes eye burns. Causes severe eye burns.
**Ingestion** May be fatal if swallowed.

Work with hydrofluoric acid on a chemical wet bench or in a chemical fume hood unless other controls are designated in the Protocol/Procedure section. Sash height should be kept low to minimize escaping fumes and to provide a physical barrier.

**Hand Protection**

Handle with gloves. Natural Rubber (Neoprene, Viton, Butyl) arm length or Heavy duty Nitrile arm length gloves are highly recommended. Note: This type of glove must be put on over the inner Butyl/Viton gloves/disposable nitrile gloves. Gloves must be inspected prior to each use. Use proper glove removal technique (without touching outer surface of the gloves) to avoid skin contact with HF on the contaminated gloves. Dispose of inner nitrile gloves after use as hazardous waste. *Inner Butyl Viton gloves can be removed carefully (i.e., without touching the outer surface of the gloves). Wash hands thoroughly with warm water and soap.

**In case of skin contact**

Immediately (within seconds) flush affected area for at least 15 minutes. Remove all contaminated clothing. Call 911 from a campus phone or call EH&S. Wearing compatible gloves, massage calcium gluconate gel into the affected area. Re-apply every 15 minutes until medical help arrives. Note: Hydrofluoric acid exposure is often treated with calcium gluconate, a source of Ca2+ that sequesters the fluoride ions. HF chemical burns can be treated with a water wash and 2.5% calcium gluconate gel, or special rinsing solutions. However, because HF is absorbed, medical treatment is necessary; rinsing off is not enough. Intra-arterial infusions of calcium chloride have also shown great effectiveness in treating burns. In some cases, amputation may be required.

**In case of eye contact**

Use Calgonate Emergency Eyewash immediately. Call 911 from a campus phone or call EH&S. **NOTE:** Do not open the Calgonate Emergency Eyewash Solution container seal, unless needs to be used. Use the entire 120 ml content during an emergency (eye exposure). Calgonate Emergency Eyewash Solution is for single use only.

**Special Storage & Handling Requirements**

- Ensure that you have all the PPE required for handling HF.
- HF must always be stored in plastic (Nalgene / polypropylene) containers. **DO NOT** store HF in glass bottles/containers.
- Store in corrosive/acid storage cabinet within a secondary containment (Nalgene/polypropylene tray or tub).
- Do not store in the top most shelf of the storage cabinet. **Note:** In general, do not store lab chemicals at or above eye level.
- Ensure the container is tightly closed at all times.
- Do not store with oxides, organic chemicals, bases or metals.
- Carefully carry the stock bottle in a Rubbermaid bottle carrier/Nalgene secondary container to the wet bench/chemical fume hood and pour out desired amount into a smaller container.
• Place stock bottle back in corrosive chemical storage cabinet with cap tightly closed.
• Lab buddy system is highly recommended when handling HF. Lab emergency contact information must be readily available. The lab personnel must have easy access to a telephone (landline or cell phone).

Methods and materials for containment and cleaning up (HAZWOPER training may be required)
Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal.

• Personal Protective equipment must be worn – natural rubber gloves (arm length), goggles, face shield, natural rubber apron/suit, long pants, closed-toe and closed-heel rubber/leather shoes, respirator approved for HF handling.
• Immediately assess amount spilled and the extent of damage. Dial 911 and Contact Environment Health & Safety (EH&S) at 510-642-9090.
• Use neutralizing agent (sodium carbonate) and liquid binding material (vermiculite, sand, kitty litter).
• Pick up contaminated material with a disposable scoop and place in a double transparent plastic bag.
• Label and tag as hazardous waste and bring to hazardous waste pick up.

Decontamination/Waste Disposal Procedure

HF is listed as Extremely Hazardous (EH) Substance by the State. Even the containers (irrespective of the size) which once held HF must be disposed of as hazardous waste with an on-line hazardous waste tag affixed on the container.

Even the safety gloves that come in contact with HF (i.e., HF contaminated gloves) must be disposed of as dry hazardous waste. All dry hazardous waste must be double bagged (use only transparent bags) and affixed with an on-line waste tag.
13 - Documentation of Training (signature of all users is required)

- Prior to conducting any work with hydrofluoric acid, designated personnel must provide training to his/her laboratory personnel specific to the hazards involved in working with this substance, work area decontamination, and emergency procedures.

- The Principal Investigator must provide his/her laboratory personnel with a copy of this SOP and a copy of the SDS provided by the manufacturer.

I have read and understand the content of this SOP:

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