Standard Operating Procedure (SOP): Concentration Hydrofluoric Acid

Laboratory Supervisor (PI): Date:
Building: Room(s):

Section 1: Process and Composition

The following SOP is concerned with the use of concentrated HF acid. All work involving this chemical must be done in a fume hood. Check for proper air flow through fume hood prior to use. All users of this chemical must read and sign this SOP and become familiar with the MSDS for HF acid prior to use. All chemical safety training required by UVM RM&S must also be completed.

Section 2: Potential Hazards

HF is a very dangerous acid that can deeply penetrate the skin and lead to the destruction of deep tissue layers, including bone. Fluoride ions bond strongly to calcium in the body, which can cause adverse health effects. Burns and pain associated with HF exposure may not be apparent for up to 24 hours depending on the concentration of acid and duration of exposure. Significant dermal or inhalation exposures may cause hypocalcemia and cardiac arrhythmias, among other effects. Medical care should be sought immediately after exposure, regardless of concentration. The OSHA permissible exposure limit (PEL) is 3 ppm.

Section 3: Personal Protective Equipment (PPE)

Ensure that the following safety precautions are taken prior to handling HF containers:

- ANSI-rated safety glasses or goggles
- Nitrile gloves (double layer)
- Closed-toe shoes
- Long pants
- Fully buttoned lab coat
- Sodium carbonate ($NaCO_3$) to neutralize HF spills
- No contact lenses

Ensure that the eyewash and safety showers are also operation prior to HF use. Fume hood sash should be kept low, but at a comfortable working height. Also, notify all persons of HF use in case of emergency.

Section 4: Special Handling and Storage Requirements

HF acid containers should be stored in a secondary containment tray inside the "inorganic acids" cabinet in A-135. **DO NOT STORE** in glass, metal, or ceramic containers because they are not compatible with HF. Polyethylene or Teflon bottles

should be used to store HF and all generated waste. When not in use, all HF containers should be in a secondary containment tray.

Always pour acid into water, never water into acid.

All rinses containing HF waste should be stored in a properly labeled waste container. Never dispose of HF-containing waste down the drain.

Section 5: Spill and Accident Procedures

If the HF spill poses an immediate threat to your health, call UWM Police at 6565-3473 or dial 911 for emergency assistance.

Do not panic! Inform others of the accident and make them aware of the spill. If less than 30 mL is spilled, encompass the spill with sodium carbonate and then pour on spill to neutralize acid. Place adsorbent pads directly onto the spill. Sweep up any solid debris remaining after neutralization and adsorption steps. Place soaked adsorbent pad and any debris into a plastic disposal bag and label waste for pickup by RM&S. Be careful to not expose yourself to HF during cleanup.

For larger spills, follow above procedure and document all cleanup activity. Provide RM&S with all information regarding the spill and fill out an accident/incident report form.

For spills that occur outside of the fume hood, place adsorbent material over spill, but DO NOT try to dispose of soaked adsorbent. Dangerous fumes from concentrated HF pose a serious health hazard. Notify all lab personnel and contact RM&S or dial 911 for emergency response.

Low concentration (<5%) spills should be carefully cleaned up with adsorbent material and the workspace should be rinsed with plenty of water. All waste should be disposed of properly.

DO NOT use organic adsorbents that contain sand because HF will react with silica (SiO_2) and produce hazardous fumes.

For health-threatening situations

IF HF is spilled on a person – locate HF burn kit where there is a chemical spill kit.

1. Immediately flush area with copious amount of cold water. Continue flushing until calcium gluconate gel is available.
2. Remove all effected clothing and PPE that came in contact with HF.
3. While flushing with water, massage calcium gluconate gel into effected portion of skin.
4. Contact emergency personnel and continue treating the exposed area.

5. During transport to medical facility, apply calcium gluconate as needed until pain subsides. Use cold compress of same solution, changing compresses frequently and when they dry out.

For non-health-threatening situations
If there is a spill or release of HF that cannot be cleaned up by local personnel and may impact the surrounding environment (storm drains, outdoor soil, etc.):
Emergency Contact Information
UVM SOS to contact RM&S – 656-2560 ext. 1 (contact first)
Laboratory supervisor (PI) for [LAB]: [NAME] – [NUMBER] (second contact)

For minor, local response spill
1. Notify all personnel in the vicinity of the accident that there has been a release of HF acid
2. Equip yourself with appropriate PPE before attempting to clean any HF spill.
3. Use adsorbent kit to clean spill and properly dispose of all waste in properly labeled plastic bottle.
4. Notify the laboratory supervisor of spill and actions taken to clean area.
5. If spill is greater than 30 mL, notify UVM RM&S and fill out accident/incident report form on the UVM RM&S website (uvm.edu/safety)

Section 6: Waste Disposal

All adsorbent material, debris or solid waste containing HF must be placed in a properly labeled plastic bottle for disposal by RM&S. All solution waste containing HF must be placed in a properly labeled plastic bottle.

Section 7: Training Requirements

All research personnel must have completed all necessary online training sessions as required by UVM RM&S (uvm.edu/safety/). Consult the Laboratory Safety Notebook located in A-135 and A-140 to determine your training requirements. Please contact RM&S at safety@uvm.edu if you have any further questions regarding the training that must be completed. Any person planning to use HF acid must be familiar with the entire contents of this SOP and sign this document before starting any work.

Section 8: Required Approval

All research personnel must be cleared to work with concentrated HF acid by the laboratory supervisor (i.e. the PI) prior to work with this chemical. UNDER NO CIRCUMSTANCES is anybody allowed to work with HF acid alone in the laboratory. If unsupervised work must be done, prior approval from the laboratory supervisor must be obtained.

Section 9: Decontamination of Laboratory Glassware

All glassware that is used to contain and/or mix HF acid must be rinsed, at minimum, with excess distilled water three times and then thoroughly washed with glassware soap and water one time. Initial rinses must be collected in proper waste container.

Section 10: Designated Workspace

Concentrated HF must be handled and mixed in fume hoods only. Filling and rinsing of containers must be done within a secondary container.

Section 11: Completion of Work with Chemical

Upon completion of work in the designated area, decontaminate any areas that may have come in contact with HF acid residues. Wipe down all work surfaces in the designated area. After all glassware and equipment is decontaminated, remove all personal protective equipment and thoroughly wash hands and forearms.

Section 12: Specific Procedure Description

In DETAIL, describe the procedure for either doing the work or making the solution mentioned in Section 1. Specific amounts of reagents should be included where appropriate. This can be a step-by-step guide.

Section 13: Signature(s) of Compliance

I have read and fully understand the above SOP. I will adhere to all stated regulations and safety measures when using this chemical.

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