**Wayne State University**

**Office of Environmental Health and Safety (OEHS)**

**Standard Operating Procedure (SOP)**

**Hydrofluoric Acid**

Enter Lab Specific SOP Title Here

**** ****

***Note –Text in gray italics indicate instructions to complete this SOP.***

| **#1 CONTACT INFORMATION** |  |
| --- | --- |
| **SOP Title** | Click or tap here to enter text. |
| **SOP Prepared By** | Click or tap here to enter text. |
| **Date Prepared** | Click or tap here to enter text. |
| **SOP Revised By** | Click or tap here to enter text. |
| **Date Revised** | Click or tap here to enter text. |
| **Responsible Person** | *[Name of PI, Lab Supervisor, or Autonomous Researcher, as appropriate]*  Click or tap here to enter text. |
| **Locations** | **This procedure may be performed in the following location(s):**Building Name & Room #. Building Name & Room #. Building Name & Room #. Building Name & Room #.  |
| **Approval Signature** | *[Obtain prior approval, as appropriate. See section #10 of this template.]*Signature.  |
| **Emergency Contact Name(s)** | Click or tap here to enter text. |
| **Emergency Contact Number(s)** | *[Enter at least one 24/7 emergency contact number of a lab member]*Enter contact number(s).  |
|  | **WSU Police: (313) 577-2222** |

| **#2 THIS SOP IS DEVELOPED FOR A:** |
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| [ ]  **Storage of Hydrofluoric Acid Only**[ ]  The Principal Investigator acknowledges the lab is currently only storing hydrofluoric acid and has no immediate plans to use it. The Principal Investigator also acknowledges that no work with hydrofluoric acid will commence in the lab without prior approval of the WSU Chemical Safety Committee.Warning signage most be posted at the storage location of the hydrofluoric acid. The lab must also maintain a stock of unexpired 2.5% calcium gluconate gel and an HF chemical spill kit, even for just storage.*[Complete section 6.1 - PPE information, section 6.2 – Chemical Spill Kit information and the location of calcium gluconate in section 7.]*[ ]  **Specific laboratory procedure or experiment***[Examples: synthesis of chemiluminescent esters; folate functionalization of polymeric micelles; etc.]*[ ]  **Generic laboratory procedure that covers several chemicals***[Examples: distillation; chromatography; etc.]*[ ]  **Generic use of specific chemical or class of chemicals with similar hazards***[Examples: organic azides, mineral acids, etc.]* |

| **#3 PROCESS OR EXPERIMENT DESCRIPTION** |
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| *[Provide a brief description of your process or experiment, including its purpose. Do not provide a detailed sequential description as this will be covered by section #6 of this template. Include the frequency and the duration below.]*Click or tap here to enter text. |
| **Frequency** | [ ]  One time[ ]  Daily[ ]  Weekly[ ]  Monthly[ ]  Other: Enter text |
| **Duration per experiment** | *[Minutes/ Hours/ Days, etc.]*Click or tap here to enter text. |

| **#4 HAZARD SUMMARY & SAFETY LITERATURE REVIEW** |
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| 1. Hazardous substances and associated physical, health, and environmental hazards.

*[List hazardous substances (chemicals) and their associated physical, health, and environmental hazardous. Refer to Safety Data Sheets (SDS),* [*Globally Harmonized System (GHS) of Classification and Labeling of Chemicals*](https://unece.org/transport/standards/transport/dangerous-goods/ghs-rev9-2021)*,* [*GHS Classification Criteria*](https://www.chemsafetypro.com/Topics/GHS/GHS_Classification_Criteria.html)*, or* [*OSHA Hazard Communication resource webpage*](https://www.osha.gov/hazcom#data-analysis) *as needed.]*1. Other Hazards Associated with the Process or Experiment

[List nonchemical hazards, e.g., biological hazards, electrical hazards, mechanical hazards, nonionizing radiation, or ionizing radiation.]Enter text. If not applicable, enter “N/A”.1. References

*[List all references you are using for the safe and effective design of your process or experiment, including safety literature and peer-reviewed journal articles.]* Enter text. If not applicable, enter “N/A”.  |

| **#5 STORAGE REQUIREMENTS** |
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| ***[Describe special handling and storage requirements for hazardous chemicals in your laboratory, especially for explosives, water reactive/pyrophoric materials, highly flammable materials, oxidizers and corrosives.]***Click or tap here to enter text.  |

| **#6 STEP-BY-STEP OPERATING PROCEDURE** |
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| [*Include any personal protective equipment, engineering controls, and designated work areas in the left hand column in the table below.*1. ***Guidance on Personal Protective Equipment(PPE) - To assist with your PPE selection, refer to Section 8 “Exposure controls/personal protection” of SDS or PPE guides such as*** [*Ansell Chemical Protection Guide*](https://www.ansellguardianpartner.com/chemical/home#hp)***,*** [*VWR North Safety Hand Protection Chemical Resistance Guide*](https://eta-safety.lbl.gov/sites/all/files/VWR%20Chemical%20Resistance%20Gloves%20Chart.pdf)***. Respiratory protection is generally not required for lab research, provided the appropriate engineering controls are employed. For additional guidance on respiratory protection, consult with OEHS, 313-577-1200.***
2. ***Guidance on Engineering and Ventilation Controls – Review safety literature and peer-reviewed journal articles to determine appropriate engineering and ventilation controls for your process or experiment. Guidance is available from OEHS (313-577-1200).***
3. ***De*signated work area(s)** – These areas are intended to limit and minimize possible sources of exposure to highly hazardous materials [e.g. – highly flammable, highly reactive (e.g. water reactive/pyrophoric), toxic (e.g. acute toxins, reproductive toxins, mutagens), biohazards, radioactive materials]. The entire laboratory, a portion of the laboratory, or a laboratory fume hood or bench may be considered a designated work area

Describe the possible risks involved with failure to follow a step in the SOP in the right hand column.] |

| **Step-by-Step Description of Your Process or Experiment** | **Potential Risks if Step is Not Done or Done Incorrectly (if any)** |
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| 1. Don personal protective Equipment

[x]  Appropriate street clothing (long pants/skirt, closed toed shoes)[ ]  Gloves. Type & thickness: Enter text.[ ]  Safety glasses[ ]  Safety goggles[ ]  Face shield[ ]  Standard Lab coat – Type: Enter text.[ ]  Flame-resistant lab coat – Type: Enter text.[ ]  Disposable gown[ ]  Chemical resistant apron – Type: Enter text.[ ]  Air purifying respirator (e.g. N95, cartridge respirator, etc.) Type: Enter text.[Requires fit testing and adherence to [WSU Respiratory Protection Program](https://research.wayne.edu/oehs/health-safety/respirators)][ ]  Other: List all other required PPE. Enter text.*Describe if specific activities require additional or specific PPE.* Click or tap here to enter text. | Enter text. |
| 1. Check the location/accessibility/certification of the safety equipment that serves your lab:
 |  |
| **ITEM AND STATUS** |  |
| [ ]  Chemical Fume Hood – Location & certification date: Enter text.[ ]  Biological Safety Cabinet – Location & certification date: Enter text.[ ]  Glove Box – Location: Enter text.[ ]  Other – Description & location: Enter text. | Enter text. |
| Eyewash – Location: Enter text.Safety Shower – Location & certification date: Enter text. | Enter text. |
| First Aid Kit – Location: Enter text. | Enter text. |
| Chemical Spill Kit – Type & location: *[The chemicals being used may require a specific, commercially available chemical spill kit (e.g. hydrofluoric acid neutralizing spill kit). If this is a lab-assembled, basic chemical spill kit, please describe contents. Note: Upon request, an OEHS approved, commercially available HF neutralizer (with 1:1 neutralization ratio) will be provided to the lab free of charge. Please contact Chemical Hygiene Officer (313-993-6614) for more information.]*Enter kit information & location | Enter text. |
| Fire Extinguisher – Type & location: Enter text. | Enter text. |
| Fire Alarm Manual Pull Station – Location: Enter text. | Enter text. |
| Telephone – Location: Enter text. | Enter text. |
| 1. Designated work area(s) - Enter text.
 | Enter text. |
| 1. Procedure – *[Describe the steps in the procedure. Add steps as required. Note which steps are of highest risk for personnel exposure. If HF will be transported to a different room, building floor, or different building, describe the safety controls to be used for safe transport. Note where HF will be transported to.]*

Step 1: Step 2: Step 3:  | Enter text. |
| 1. Dispose of hazardous solvents, solutions, mixtures, and reaction residues as hazardous chemical waste.
 | Enter text. |
| 1. Clean up /decontamination work area and lab equipment. *[Describe specific cleanup procedures for work areas and lab equipment that must be performed after completion of your process or experiment. For carcinogens and reproductive toxins, designated areas must be immediately wiped down following each use.]*

Enter text. | Enter text. |
| 1. Remove PPE in the following order:
* Outer gloves
* Disposable gown
* Safety glasses (or face shield then goggles)
* N95 respirator (dispose of as hazardous chemical waste)
* Lab coat
* Inner gloves
* Wash hands with soap and water
 | Enter text. |

| **#7 EMERGENCY PROCEDURES AND SPILL RESPONSE** |
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| **\*\*Any amount of HF exposure requires medical attention.****Call WSU police (313-577-2222) immediately\*\**** **Fire Extinguishers** – Both ABC dry powder and carbon dioxide extinguishers are appropriate for most fires. Refer to section 5 of the SDS for chemical specific firefighting measures. If unsure about the type of fire extinguisher in your laboratory, consult with OEHS and the WSU Fire Marshall.

[ ]  **Chemical Specific Fire Extinguisher Required**Enter chemical specific fire extinguisher information.* **Eyewash/Safety Showers** – Depending on the chemical hazard type, an eyewash station and safety shower may be required, easily accessed, and available within 10 seconds travel time for emergency use. Instruct personnel on the locations of eyewashes and safety showers, and how to activate them, prior to an emergency. Refer to [MIOSHA Fact Sheet: Eyewashes and Safety Showers](https://www.michigan.gov/documents/lara/lara_miosha_cet0199_628109_7.doc) to determine if an eyewash/safety shower is required for your specific chemical.

Please note: Additional hazards present in the laboratory may require that an eyewash or safety shower be present. This emergency equipment is required for treating exposures to workplace hazards such as chemical splashes, biological agents, welding sparks, metal shavings, or fine particulates like dust, dirt and sand.1. **Life Threatening Emergencies**
	1. **Fire, explosion, health-threatening hazardous material spill or release, compressed gas leak, or valve failure, etc.**
		1. Call WSU Police 313-577-2222
		2. Alert people in the vicinity and activate the local alarm systems.
		3. Evacuate the area and go to your Emergency Assembly Point (EAP): Enter EAP Location.
		4. Remain nearby to advise emergency responders.
		5. Once personal safety is established, call OEHS at 313-577-1200.

**Note:** For compressed gas leaks, shut off gas supply only if this can be done safely, without risk to personnel.* 1. **Injuries and Exposures**
		1. **CALL WSU POLICE (313-577-2222) IMMEDIATELY AND REQUEST AN AMBULANCE FOR ANYONE EXPOSED TO ANY AMOUNT OF HF.**
		2. **Individuals aiding another worker exposed to HF MUST protect themselves by wearing two pair of HF protective gloves (nitrile or neoprene) and other safety equipment such as a lab coat and safety glasses.**
		3. Remove the injured/exposed individual from the area, unless it is unsafe to do so because of the medical condition of the victim or the potential hazard to rescuers. Do not allow individual to remain in contact with liquid HF even if moving the person may expose the victim to additional risk.
		4. Administer first aid as appropriate. In order to prevent cross contamination, if possible the victim should perform the following actions on themselves.
			1. Eye contact: Promptly flush eyes with copious amounts of water for a prolonged period (at least 15 minutes). If applicable, after washing hands remove contact lenses while flushing with water. Seek medical attention.
			2. Ingestion:

[x]  **Chemical specific first aid**Do not induce vomiting. Attempt immediate administration of a fluoride binding substance such as milk (1/2 to 1 glass-full), chewable calcium carbonate tablets [e.g. 12 TUMS(R) tablets (contain 200 mg each), 11 ROLAIDS CALCIUM RICH(R) tablets (contain 220 mg each), OR 8 TUMS EXTRA STRENGTH(R) tablets (contain 300 mg each) per dose] or milk of magnesia. Do not exceed 8 ounces of liquid (large amounts of liquid may induce vomiting). Stop if person becomes nauseated. The calcium or magnesium in these compounds may act as an antidote by binding fluoride ions. DO NOT administrate sodium bicarbonate. Never give anything by mouth to sedated an unconscious person.* + - 1. Skin contact:

[x]  **Chemical specific first aid**IMMEDIATELY flush all affected areas with water for 5 -10 minutes using the nearest sink or safety shower (depending on size and location of exposure). While flushing with water, remove all clothing, PPE or jewelry that could trap, or is suspected of contact with, HF. Any clothing that needs to be pulled over the head should be cut off the body instead. REMOVE GOGGLES LAST. After rinsing with water, while wearing appropriate gloves, quickly and liberally rub 2.5% calcium gluconate gel onto all affected sites. Apply fresh gel every 10-15 minutes until medical assistance arrives. The affected areas do not need to be dried prior to applying gel. Reexamine the victim for any exposure / burn sites that have been overlooked. Do not apply analgesic, antibiotic ointment, or any other substance to the exposure site, except 2.5% calcium gluconate gel.Seek medical attention IMMEDIATELY**Lab specific location of 2.5% calcium gluconate gel***[Be as specific as possible, such as “Room 1540 Engineering, first aid cabinet next to west lab door”.]*Enter calcium gluconate location in lab.**NOTE: Verify on a regular basis that the calcium gluconate has not expired. Replace when expired.*** + - 1. Inhalation: Immediately move to a source of fresh air and call WSU Police (313-577-2222). DO NOT perform mouth-to-mouth resuscitation on a victim who is not breathing, due to the risk of exposing yourself.
1. Call (313) 577-1200 to report the exposure to OEHS.
2. After seeking medical attention, complete and submit the [Report of Injury](https://risk.wayne.edu/files/rofi.pdf) form to [WSU Enterprise Risk Management & Insurance Programs](https://risk.wayne.edu/) (5700 Cass, Suite 4622).
3. Bring to the hospital copies of Safety Data Sheets for all chemicals the victim was exposed.
	1. **Emergency Medical Facilities**

Detroit Receiving Hospital - Emergency Room **(Preferred for HF exposures)**4201 St. Antoine St, Detroit, MI 48201Phone: (313) 745-3000ORHenry Ford Hospital – Emergency Room2799 W. Grand Blvd.Detroit MI 48202(313) 916-8742After seeking medical attention, complete and submit the [Report of Injury](https://risk.wayne.edu/files/rofi.pdf) form to [WSU Enterprise Risk Management & Insurance Programs](https://risk.wayne.edu/) (5700 Cass, Suite 4622).1. **Hydrofluoric Acid Specific Spill Clean-up**

For any HF spills or releases which may:* impact the environment (via the storm drain, soil, or air outside the building)
* noticeably fuming
* contain any volume of concentrated HF (concentrations >5%)
* contain dilute HF (≤ 5% concentration) that are > 2 mL
* occur in poorly ventilated areas
* OR involving additional hazard concerns
	1. Evacuate the spill area.
	2. Call WSU Police (313) 577-2222. Available 24 hours a day, 7 days a week.
	3. Safely post someone or mark-off the hazardous area with tape and warning signs to keep other people from entering.
	4. Safely, remain in the vicinity until emergency personnel arrive and provide them with information on the chemicals involved.

**Local Cleanup of Small Spills**Lab personnel must only clean small HF spills (< 2 mL of ≤ 5 % HF) in well ventilated areas, that can be handle safely. * DO NOT use spill cleanup materials to treat/decontaminate people expose to HF acid – Refer to Injuries and Exposures section (7.1.B) listed under Emergency Procedures
* DO NOT use general chemical spill kits that contain Floor-Dri, kitty litter, or sand because HF reacts with silica to produce silicon tetrafluoride (a toxic gas).
* Use a HF specific spill kit assembled by the lab. NOTE: Upon request, an OEHS approved, commercially available HF neutralizer (with 1:1 neutralization ratio) will be provided to the lab free of charge. Please contact Chemical Hygiene Officer (313 993 6614) for more information.
* **NOTE – Labs must keep track on the expiration date of the HF neutralizer provided by OEHS, and contact OEHS for a replacement two months prior to the expiration date mentioned on the neutralizer bottle.**
* HF specific spill kit assemble by the lab, MUST contain at minimum:
	+ chemical resistant shoe covers
	+ absorbent material (e.g. Folded paper towels)
	+ HF acid neutralizer provided by OEHS
	+ pH test strips or a pH meter
	+ polyethylene scoop or dust pan
	+ polyethylene or Teflon tongs
* Personnel cleaning up a HF spill must wear the required PPE listed in the PPE section of this SOP.
* To clean up a small spill or release by local personnel using the HF spill kit assembled by the lab and appropriate PPE:
1. Alert personnel in the immediate area of spill and restrict access.
2. If your skin, eyes, or airways have been exposed to HF, medical treatment is the priority. Spill clean-up should then be left to another lab personnel familiar with safe HF spill clean-up procedures or OEHS emergency response group.
3. Remove and replace any contaminated PPE.
4. Protect floor drains, sinks or other potential avenues of environmental release as much as possible. Make a dike around the outside edges of the spill using absorbent materials.
5. To neutralize the spill:
* Spray the neutralizer into the air surrounding the spill, then directly onto the spilled acid to help reduce any vapors.
* Gently pour and/or spray the neutralizer onto the spilled acid, working from the spill's outer edges toward the center.
* The liquid hydrofluoric acid neutralizer will change colors in the presence of hydrofluoric acid from its original beige color to red and then back to beige indicating the neutralization process is completed to help identify the best time to handle the spill with the least amount of risk. NOTE: It is recommended that the pH of the neutralized liquid is also checked with a secondary measurement device such as a pH meter or paper to verify that neutralization of the liquid has occurred.
* Once the spilled acid has been neutralized, use absorbent materials (e.g. C fold paper towels) absorb it.
1. Collect spill cleanup materials using a polyethylene scoop/dust pan and tongs. Place spill cleanup materials in a tightly closed hazardous chemical waste container.
2. After all visible spill cleanup material is removed, decontaminate surfaces following guidelines mentioned under decontamination procedures.
3. Place all contaminated materials, including items such as gloves, in the hazardous chemical waste containers dedicated to collect HF waste.
4. Label waste container with completed hazardous waste tag (available from OEHS).
5. Submit online waste pickup request to OEHS
6. Report spill to supervisor or PI.
7. **Lab Specific Emergency Procedures**

*[This section is for any emergency procedures different from standard responses, or for additional emergency information due to the nature of materials or task. Include information on gas leaks, chemical spills, and personal exposure/medical emergency as appropriate.]*Enter text. If not applicable, enter “N/A”.1. **Building Maintenance Emergencies**

For building maintenance emergencies (e.g. power outages, plumbing leaks, roof leaks, etc.) immediately call:* Between 7:00 AM - 4:00 PM Monday – Friday, Facilities Operations and Maintenance at (313) 577-4315
* After business hours, Public Safety at (313) 577-2222
1. **Local Notifications**

*[Identify the area management staff that must be contacted and include their work and after-hours numbers. This must include the principal investigator and may include the lab safety coordinator, facilities manager, and/or business manager.]*Enter text. |
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| **#8 WASTE DISPOSAL** |
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| [Describe the quantities of waste you anticipate generating and appropriate waste disposal procedures. Include any special handling or storage requirements for your waste].Enter text.Do not dispose waste by dumping down a drain or discarding in regular trash containers, unless authorized by OEHS. Contact OEHS at (313) 577-1200 for waste containers, labels, manifests, waste collection and for any questions regarding proper waste disposal. Also, refer to the [OEHS Hazardous Waste Management web page](http://research.wayne.edu/oehs/hazardous/index.php) and [WSU Chemical Hygiene Plan](https://research.wayne.edu/oehs/pdf/chemical-hygiene-plan.pdf) for more information. |

| **#9 TRAINING REQUIREMENTS** |
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| **General Training** *(check all that apply)*: The courses listed below can be taken online through the [Collaborative Institutional Training Initiative (CITI) at the University of Miami](https://about.citiprogram.org/).[x]  Laboratory Safety Training (general lab and chemical safety issues)[x]  Hazard Communication[ ]  Shipping Biological Substances & Dry Ice Refresher TrainingInformation about [Shipping Dangerous Goods](https://research.wayne.edu/oehs/shipping).The trainings below are linked to specific training slides or documents.[ ]  [Laboratory-Specific Safety Training (](http://research.wayne.edu/oehs/docs/lab-safety-training-checklist.doc)link to Word Doc checklist)[ ]  [Controlled Substance Training](http://research.wayne.edu/oehs/training/lab.php#CS)[ ]  [Radiation Safety Training](https://research.wayne.edu/oehs/training/radiation) |
| **Laboratory Specific Training** *(check all that apply)*:[ ]  Review of SDS for chemicals involved in process/experiment[ ]  Review of this SOP[ ]  Other: Enter text. |
| **Location Where Training Records Are Maintained:** Enter text. |

| **#10 PRIOR APPROVALS AND CERTIFICATIONS** |
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| Notes: You **must** seek prior approval from your principal investigator (PI) or lab supervisor if you plan to use **restricted chemicals** (e.g. dimethyl mercury, hydrofluoric acid and toxic gasses).You should also consult your PI or lab supervisor if your experiments involve **high-risk chemicals and operations,** as special safety precautions may need to be taken. High-risk chemicals and operations may involve chemicals with a high level of acute toxicity, carcinogens, reproductive toxins, and highly reactive materials.[ ]  **Prior approval from the PI or lab supervisor is required for this procedure**Complete the following table confirming that all lab personnel using this SOP read and understand the above SOP and is agreed to contact PI if planned to modify this SOP.*[The table below should be completed after WSU Chemical Safety Committee approval.]* |

| **NAME** | **ACCESS ID #** | **SIGNATURE** | **DATE** |
| --- | --- | --- | --- |
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