CORROSIVES (ACIDS AND BASES)

STANDARD OPERATING PROCEDURE (SOP)

Type of SOP: ☐ Process ☐ Hazardous Chemical ☒ Hazardous Class

All personnel who are subject to the requirements of this SOP must review and sign the associated training record. Completed SOPs must be kept with the UC Davis Laboratory Safety Manual or be otherwise readily accessible to laboratory personnel. Electronic access is acceptable. SOPs must be reviewed, as revised where needed, as described in the UC Davis Laboratory Safety Manual. Note that not all hazardous chemicals are appropriately addressed in a single control-banded SOP, and some chemicals are subject to several control-banded SOPs. The unique properties of each chemical must be considered before including it into a control band.

Date SOP Written: **Required** Approval Date: _____

SOP Prepared by: **Required – Insert Preparer's Name**

SOP Reviewed and Approved by (name/signature): **Required – Insert Approver's Name & Signature**

Department: **Required**

Principal Investigator: **Required** Phone: **Required**

Lab Manager/
Safety Coordinator: **Required** Phone: **Required**

Emergency Contact(s): **Required** Phone: **Required**

_____ _____

_____ _____

_____ _____

_____ _____

Location(s) Covered by SOP: Building: **Required** Lab

Room #(s): **Required** Phone: **Required**

1. HAZARD OVERVIEW

Corrosive substances cause destruction of living tissue by chemical action at the site of contact and can be solids, liquids, or gases. Corrosive effects can occur not only on the skin and eyes, but also in the respiratory tract and, in the case of ingestion, in the gastrointestinal tract as well. Corrosive materials are probably the most common toxic substances encountered in the laboratory. Corrosive liquids are especially dangerous because their effect on tissue generally takes place very rapidly.

2. HAZARDOUS CHEMICAL(S)/CLASS OF HAZARDOUS CHEMICAL(S)

Corrosive chemicals are substances that cause visible destruction or permanent changes in human skin tissue at the site of contact, or are highly corrosive to steel. Corrosive chemicals can be liquids, solids, or gases and can affect the eyes, skin, and respiratory tract. The major classes of corrosives include strong acids, bases, and dehydrating agents. Liquid ***corrosive*** chemicals are those with a pH of 4.0 or lower or a pH of 9 or higher. Solid chemicals are considered corrosive when in solution; they fall in the above pH range. A ***highly corrosive*** chemical has a pH of 2 or lower or a pH of 12.5 or higher. ***Injurious*** chemicals cause tissue destruction at the site of contact.

Some examples of corrosive materials include:

Strong Acids: hydrochloric, sulfuric, phosphoric
Strong Bases: hydroxides of sodium, potassium, ammonia
Strong Dehydrating Corrosives: sulfuric, phosphophrous pentoxide, calcium oxide
Strong Oxidizing Corrosives: concentrated hydrogen peroxide, sodium hypochlorite
Corrosive Gases: chlorine, ammonia
Corrosive Solids: phosphorous, phenol

REQUIRED - List (or attach) the applicable chemical(s) for your laboratory, and describe important properties and signs/symptoms of exposure

---

3. ENGINEERING/VENTILATION CONTROLS

All activities involving the use of corrosives should be carried out in a properly functioning chemical fume hood. Any work that runs the risk of explosion must be done behind a blast shield. A bottle carrier should be used for the transport of corrosive materials between locations. Chemical dispensers should be used to reduce potential exposures.

Evacuated glassware can implode and eject flying glass, and chemicals. Vacuum work involving corrosives must be conducted in a fume hood, glove box or isolated in an acceptable manner. Mechanical vacuum pumps must be protected using cold traps and, where appropriate, filtered to prevent particulate release. The exhaust for the pumps must be vented into an exhaust hood. Vacuum pumps should be rated for use with corrosives.

REQUIRED - Insert descriptions of the lab-specific ventilation controls and equipment safety features utilized to reduce the risk of chemical exposures.

---

4. ADMINISTRATIVE CONTROLS

The following elements are required:

1. Complete the UC Laboratory Safety Fundamentals (or approved equivalent) prior to working in the laboratory;

2. Complete laboratory-specific safety orientation and training on laboratory-specific safety equipment, procedures, and techniques to be used, including any applicable laboratory-specific Laboratory Safety Plan(s), prior to receiving unescorted access to the laboratory;
3. Demonstrate competency to perform the procedures to the Principal Investigator (PI), Laboratory Supervisor, laboratory-specific Safety Officer, and/or trainer;
4. Be familiar with the location and content of any applicable Safety Data Sheets (SDSs) for the chemicals to be used (online SDS can be accessed from Chemwatch);
5. Implement good laboratory practices, including good workspace hygiene;
6. Inspect all equipment and experimental setups prior to use;
7. Follow best practices for the movement, handling, and storage of chemicals (see Chapters 5 and 6 of Prudent Practices in the Laboratory for more detail). An appropriate spill cleanup kit must be located in the laboratory. Chemical and hazardous waste storage must follow an appropriate segregation scheme and include appropriate labeling. Hazardous chemical waste must be properly labeled, stored in closed containers, in secondary containment, and in a designated location;
8. Do not deviate from the instructions described in this SOP without prior discussion and approval from the PI and/or Laboratory Supervisor;
9. Notify the PI and/or Laboratory Supervisor of any accidents, incidents, near-misses, or upset condition (*e.g.* unexpected rise or drop in temperature, color or phase change, evolution of gas) involving the chemicals described in this SOP; and
10. Abide by the laboratory-specific working alone SOP, if applicable.

REQUIRED - Insert descriptions of any special handling or storage requirements.

---

5. PERSONAL PROTECTIVE EQUIPMENT (PPE)

At a minimum, long pants (covered legs) and closed toe/closed heel shoes are required to enter a laboratory or technical area where hazardous chemicals are used or stored.

In addition to the minimum attire required upon entering a laboratory, the following PPE is required for work with Corrosives:

A. Eye Protection: Eye protection is required for all work with Corrosives.
   i. At a minimum, ANSI Z87.1-compliant safety glasses are necessary.
   ii. Splash goggles may be substituted for safety glasses, and are required when pouring corrosive liquids out of a larger container.
   iii. Ordinary prescription glasses will NOT provide adequate protection unless they also meet the ANSI Z87.1 standard and have compliant side shields.
   iv. An emergency eyewash/safety shower must be immediately available when working with corrosive liquids in quantities that exceed 240 ml.

B. Body Protection: At a minimum a chemically-compatible laboratory coat that fully extends to the wrist is necessary.
   i. A flame-resistant laboratory coat that is NFPA 2112-compliant may be required if a significant risk of fire exists.

ii. Rubber aprons should be worn when large quantities are handled (*e.g.* acid/base baths).
iii. Non-synthetic clothing should be worn.
iv. For chemicals that are corrosive and/or toxic by skin contact/absorption additional protective clothing (*e.g.* face shield, chemically-resistant apron, disposable sleeves, etc.) are required where splashes or skin contact is forseeable.

C. Hand Protection: When hand protection is needed for the activities described in this SOP, define the type of glove to be used based on: A) the chemical(s) being used, B) the anticipated chemical contact (*e.g.* incidental, immersion, etc.), C) the manufacturers' permeation/compatibility data and D) whether a combination of different gloves is needed for any specific procedural step or task.

REQUIRED - Insert descriptions of PPE and hygiene practices used with each process, hazardous chemical(s), or hazardous chemical class, including any specialized PPE needed for a procedural step/task.

6. SPILL AND EMERGENCY PROCEDURES

Follow the guidance for chemical spill cleanup from Safety Net #13 and/or the UC Davis Laboratory Safety Manual, unless specialized cleanup procedures are described below. Emergency procedure instructions for the UC Davis campus and UCD Medical Center are contained in the UC Davis Laboratory Safety Manual and the Emergency Response Guide (which must be posted in the laboratory). All other locations must describe detailed emergency procedure instructions below.

REQUIRED - Insert descriptions of any specialized spill clean up procedures for hazardous chemicals used in this SOP (*e.g.,* hydrofluoric acid, pyrophorics, phenol, etc.). Additional details of lab-specific spill cleanup should be provided if applicable.

INSERT IF APPLICABLE - Descriptions of any specialized emergency procedures for locations outside of the UC Davis main campus and the UCD Medical Center campus.

7. WASTE MANAGEMENT AND DECONTAMINATION

Hazardous waste must be managed according to Safety Net #8 and properly labeled, using the appropriate label. In general, hazardous waste must be removed from the laboratory within 9 months of the accumulation start date. Hazardous waste pick up requests must be completed online.

REQUIRED - Insert descriptions of laboratory-specific information on the waste streams generated, storage location, and any special handling/storage requirements.

Decontamination procedures vary depending on the material being handled. The toxicity of some materials can be neutralized with other reagents. All surfaces and equipment should be wiped with the appropriate cleaning agent following the dispensing or handling of corrosive materials. Carefully inspect work areas to make sure no hazardous materials remain.

REQUIRED - Insert descriptions of decontamination procedures for equipment, glassware, and controlled areas (*e.g.,* glove boxes, restricted access hoods, perchloric/hot acid fume hoods, or designated portions of the laboratory) in your description.

Avoid contact with skin, eyes and clothing. Upon completion of work, remove gloves and/or PPE to wash hands and arms with soap and water.

8. DESIGNATED AREA

The designated area for the use of corrosives is the fume hood.

9. DETAILED PROTOCOL

REQUIRED - Insert or attach detailed laboratory-specific procedures for the process, hazardous chemical(s), or hazard class. You may also include any relevant supporting resources (*e.g.,* SafetyNets, journal citations, etc.) that are applicable.

Documentation of Standard Operating Procedure Training

(Signature of all users is required)

- ✓ Prior to conducting work with **Corrosives**, laboratory personnel must be trained on the hazards involved in working with this SOP, how to protect themselves from the hazards, and emergency procedures.

- ✓ Ready access to this SOP and to a Safety Data Sheet for each hazardous material described in the SOP must be made available.

- ✓ The Principal Investigator (PI), or the Laboratory Supervisor if the activity does not involve a PI, must ensure that their laboratory personnel have attended appropriate laboratory safety training or refresher training with the last three years.

- ✓ Training must be repeated following any revision to the content of this SOP. Training must be documented. The training sheet is provided as one option; other forms of training documentation (including electronic) are acceptable but records must be accessible and immediately available upon request.

Designated Trainer: *(signature is required*

I have read and acknowledge the contents, requirements, and responsibilities outline in this SOP:

Name	Signature	Trainer Initials	Date