Stanford | Environmental Health & Safety

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General Use SOP

Corrosive Materials

Process or Experiment Description

This standard operating procedure (SOP) provides general guidance on working safely with lab-scale quantities of solid and liquid corrosive materials. In some cases, multiple SOPs may apply to a single chemical (e.g., for perchloric acid, both General Use SOPs for corrosive and highly reactive materials would apply). For questions about the applicability of any item in this SOP, contact your Principal Investigator/Supervisor or EH&S at 650-723-0448.

For work with large quantities of corrosive materials, corrosive gases, complex procedures, or otherwise particularly hazardous procedures involving corrosive materials, EH&S recommends completing a risk assessment, reviewing other EH&S guidance (such as guidance on scale-up), looking for SOPs on similar procedures in the SOP Library, and/or writing a dedicated SOP and submitting it for EH&S review.

Hazards

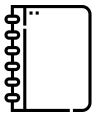
Corrosive materials cause irreversible destruction of living tissue through chemical action at the point of contact. Corrosive chemicals can be liquids, solids, or gases/vapors, so corrosive effects can affect the skin, eyes, and respiratory tract.

Many common corrosive materials are acids or bases. In general, the closer a material's pH is to 0 (with very strong acids having pHs <0) or to 14, the more corrosive a material is. Strong oxidizers can be corrosive as well. Acids and bases are incompatible and may react vigorously, generating large amounts of heat.

Additionally, strong acids and bases generate a significant amount of heat when diluted with or dissolved into water. This heat can cause the solution to boil and splatter, and may cause hazardous gases to evaporate out of the solution.

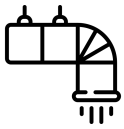
Common corrosive chemicals include: liquids such as hydrochloric acid, solutions of sodium hydroxide or bleach; and solids such as phosphorus or phenol.

Control of Hazards



General

- Minimize the potential for splash, splatter, or other likely scenarios for accidental contact.
- Use non-corrosive or less corrosive alternatives as feasible.
- Use the smallest feasible quantity and concentration.
- Do not pour water into concentrated acids or bases. Slowly add the acid or base to the water while stirring.
- Use a mechanical aid or a pipette bulb for pipetting.
- Wipe drips from containers and bench tops. Be careful to wipe up visible residues, especially of sodium hydroxide and potassium hydroxide from all surfaces. Skin contact with dry residue may result in burns.
- Be aware that the solution may heat up when mixing corrosives (particularly acids and bases) with other chemicals and use appropriate cooling methods, as needed. If you must neutralize a solution as part of your procedure, add the neutralizing agent slowly and with stirring.



Engineering/Ventilation Controls

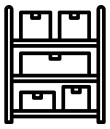
Use a properly functioning chemical fume hood when handling corrosive materials, especially those that can form mists/vapors upon contact with air, often referred to as “fuming” (this includes many strong acids and bases). If the process doesn’t allow working in a fume hood, contact Environmental Health and Safety at 650-723-0448.

Personal Protective Equipment

In addition to proper street clothing (long pants or equivalent that covers legs and ankles, and close-toed non-perforated shoes that completely cover the feet), wear the following Personal Protective Equipment (PPE):

- Safety glasses (If splash potential exists, wear goggles and a face shield instead)
- Lab coat (If splash potential exists, wear a chemical-resistant apron over your lab coat)
- Appropriate chemical-resistant gloves (continued on next page)

- Many corrosives penetrate nitrile gloves; however, wearing large, bulky gloves while working with small quantities of corrosives can be cumbersome and may increase the risk of spilling. In many cases, wearing nitrile gloves while working with small quantities of corrosives with a low splash risk is sufficient, but care must be taken to remove gloves immediately if contaminated and wash hands.



Special Handling Procedures and Storage Requirements

Segregate incompatible chemicals and use secondary containment. Follow any substance-specific storage guidance provided in SDS. Corrosives should not be stored above eye level. Wherever hydrofluoric acid is used, ensure that a calcium gluconate kit is available nearby. See the SU Laboratory Safety Fact Sheet on Hydrofluoric Acid.

Emergency Procedures

All incidents should be reported to EH&S with an incident report form.

Spill

Refer to EH&S' guidance on hazardous materials incidents for general procedures for incident response, and call 650-725-9999 for assistance with spill cleanup.

If you are trained in spill cleanup and the spill is not health-threatening, proceed with spill cleanup. There may be variations in procedure based on the specific spill, but the general steps are:

1. Don the appropriate PPE (See Personal Protective Equipment section, above).
2. Locate the nearest spill kit and bring it to the spill.
3. Use the absorbent pads in the spill kit to wipe up the spill.
4. Place the used absorbent pad and gloves inside the spill kit jar.
5. Place a waste tag on the spill kit and request waste pickup.

For spills of acids, use an Acid Spill Kit. This is especially important for oxidizing acids such as concentrated nitric, perchloric, and sulfuric acids, aqua regia, or piranha, which will react vigorously with and may ignite normal spill pads. Do not attempt to neutralize spills of acids or bases by pouring a neutralizing agent on them; if you feel a spill is too hazardous to clean without neutralization, contact EH&S for assistance in cleaning the spill.

Exposure

If immediate medical attention is required, call 911 . Remove any contaminated clothing, and IMMEDIATELY flush contaminated skin with water for at least 15 minutes. Use a safety shower for any skin exposures to the trunk, legs, or feet.

For eye exposures, IMMEDIATELY flush eyes with water for at least 15 minutes using an eyewash station.

If medical attention is needed, provide the SDS(s) of the chemical(s) to aid medical staff in proper diagnosis and treatment.

For minor exposures, personnel can contact the Stanford University Occupational Health Center at 650-725-5308. For serious exposures, personnel should go to the Stanford Hospital Emergency Department.

Those who work with hazardous chemicals are entitled to receive medical attention/consultation when:

- A spill, leak, explosion or other occurrence results in a hazardous exposure (potential overexposure).
- Symptoms or signs of exposure to a hazardous chemical develop

Special Exposure Guidance - Hydrofluoric Acid, TMAH, and Phenol

For exposures to hydrofluoric acid, follow SU HF First Aid Instructions. For exposures to tetramethylammonium hydroxide (TMAH), see EH&S' TMAH fact sheet.

All incidents involving exposure to hydrofluoric acid, TMAH, phenol, or other severe skin contact hazards require immediate medical attention. Additionally, seek medical attention if pain, numbness, redness, irritation or other health symptoms are apparent. Check the SDS to see if any delayed effects should be expected..

Waste Disposal

Dispose of corrosive liquids as hazardous waste. All hazardous waste containers should have a waste tag attached before any waste is added. Before combining materials in waste containers, review the SDSs and Stanford's Incompatibility Guide. For general guidance regarding waste disposal, refer to the guide for handling and storing waste and the chemical waste poster.

Do not neutralize acidic and basic wastes in order to pour them down the drain. This is considered waste treatment and is not permitted at Stanford. Dispose of acidic and basic waste as hazardous waste.

Minimum Training Requirements

- General Safety & Emergency Preparedness (EHS-4200)
- Chemical Safety for Laboratories (EHS-1900)
- Laboratory-specific training
    - Where hydrofluoric acid or TMAH are used, training must include emergency first aid procedures.

Approval Required

Consult with your PI regarding the need for prior approval. Laboratory personnel shall seek and the PI must provide prior approval of any chemical usage involving Restricted Chemicals or High Risk Procedures.

Designated Area

For corrosives that are also considered particularly hazardous substances (i.e., select carcinogens, reproductive toxins, and highly acutely toxic materials), a designated area shall be established per the other applicable SOP(s).