



Corrosives- Strong Bases

H290 H314 H315 H316 H318 H319 H320



Areas with blue text indicate that information must be provided or modified by researcher prior to the SOP approval.

This SOP is not a substitute for hands-on training.

Print a copy and insert into your laboratory SOP binder.

Department:	Chemistry
Date SOP was written:	Tuesday, September 20, 2016
Date SOP was approved by PI/lab supervisor:	
Principal Investigator:	Name: R. Cohen Signature: _____
Internal Lab Safety Coordinator or Lab Manager:	Name: Tamara Sparks Lab Phone: 303-921-9783 Office Phone:
Emergency Contact:	Name: Tamara Sparks Phone Number:
Location(s) covered by this SOP:	Hildebrand B49,B70,B74,B76

1. Purpose

This SOP covers the precautions and safe handling procedures for the use of Corrosives – Strong Bases. For a list of Corrosives - Strong Bases covered by this SOP and their use(s), see the “List of Chemicals”. Procedures described in Section 12 apply to all materials covered in this SOP.

If you have questions concerning the applicability of any recommendation or requirement listed in this procedure, contact the Principal Investigator/Laboratory Supervisor or the campus Chemical Hygiene Officer at ucbcho@berkeley.edu.

2. Physical & Chemical Properties/Definition of Chemical Group

A strong base is one that completely ionizes (dissociates) in a solution. (See Appendix for a complete list of Strong Bases.)



3. Potential Hazards/Toxicity

Strong bases are very hazardous in case of skin contact, eye contact, ingestion, and/or inhalation. Strong bases are corrosive to eyes and skin. Eye contact can result in corneal damage or blindness. Skin contact can produce inflammation and blistering. Inhalation of dust will produce irritation to gastro-intestinal or respiratory tract, characterized by burning, sneezing and coughing. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening or, occasionally, blistering.

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS) designates corrosives by one or more of the following H codes:

- H290** May be corrosive to metals
- H314** Causes severe skin burns and eye damage
- H315** Causes skin irritation
- H316** Causes mild skin irritation
- H318** Causes serious eye damage
- H319** Causes serious eye irritation
- H320** Causes eye irritation

Strong Bases may also have other hazardous properties in addition to corrosivity. Safe use requires assessing all potential hazards.

It is the Principal Investigator’s responsibility to ensure activity-specific laboratory procedures and/or processes are taken into account when using this Chemical Class SOP.

Please, review the SDS of any chemical before use (see Section 11 – SDS Location)

4. Engineering Controls

Use the engineering controls listed below unless other lab-specific information is included in Section 12 - Protocol/Procedure.

- Work with Corrosives – Strong Bases must be conducted in a fume hood unless other controls are designated in the lab-specific Protocol/Procedure section. Sash height must be kept as low as possible to avoid escaping fumes and provide a physical barrier.
- Laboratories and rooms where strong bases are used must have general room ventilation that is negative pressure with respect to the corridors and external environment. The laboratory/room door must be kept closed at all times.

5. Personal Protective Equipment

At a minimum, the following PPE must be worn at all times.

Eye and Face Protection

- A. ANSI Z87.1-compliant safety glasses with side shields, or chemical splash goggles.
 - Ordinary prescription glasses will NOT provide adequate protection unless they also meet ANSI standard and have compliant side shields.
- B. If the potential for explosion/splashing exists, and adequate coverage is not provided by the hood sash, a face shield must be worn.



Skin and Body Protection

- A. Gloves are required when handling hazardous chemicals.
 - Refer to specific chemical SDS for information on glove selection.
 - For additional information on glove selection, go to:
<http://ehs.berkeley.edu/hs/63-laboratory-safety/94-glove-selection-and-usage.html>
- B. Lab coats are required when handling hazardous chemicals in the lab. Select the type of lab coat according to the hazards at the specific workplace.
- C. Long pants, closed-toe/closed-heel shoes, covered legs, and ankles.

Respiratory Protection

Respiratory protection is normally not required for UC Berkeley laboratory activities. Any lab personnel considering the use of a respirator (e.g. N-95 respirator, dust mask) must contact EH&S for a workplace assessment.

6. First Aid Procedures and Medical Emergencies

In the event of an injury, notify your supervisor immediately and EH&S within 8 hours.



Go to the Occupational Health Facility (Tang Health Center, on campus); if after hours, go to the nearest emergency room (Alta Bates, 2450 Ashby Ave in Berkeley); or



Call 911 (from a cell phone: 510-642-3333) if:

- *it is a life threatening emergency; or*
- *you not are confident in your ability to fully assess the conditions of the environment and/or the condition of the contaminated/injured person, or you cannot be assured of your own safety; or*
- *the contaminated/injured person is not breathing or is unconscious.*

Please remember to provide a copy of the appropriate manufacturer SDS (if available) to the emergency responders or physician. At a minimum, be ready to provide the identity/name of any hazardous materials involved.

In case of skin contact

Immediately drench in the safety shower with copious amounts of water for no less than 15 minutes to remove any remaining contaminants; 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.

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.

If swallowed

Do NOT induce vomiting unless directed otherwise by the SDS. Never give anything by mouth to an unconscious person. Rinse mouth with water.

If inhaled

Move into fresh air.

Needle stick/puncture exposure

Wash the affected area with antiseptic soap and warm water for 15 minutes.

7. Special Handling, Storage, and Disposal Requirements



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

Precautions for Safe Handling

- Do not allow water to get into the containers because of potentially violent reactions. Do not get in eyes, on skin, or on clothing.
- When mixing with water, always add bases slowly to the water and stir continuously. Never add water to base.
- Eliminate or substitute for a less hazardous material when possible.
- Design your experiment to use the least amount of material possible to achieve the desired result.
- Do not exceed the scale of procedures specified in Protocol/Procedure section without approval of the PI.
- Verify your experimental set-up and procedure prior to use.
- Know the location of the nearest eyewash, safety shower and fire extinguisher before beginning work.
- Upon leaving the work area, remove any personal protective equipment worn and wash hands.
- At the end of each project, thoroughly decontaminate the work area according to the material being handled.

Conditions for Safe Storage

- Store in a cool, dry, well-ventilated area away from incompatible substances.
- Liquid strong bases must be stored in isolation from all other chemicals in an approved base or corrosives safety cabinet. If no corrosive cabinet available, use secondary container to store bases.

Disposal

- Waste materials generated must be treated as a hazardous waste.
- The empty container must be rinsed three times with a COMPATIBLE solvent; leave it open in the back of the hood overnight. Solvent rinses and water rinse must be disposed of as hazardous waste.
- As an alternative, unrinsed empty containers can be disposed of through EH&S as hazardous waste. The unrinsed empty containers must be capped.
- Do not mix with incompatible waste streams.
- Decontamination of the empty container in order to use it for other purposes is not permitted.

8. Chemical Spill

Spill – Assess the extent of danger; if necessary request help by calling **911** (from a cell phone: **510-642-3333**) for emergency assistance or 510-642-3073 for non-life threatening situations. 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 510-642-3073 and if you are trained, proceed to clean it. Use



appropriate personal protective equipment and clean-up material for chemical spilled. Double bag spill waste in clear plastic bags, label and request pick-up.

- **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** or 510-642-3073 for assistance.

9. Cleaning and Decontamination

Lab-specific information on decontamination may be included in Section 12 - Protocol/Procedure.

- Wearing proper PPE, laboratory work surfaces must be cleaned at the conclusion of each procedure and at the end of each work day.
- Decontaminate all equipment before removing from a designated area.

10. Hazardous Waste Disposal

Label Waste

- Label all waste containers. 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.
- Contact EH&S at 642-3073 if you need assistance.

11. Safety Data Sheet (SDS) Location

SDS can be accessed online at <http://ucsd.com>



-Take Ownership of Your Safety-



Before starting any work, ask yourself:

- 1- **What will I be doing?**
- 2- **Do I know what the hazards are?**
- 3- **Do I have everything I need to do the job safely?**
- 4- **Am I doing the job safely?**
- 5- **What can we do better?**



12. Protocol/Procedure – Corrosives – Strong Bases

Section 12 must be customized to your specific needs. Delete any procedure that does not apply to your laboratory.

Procedure/Use	Scale	Engineering Controls/Equipment	PPE (eye, face, gloves, clothing)	Procedure Steps and Precautions
1. Remove CO ₂ from the LICOR LI-6262 instrument	Up to 100 mL of granulated soda lime material (as supplied in the reagent bottle)	N/A	<p>Eye protection: Wear ANSI Approved tight-fitting safety goggles or safety glasses with side shields.</p> <p>Hand Protection: Confirm compatibility of glove material with chemical being used. General guidance (unless otherwise specified in the specific SDS): Nitrile gloves must be used to prevent incidental contact. Gloves must be inspected prior to use. Wash and dry hands after use.</p> <p>Clothing: Wear lab coat, full length pants or equivalent; and close-toed closed heeled shoes.</p>	<p>Follow instructions in the maintenance section of the LICOR LI-6262 CO₂/H₂O analyzer instruction manual for how to remove and refill the desiccant container with magnesium perchlorate. (Instruction manual is generally found on top of the plant project laser system next to the LICOR instrument.)</p> <p>Keep containers closed when not in use.</p> <p>Clean up any material spilled while refilling the instrument tube.</p> <p>Dispose as solid waste.</p>
Notes	Any deviation from this SOP requires approval from PI.			



Procedure/Use	Scale	Engineering Controls/Equipment	PPE (eye, face, gloves, clothing)	Procedure Steps and Precautions
2. NO ₂ absorption by NaOH for instrument calibration	Up to 200g NaOH (as suppliant in the reagent bottle)	See Procedure	<p>Eye protection: Wear ANSI Approved tight-fitting safety goggles or safety glasses with side shields.</p> <p>Hand Protection: Confirm compatibility of glove material with chemical being used. General guidance (unless otherwise specified in the specific SDS): Nitrile gloves must be used to prevent incidental contact. For spill handling or for potential contact with larger quantities, use double nitrile or heavier gauge nitrile or neoprene gloves. Gloves must be inspected prior to use. Wash and dry hands after use.</p> <p>Clothing: Wear lab coat, full length pants or equivalent; and close-toed closed heeled shoes.</p>	To make sodium hydroxide solutions, solid NaOH is weighed and added to the desired volume of water. Especially when making solutions of over 1M NaOH, solid NaOH should always be added to water, never water added to the NaOH. In the case of a spill, use a weak acid such as citric acid, sodium bisulfate, or dilute acetic acid to neutralize the base. If solid NaOH is spilled there is no need to neutralize or absorb it, it should be picked up and disposed of in the appropriately labeled waste container. After use, concentrations exceeding 10 ⁽⁻⁴⁾ M NaOH must be placed into a closeable labeled waste container for disposal. Solutions with concentrations of 10 ⁽⁻⁴⁾ M NaOH or less can be drain disposed. Alternatively, solutions can be neutralized with a weak acid to below pH 10 and drain disposed. The pH is tested by dipping a pH test strip into the NaOH solution and comparing the color on the strip to the chart that comes with them. Used test strips are disposed of into labeled containers for chemically contaminated waste.
Notes	Any deviation from this SOP requires approval from PI.			



Procedure/Use	Scale	Engineering Controls/Equipment	PPE (eye, face, gloves, clothing)	Procedure Steps and Special Precautions for this Procedure
3. Using ammonium nitrate salt to prepare standards and QC for inorganic microplate protocol	Up to 5g as supplied in the reagent bottle	See procedure	<p>Eye protection: Wear ANSI Approved tight-fitting safety goggles or safety glasses with side shields.</p> <p>Face Protection: Face shields are to be used when there is no protection from the hood sash.</p> <p>Hand protection: Confirm compatibility of glove material with chemical being used. General guidance (unless otherwise specified in the specific SDS): Nitrile gloves must be used to prevent incidental contact. For spill handling or for potential contact with larger quantities, use double nitrile or neoprene gloves. Gloves must be inspected prior to use. Wash and dry hands after use.</p> <p>Clothing: Wear lab coat; full-length pants or equivalent; and close-toed, close-heeled shoes.</p>	<p>Avoid skin contact, eye contact, indigestion and inhalation.</p> <p>Keep away from heat, from source of ignition and from combustible material. Contact with combustible or organic materials may cause fire.</p> <p>Place ammonium nitrate salt in drying oven before weighing out 5g of ammonium nitrate salt into an aluminum weighing tin and place in drying oven at 60°C for two hours. Add 2,8571g dry ammonium nitrate to a 500 mL volumetric flask.</p> <p>Ammonium nitrate should be used in a well-ventilated place. Stable in the refrigerator.</p>
Notes	Any deviation from this SOP requires approval from PI.			



Procedure/Use	Scale	Engineering Controls/Equipment	PPE (eye, face, gloves, clothing)	Procedure Steps and Special Precautions for this Procedure
4. Using N-(1-Naphthyl) ethylenediamine dihydrochloride (NEDD) to make NO ₃ reagent for inorganic microplate protocol	Up to 10mg as supplied in the reagent bottle	See procedure	<p>Eye protection: Wear ANSI Approved tight-fitting safety goggles or safety glasses with side shields.</p> <p>Face Protection: Face shields are to be used when there is no protection from the hood sash.</p> <p>Hand protection: Confirm compatibility of glove material with chemical being used. General guidance (unless otherwise specified in the specific SDS): Nitrile gloves must be used to prevent incidental contact. For spill handling or for potential contact with larger quantities, use double nitrile or neoprene gloves. Gloves must be inspected prior to use. Wash and dry hands after use.</p> <p>Clothing: Wear lab coat; full-length pants or equivalent; and close-toed, close-heeled shoes.</p>	<p>Avoid skin contact, eye contact, indigestion and inhalation.</p> <p>In a beaker, add 200 mg sulfanilamide and 10 mg of NEDD (N-(1-Naphthyl) ethylenediamine dihydrochloride) to 400 mL Millipore water and use a spin bare to dissolve.</p> <p>Keep container dry and in a cool place.</p> <p>Avoid formation of dust and aerosols.</p>
Notes	Any deviation from this SOP requires approval from PI.			



Procedure/Use	Scale	Engineering Controls/Equipment	PPE (eye, face, gloves, clothing)	Procedure Steps and Special Precautions for this Procedure
5. Using Sodium hypochlorite to prepare NH_4^+ hypochlorite Reagent	10mL per reagent sample	See procedure, handle in hood	<p>Eye protection: Wear ANSI Approved tight-fitting safety goggles or safety glasses with side shields. Causes severe eye damage.</p> <p>Hand protection: Nitrile gloves must be used to prevent incidental contact. For spill handling or for potential contact with larger quantities, use double nitrile or neoprene gloves. Gloves must be inspected prior to use. Wash and dry hands after use. Can cause severe skin burns.</p> <p>Clothing: Wear lab coat; full-length pants or equivalent; and close-toed, close-heeled shoes.</p> <p>Respiratory protection: Wear respirator if handling outside of hood. Keep sash low to prevent from breathing in vapors.</p>	<p>Avoid skin contact, eye contact, indigestion. Wash skin thoroughly after handling.</p> <p>Avoid contact with metals.</p> <p>Add 1 g sodium phosphate and 1.333 mL of 3.0 M sodium hydroxide along with 10 mL of sodium hypochlorite to 100 mL volumetric flask and bring to volume with millipore water. Recommend storing hypochlorite in the refrigerator (2-8C). If stored in refrigerator, add it first and bring up to temperature with ~25-50mL millipore water before adding the rest of the reagents.</p> <p>In the case of spill do not let chemical enter drain. Soak up with inert material. Do not flush with water. Store in a cool dry well-ventilated area</p>
Notes	Any deviation from this SOP requires approval from PI.			



Procedure/Use	Scale	Engineering Controls/Equipment	PPE (eye, face, gloves, clothing)	Procedure Steps and Precautions
6. Using Sodium phosphate tribasic to prepare NH_4^+ hypochlorite Reagent	1g per reagent sample	See procedure, handle in hood	<p>Eye protection: Wear ANSI Approved tight-fitting safety goggles or safety glasses with side shields.</p> <p>Hand protection: Nitrile gloves must be used to prevent incidental contact. For spill handling or for potential contact with larger quantities, use double nitrile or neoprene gloves. Gloves must be inspected prior to use. Wash and dry hands after use.</p> <p>Clothing: Wear lab coat; full-length pants or equivalent; and close-toed, close-heeled shoes.</p> <p>Respiratory protection: Wear respirator if handling outside of hood. Keep sash low to prevent from breathing in dust particles.</p>	<p>Avoid skin contact, eye contact, indigestion and inhalation. Avoid formation of dust and aerosols. Wash skin thoroughly after handling.</p> <p>Avoid contact with metals.</p> <p>Add 1 g sodium phosphate and 1.333 mL of 3.0 M sodium hydroxide along with 10 mL of sodium hypochlorite to 100 mL volumetric flask and bring to volume with millipore water. Since the hypochlorite will be cold, as it is kept in the refrigerator, add it first and bring up to temperature with ~25-50mL millipore water before adding the rest of the reagents.</p> <p>In the case of spill do not let chemical enter drain. Shovel into appropriate container. Avoid forming dust particles. Clean contaminated surface thoroughly.</p>
Notes	Any deviation from this SOP requires approval from PI.			



Procedure/Use	Scale	Engineering Controls/Equipment	PPE (eye, face, gloves, clothing)	Procedure Steps and Precautions
7. Using sodium salicylate to prepare NH_4^+ Nitroprusside Reagent (good for two weeks; light sensitive)	Up to 15g, 7.8g per reagent sample	See procedure,	<p>Eye protection: Wear ANSI Approved tight-fitting safety goggles or safety glasses with side shields.</p> <p>Hand protection: Nitrile gloves must be used to prevent incidental contact. For spill handling or for potential contact with larger quantities, use double nitrile or neoprene gloves. Gloves must be inspected prior to use. Wash and dry hands after use.</p> <p>Clothing: Wear lab coat; full-length pants or equivalent; and close-toed, close-heeled shoes.</p>	<p>Avoid skin contact, eye contact, indigestion and inhalation. Avoid formation of dust and aerosols. Wash skin thoroughly after handling.</p> <p>Under the hood!!! Dissolve 0.125 g of sodium nitroprusside and 7.813 g of sodium salicylate in 100 mL of millipore water. Sodium salicylate is very flaky and toxic. The best way to do this is to add the sodium nitroprusside to the flask first outside of the hood, then to wet a weighing dish with a layer of Millipore water, tare the dish, and add the sodium salicylate to the dish. This will cut down on the flyaway particles of sodium salicylate. Be careful not to overshoot the mass of chemical added, because you cannot remove wet chemical from the dish.</p> <p>Wrap volumetric flask in foil (for light sensitivity) and store in the refrigerator.</p> <p>In the case of spill use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of appropriately.</p>
Notes	Any deviation from this SOP requires approval from PI.			



List of Chemicals

Chemical(s)	Chemical(s)	Chemical(s)
Sodium Hydroxide	Ammonium Nitrate	NEDD
Soda Lime	Sodium Hypochlorite	Sodium phosphate tribasic
Bleach	Sodium Salicylate	