



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:	Monday, October 24, 2016
Date SOP was approved by PI/lab supervisor:	
Principal Investigator:	Name: R. Sarpong Signature: _____
Internal Lab Safety Coordinator or Lab Manager:	Name: Melissa Hardy/Justin Jurczyk Lab Phone: 406-696-1225/412-728-1952 Office Phone: 510-642-6312
Emergency Contact:	Name: Melissa Hardy/Justin Jurczyk Lab Phone: 406-696-1225/412-728-1952
Location(s) covered by this SOP:	Latimer Hall 831,832,834,836,837,838,839,842,844,847,849

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 are not 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

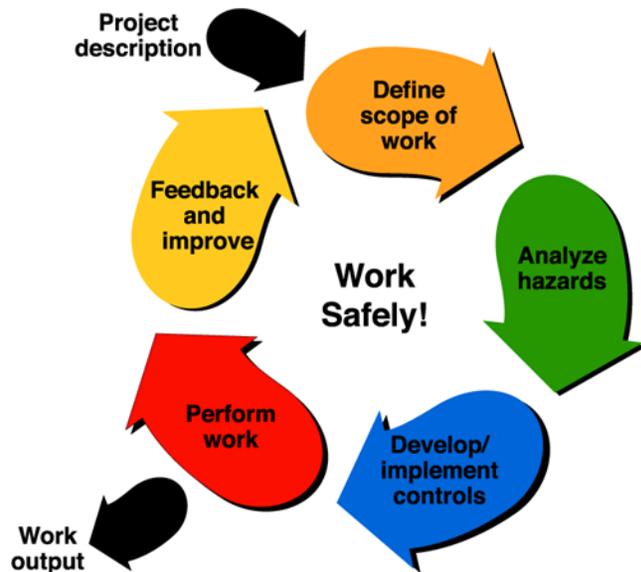
- Dispose of regularly generated chemical waste within 6 months.
- Contact EH&S at 642-3073 if you need assistance.

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. Preparation of dilute solutions (typically 1-10 M) starting with a 50% NaOH liquid.	<p>Up to 500 mL concentrated sodium hydroxide as supplied in the reagent bottle per dilution.</p> <p>Up to 2 L of dilute solution.</p> <p style="color: red;">Remember to obtain PI approval if higher scale is necessary.</p>	All reactions using these materials must be performed in a properly operating fume hood with the sash as low as possible. Or in an inert atmosphere glovebox.	<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 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. Wear a base resistant apron when handling the chemical as supplied in the reagent bottle or when there is the potential for splashing.</p>	<p>Eliminate incompatible materials from the potential spill area.</p> <p>Concentrated sodium hydroxide solutions can cause severe burns to the eyes, skin, and mucous membranes. Handle with great care.</p> <p>Determine the amount of base and water required for the dilution.</p> <p>Inspect the glassware prior to use to make sure it is free from any cracks, scratches or chips that would indicate a weakness in the glass. Be sure to use borosilicate glass.</p> <p>Transfer the base to a beaker for easier handling. Always add base slowly to the bulk water component. Do not add the water to the base. Stir the sodium hydroxide, a little at a time, into a large volume of water and then dilute the solution to make one liter.</p> <p>The dilution of sodium hydroxide is exothermic. Immerse the container in a bucket of ice to keep the heat down. Set the mixing vessel in an ice bath. Add almost all the water required for the dilution to the vessel.</p> <p>Cool the resulting solution and dilute to the final volume.</p> <p>Transfer to a plastic storage container. Do not use glass. Strong bases etch glass.</p> <p>Rinse glassware of residue immediately. Dispose of rinse as described below.</p> <p>Chemical Disposal</p> <p>Neutralize solutions with dilute HCl and drain dispose with excess water.</p>



Notes	Any deviation from this SOP requires approval from PI.
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Procedure/Use	Scale	Engineering Controls/Equipment	PPE (eye, face, gloves, clothing)	Procedure Steps and Precautions
2. Preparation of 1 – 5 M solutions of strong base using pellets.	Up to 500 grams of strong base pellets as supplied in the reagent bottle (e.g., KOH, Ca(OH) ₂ or LiOH. Remember to obtain PI approval if higher scale is necessary.	All reactions using these materials must be performed in a properly operating fume hood with the sash as low as possible. Or in an inert atmosphere glovebox.	Eye protection: Wear ANSI Approved tight-fitting safety goggles or safety glasses with side shields. Face Protection: Face shields are to be used when there is no protection from the hood sash. 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. Clothing: Wear lab coat, full length pants or equivalent; and close-toed closed heeled shoes.	Eliminate incompatible materials from the potential spill area. Handle solid pellets carefully to prevent exposure to skin. Slowly add the strong base pellets to water; never the reverse. Provide adequate cooling capacity (e.g. ice bath) when preparing concentrated solutions of strong base as the pellets react exothermically with water. Dispose of any waste in the proper chemical waste container.
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
3. Using alkali hydroxides as reagents in a chemical reaction.	<p>Up to 100 g of alkali hydroxide as supplied in the reagent bottle.</p> <p style="color: red;">Remember to obtain PI approval if higher scale is necessary.</p>	All reactions using these materials must be performed in a properly operating fume hood with the sash as low as possible. Or in an inert atmosphere glovebox.	<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 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>	<p>Measure out the desired quantity of hydroxide by transferring the white solid to a tarred plastic weigh boat positioned on a balance using a metal spatula.</p> <p>Add the hydroxide slowly to the desired reaction vessel in a fume hood. Slow addition avoids the generation of excess heat.</p> <p>Dilute any hydroxide that was spilled during the above processes with copious amounts of water and use paper towels to soak up the resulting solution.</p> <p>Dispose of any paper towels in a chemically contaminated waste container.</p> <p>Allow the solution to cool off from heat of mixing</p> <p>Add water/solvent to complete the final volume required</p> <p>Place a stopper or lid securely on the flask and invert several times to thoroughly mix. </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
<p>4. Use of dilute hydroxide solutions to quench acidic media and/or to wash organic solutions to remove excess acid.]</p>	<p>Up to 4 liters of dilute hydroxide solution per quench or wash.</p> <p>Remember to obtain PI approval if higher scale is necessary.</p>	<p>All reactions using these materials must be performed in a properly operating fume hood with the sash as low as possible. Or in an inert atmosphere glovebox.</p>	<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 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. Wear a base resistant apron when there is the potential for splashing.</p>	<p>Eliminate incompatible materials from the potential spill area.</p> <p>When quenching or washing procedures employ a separatory funnel, caution must be exercised such that pressure build-up in the funnel is safely vented.</p> <p>Vent separatory funnel often. Aim funnel spout before and during vent toward back of hood.</p>
<p>Notes</p>	<p>Any deviation from this SOP requires approval from PI.</p>			



Procedure/Use	Scale	Engineering Controls/Equipment	PPE (eye, face, gloves, clothing)	Procedure Steps and Precautions
5. Use of concentrated potassium hydroxide solutions for cleaning glassware (base bath).	Up to 1 kg of potassium hydroxide as supplied in the reagent bottle. Remember to obtain PI approval if higher scale is necessary.	Secondary containment for the base bath must be used at all times, and the base bath shall be used in a well-ventilated area. Or in an inert atmosphere glovebox.	Eye protection: Wear ANSI Approved tight-fitting safety goggles or safety glasses with side shields. Face Protection: Face shields are to be used when there is no protection from the hood sash. Hand Protection: Wear long-cuff heavy weight rubber gloves when working with base bath solution. Gloves must be inspected prior to use. Wash and dry hands after use. Clothing: Wear lab coat, full length pants or equivalent; and close-toed closed heeled shoes. Wear a base resistant apron when there is the potential for splashing.	Eliminate incompatible materials from the potential spill area. Make sure any reactive residues are removed from glassware before addition to the base bath. When preparing the base bath, add the potassium hydroxide slowly and carefully.
Notes	Any deviation from this SOP requires approval from PI.			



List of Chemicals

Chemical(s)	Chemical(s)	Chemical(s)
calcium hydroxide	lithium hydroxide	sodium hydroxide
2,4,6-Trimethylbenzenesulfonyl hydrazide		