UC | Center for Laboratory Safety

Standard Operating Procedure

ACUTELY TOXIC CHEMICALS - SOLIDS (LD50 < 50 mg/kg)

This SOP is not complete until it has been signed and dated by the PI and relevant lab personnel.

Print a copy and insert into your
Laboratory Safety Manual and *Chemical Hygiene Plan*.
Refer to instructions for assistance.

Department:	Chemistry & Biochemistry– Chemical Engineering
Date SOP was written:	December 14, 2012
Date SOP was approved by PI/lab supervisor:	January 18, 2013
Principal Investigator:	Prof. Susannah Scott
Internal Lab Safety Coordinator/Lab Manager:	Stephanie Goubert-Renaudin
Lab Phone:	805-893-8941
Office Phone:	805-893-7403
Emergency Contact:	EH&S 24 hour line: 805-893-3194 *(Name and Phone Number)*
Location(s) covered by this SOP:	*ESB 3324 and 3328* *(Building/Room Number)*

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

Acutely Toxic Chemicals Information

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.

This Chemical Class SOP is intended to provide general guidance on how to work safely with acutely toxic chemicals. If you have questions concerning the applicability of any item listed in this procedure, contact the Principal Investigator/Laboratory Supervisor of your laboratory or Environment, Health and Safety.

Some acutely toxic chemicals are listed in Section 4 of Exhibit 1, Chemical Classification List, of the Settlement Agreement.

In addition, compounds with a *high* level of acute toxicity are defined by LD50 and LC50 levels:

1. A chemical with a median lethal dose (LD50) of 50 mg or less per Kg of body weight when administered orally to albino rats weighing between 200 and 300 gm each.
2. A chemical with a median lethal dose (LD50) of 200 mg or less per Kg of body weight when administered by continuous skin contact for 24 hours (or less if death occurs within 24 hours) with the bare skin of albino rabbits weighing between 2 and 3 Kg each.
3. A chemical that has a median lethal concentration (LC50) in air of 200 ppm by volume or less of gas or vapor, or 2 mg per liter or less of mist, fume, or dust, when administered by continuous inhalation for 1 hour (or less if death occurs within 1 hour) to albino rats weighing between 200 and 300 gm each.

Acutely toxic chemicals may also have other hazardous properties in addition to acute toxicity. Safe use requires assessing all potential hazards.

Examples of acutely toxic solid chemicals

Mercury(II) acetate, Sodium cyanide, Ammonium metavanadate, Mercury (II) nitrate, Potassium dichromate, Sodium chromate, Chromium (III) chloride, Sodium fluoride, Phosphoric acid, Thalium (I) acetylacetonate, Vanadium pentoxide, Phosphorus pentoxide, Phenol.

Required Training/Approvals

- Prior to conducting any work with an acutely toxic chemical, a designated person must provide training to his/her laboratory personnel specific to the hazards involved in working with this substance, work area decontamination, and emergency procedures.
- The Principal Investigator must provide his/her laboratory personnel with a copy of this Chemical Class SOP, any other relevant SOP, and a copy of relevant MSDSs provided by the manufacturer.

Administrative Controls

- Never work alone with extremely hazardous materials/operations. Ask the Principal Investigator for specific prohibitions (if any) on working alone with any acutely toxic chemical.
- Certain extremely hazardous operations should not be performed if the PI or Lab Safety Contact(s) are not present.
- 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 Lab Specific Instructions 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.
- Certain extremely hazardous operations should be performed in a designated area. A designated area is where limited access, special procedures, knowledge, and work skills are required. A designated area can be the entire laboratory, a specific laboratory workbench, or a laboratory hood.
- Upon leaving a designated area, remove any personal protective equipment worn and wash hands, forearms, face, and neck.
- Decontamination procedures vary depending on the material being handled. The toxicity of some materials can be neutralized with other reagents.
- All surfaces should be wiped with the appropriate cleaning agent following dispensing or handling.
- Decontaminate vacuum pumps or other contaminated equipment (glassware) before removing them from the designated area.

- At the end of each project, thoroughly decontaminate the designated area before performing other laboratory work in the area.
- Waste materials generated should be treated as a hazardous waste.

Engineering Controls

- Use a properly functioning certified chemical fume hood when handling this class of materials. If the process does not permit the handing of such materials in a fume hood, contact Environment, Health and Safety for reviewing the adequacy of ventilation measures.
- Use containment devices (such as lab fume hoods or glove boxes) when: (i) volatilizing these substances, (ii) manipulating substances that may generate aerosols, and (iii) performing laboratory procedures that may result in uncontrolled release of the substance.
- Use ventilated containment to weigh out solid chemicals. Alternatively, the tare method can be used to prevent inhalation of the chemical. While working in a laboratory hood, the chemical is added to a pre-weighed container. The container is then sealed and can be re-weighed outside of the hood. If chemical needs to be added or removed, this manipulation is carried out in the hood. In this manner, all open chemical handling is conducted in the laboratory hood.

Personal Protective Equipment (PPE)

NOTE: Safety glasses, fire resistant (where appropriate) lab coat, long pants, closed toed shoes, and safety gloves must be worn when working with acutely toxic substances. All substances covered by this SOP must also be used in a fume hood, if not in a sealed system such as a glove box or vacuum line.

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type AXBEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU). Refer to 8 CCR 5144 for selection of respirators. A respiratory protection program that meets 8 CCR 5144 must be followed whenever workplace conditions warrant use of a respirator.

Respirators should be used only under any of the following circumstances:

- As a last line of defense (i.e., after engineering and administrative controls have been exhausted).
- When Permissible Exposure Limit (PEL) has exceeded or when there is a possibility that PEL will be exceeded.
- Regulations require the use of a respirator.
- An employer requires the use of a respirator.
- There is potential for harmful exposure due to an atmospheric contaminant (in the absence of PEL)
- As PPE in the event of a chemical spill clean-up process

NOTE: Lab personnel intending to use/wear a respirator mask must be trained and fit-tested by EH&S. This is a regulatory requirement.

Hand Protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Refer to glove selection chart from the links below:

http://www.ansellpro.com/download/Ansell_8thEditionChemicalResistanceGuide.pdf

OR

http://www.allsafetyproducts.biz/page/74172

OR

http://www.showabestglove.com/site/default.aspx

OR

http://www.mapaglove.com/

Eye Protection

Safety glasses with side shields or tightly fitting safety goggles. Use face shield (8-inch minimum) when appropriate.

Skin and Body Protection

Long pants, closed-toed and closed-heeled shoes, cotton-based clothing/attire, and flame resistant (where appropriate) lab coat must be worn for protecting against chemical hazards.

Additional PPE may be required if procedures or processes present additional risk.

Storage

Use unbreakable secondary containment for the storage of acutely toxic chemicals. If the materials are volatile (or could react with moisture or air to form volatile toxic compounds), containers should be in a ventilated storage area.

Chemicals that can combine to make toxic materials (e.g., acids and inorganic cyanides, which can generate hydrogen cyanide) should not be stored in the same secondary containment. Chemicals that have a limited shelf life need to be tracked and monitored. Chemicals that require refrigeration should be stored appropriately.

Spill Response and Exposure Response

Before beginning work with chemicals, review the relevant SOPs, Safety Data Sheets, and other chemical safety resources. Develop specific procedures for emergency response and chemical exposure or injury to staff, including any special first aid measures required for the relevant chemicals.

First Aid Procedures

If Inhaled
Move person into fresh air. If breathing is difficult, give oxygen. Do NOT use mouth-to-mouth resuscitation. Get medical attention immediately.

In Case of Skin Contact
Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

In Case of Eye Contact
Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention immediately

If Swallowed
Do NOT induce vomiting unless directed to do so by medical personnel. If victim is conscious and alert, rinse mouth with 2-4 cupfuls of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Spill and Accident Procedure

Chemical Spill Dial 9-911 and EH&S (805-893-3194)

Spill – Assess the extent of danger. Help contaminated or injured persons. Evacuate the spill area. Avoid breathing vapors. 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.).

Small (<1 L) – If you have training, you may assist in the clean-up effort. Use appropriate personal protective equipment and clean-up material for chemical spilled. Double bag spill waste in clear plastic bags, label and take to the next chemical waste pick-up.

Large (>1 L) – Dial 9-911 **from campus phones (and 805-893-3446 from a cell phone)** and EH&S (893-3194) for assistance.

Chemical Spill on Body or Clothes – Remove clothing and rinse body thoroughly in emergency shower for at least 15 minutes. Seek medical attention. *Notify supervisor and EH&S immediately.*

Chemical Splash Into Eyes – Immediately rinse eyeball and inner surface of eyelid with water from the emergency eyewash station for 15 minutes by forcibly holding the eye open. Seek medical attention. *Notify supervisor and EH&S immediately.*

Medical Emergency Dial 9-911

Life Threatening Emergency, After Hours, Weekends and Holidays – Dial 9-911 (or 805-893-3446 from a cell phone) or go to the Emergency Room of Goleta Valley Cottage Hospital at 351 South Patterson Avenue, Goleta (Phone number: 805-967-3411) *Note: All Serious injuries must be reported to EH&S within 8 hours.*

Non-Life Threatening Emergency – Go to the Student Health Building, Building 588 (phone number: 893-5361, hours: M, T, R, F 8am-4.30pm, W 9am - 4.30pm, R 5pm to 7pm by appointment). After hours go to the Emergency Room of Goleta Valley Cottage Hospital at 351 South Patterson Avenue, Goleta (Phone number: 805-967-3411) *Note: All serious injuries must be reported to EH&S within 8 hours.*

Needle stick/puncture exposure (as applicable to chemical handling procedure) – Wash the affected area with antiseptic soap and warm water for 15 minutes. For mucous membrane exposure, flush the affected area for 15 minutes using an eyewash station. Page the needle stick nurse \ and then enter your extension. After hours go to the nearest emergency room: the Emergency Room of Goleta Valley Cottage Hospital at 351 South Patterson Avenue, Goleta (Phone number: 805-967-3411). *Note: All needle stick/puncture exposures must be reported to EH&S within 8 hours.*

Decontamination/Waste Disposal Procedure

Wearing proper PPE, decontaminate equipment and bench tops. Call EH&S for assistance, if needed. Dispose of any acutely toxic chemical waste and any other disposables contaminated with these materials as hazardous waste.

Label Waste

- Affix an hazardous waste tag on all waste as soon as the first drop of waste is added to the container

Store Waste

- Store hazardous waste in closed containers, in secondary containment and in a designated location

Dispose of Waste

- Dispose of regularly generated chemical waste within 90 days
- Call EH&S for questions (**893-3194**)
- Empty Containers
    - Dispose as hazardous waste

Safety Data Sheet (SDS) Location

SDS can be accessed online at http://ehs.ucsb.edu/units/labsfty/labrsc/chemistry/lschemmsdsacc.htm

Lab Specific Instructions

Refer to the MSDS of the chemical for appropriate and safe handling.

When handling acutely toxic solid chemicals, safety goggles, a lab coat (flame retardant if appropriate) and appropriate gloves have to be worn. Disposables gloves have to be changed as soon as contaminated.

Work with these solids has to be performed in a ventilated fume hood, to limit inhalation of toxic dust, if not in a sealed system such as glove box or vacuum line. Precautions have to be taken when transferring the container with acutely toxic solid inside/outside the glove box (keep it in a cap-sealed/closed container) or on/off the vacuum line (keep the flask closed when not under vacuum) to limit inhalation of toxic dust.

Acutely toxic solid chemicals have to be disposed as hazardous wastes in the proper container, kept closed at all times.

NOTE: Any deviation from this SOP requires approval from PI.

Documentation of Training (signature of all users is required)

- Prior to conducting any work with solids being acutely toxic chemicals, designated personnel, i.e. approved users listed below, must provide training to his/her laboratory personnel specific to the hazards involved in working with this substance, work area decontamination, and emergency procedures.

- The Principal Investigator must provide his/her laboratory personnel with a copy of this SOP and a copy of the SDS provided by the manufacturer.
- The Principal Investigator must ensure that his/her laboratory personnel have attended appropriate laboratory safety training or refresher training as required by EH&S.

I have read and understand the content of this SOP:

Name	Signature	Trainer	Date
Prof. Susannah Scott			
Stephanie Goubert-Renaudin			
Gary Kwanyi Ng			
Alessandro Gallo			
Anthony Crisci			
Haibo Yu			
Taeho Hwang			
Bethany Wigington			
Daniel Coller			
Zachary Jones			
Youhong Wang			
Jinghong Zhou			
Jason Fendi			