Laboratory Specific Standard Operating Procedures

**TITLE: SOP for the safe use of Arsenic (and/or cacodylic acid)**

Date: **7/20/18** Review: Date Revised:

Principal Investigator:

Authors (Names):

Department, Building, Room(s):

Contact Phone Number:

This SOP must be kept on file for all laboratory employee training and review.

**Section 1: (Check One)**
There are three methods that can be used to write SOPs. They are: by process (distillation, synthesis, chromatography, etc.); by individual hazardous chemical (benzene, phenol, arsenic, etc.); and by hazardous chemical class (flammable, corrosive, oxidizer, etc.).

_____ Process ___X__ Chemical _____Hazard Chemical Class

**Section 2: Describe Process, Hazardous Chemical or Hazard Class**
This SOP presents guidelines and procedures for the safe use of arsenic (CAS # 7440-38-2). In addition to use of this SOP, persons working with arsenic should be thoroughly familiar with general guidelines for high hazard chemicals identified in the High Hazard Chemical Policy (EHS 200.09) and all other applicable LSUHSC chemical safety policies. All current applicable Safety Data Sheets (SDSs) should be available and reviewed prior to use.

Arsenic is a naturally occurring element, with the abbreviation As, that is typically found in minerals in combination with other metals. It can be found as a pure crystalline element. The three most common allotropes are silver (or grey), yellow, and black. Arsenic is primarily used in the construction of lead alloys and manufacture of poisons (pesticides, herbicides, and insecticides). In the university setting, it is utilized within cacodylic acid and as a heavy metal stain for electron microscopy. Cacodylic acid has the chemical formula $(CH_3)_2AsO_2H$.

**Section 3: Potential Hazards**
Physical Hazards
- Arsenic is odorless and tasteless.
- Arsenic is flammable in the presence of ignition sources, acids, and oxidizing materials.
- Incompatibilities and reactivities: bromates, chlorates, iodates, acids, and oxidizing agents.
    - Verify entirety of incompatibilities via SDSs.

Health Hazards

- Arsenic is very hazardous due to ingestion.
- Arsenic is hazardous due to inhalation.
- Slightly hazardous in case of skin contact.
- Acute effects of arsenic includes vomiting, abdominal pain, diarrhea, followed by numbness and tingling of the extremities, muscle cramping, and death in extreme cases.
- Chronic exposure is typically observed within the skin, including pigmentation change, skin lesions, and hyperkeratosis (rough patches on the palms or soles of the feet). Other effects include developmental effects, neurotoxicity, diabetes, and cardiovascular disease.
    - Chronic exposure can lead to organ damage.
- Arsenic is toxic to the kidneys, the lungs, the nervous system, and mucous membranes.

An employee demonstrating symptoms which might be a result of exposure to arsenic shall report immediately to a supervisor who shall request an evaluation by EH&S.

**Section 4: Personal Protective Equipment**

- Proper Laboratory Attire - pants or dresses/shorts below the knees, sleeved shirt, close-toe shoes.
- Lab Coat - fully buttoned lab coat with sleeves extending to the wrists. Coat may be reused before laundering if it has not been contaminated with arsenic.
- Eye/ Face Protection
    - Safety glasses or goggles are appropriate for handling arsenic.
    - Ordinary (street) prescription glasses do not provide adequate protection.
- Hand Protection
    - Disposable nitrile gloves (NOT latex). Double-gloving is recommended when working with pure arsenic or concentrated solutions. Change gloves frequently and when contaminated, punctured or torn.
    - Laboratory personnel should thoroughly wash hands with soap and water before and immediately upon removal of gloves.
- Respiratory Protection - EH&S (568-6585) should be contacted prior to initial use (and when processes of use change) of arsenic to evaluate exposures and need for respiratory protection.

Refer to EHS-400.03, Personal Protective Equipment for more information.

**Section 5: Engineering Controls**

- Arsenic should be purchased in the minimum amounts necessary to mitigate potential hazards.
- Ventilation controls to keep airborne contaminants below the exposure limit include:
    - Process enclosures shall be utilized.
    - Local exhaust ventilation shall be utilized.
    - PPE shall be utilized as necessary.
- All arsenic solutions must be prepared and handled in a certified chemical hood.
    - Use of a Biological Safety Cabinet is especially not appropriate for working with arsenic.

- Work at least 6" inside of hood and set sash at lowest possible position
- Any hood for which arsenic is used shall be posted with a warning sign that identifies the hazards and necessary controls.

**Section 6: Special Handling and Storage Requirements**

- Arsenic should be secured from unauthorized access.
- Arsenic is highly toxic, as such the container should be sealed tightly.
- Ground all equipment containing material.
- Keep away from all sources of ignition and heat.
- Prepare the smallest amount necessary for the procedure.
- Avoid formation of dusts and aerosols.
- Utilize appropriate PPE.
    - In the case of insufficient ventilation utilize appropriate respiratory PPE.
- Prior to conducting any work with arsenic, the Principal Investigator must provide training to his/her laboratory personnel specific to the hazards involved in working with this substance, work area decontamination, and emergency procedures, to include review of this SOP and applicable SDSs.

**Section 7: Spill and Accident Procedures**

- The availability, location, and contents of chemical spill clean-up kits must be confirmed prior to handling or beginning any work with arsenic.
- Immediately notify all lab personnel of spills (with the details of the spill and actions being taken) and regulate access to the area.
- Laboratory personnel should be prepared to respond to spills in accordance with the guidance provided in LSUHSC Chemical Spill Response Procedure (EHS 200.02).
- All spills of arsenic should have personnel contact University Police.
- Personnel cleaning the spill shall, at minimum, wear the same PPE required for handling/use.
- Eliminate all sources of ignition.
- Avoid dust formation to ensure particulate limits remain low.
    - A self-contained breathing apparatus might be necessary to protect against large amounts of particulates.
    - If exposure may exceed permissible limits, the minimum protection would be a negative air pressure purifying respirator with approved cartridges.
    - Where airborne exposures may exceed OSHA/ACGIH permissible air concentrations, the minimum respiratory protection recommended is negative pressure air purifying respirator with cartridges that are NIOSH/MSHA approved against dusts, fumes and mists having a TWA less than 0.05 mg/m3.
    - When cleaning, wet sweep or wet vacuum the spill to prevent further dust creation.
- In the event of skin contact, immediately remove contaminated clothing and wash affected areas with soap and copious amounts of water.
- In case of contact with eyes, immediately flush eyes with copious amounts of water for at least 15 minutes.
- All exposed persons should seek immediate medical attention (subsequent to initial decontamination for skin contact).
- Report all spills, regardless of size, to laboratory PI, who will report to LSUHSC EH&S.

Incident and accident reporting must be done electronically via the on-line fillable forms located on the EHS website. For more information about appropriate form selection, refer to EHS-400.06, Incident and Accident Reporting and Investigation Policy.

**Section 8: Decontamination Procedures**

- Where the eyes or body of any person may be exposed to arsenic, a safety shower/eye wash must be available for immediate use. Personnel must be aware of location of nearest Safety Shower/ Eye Wash and verify that a current certification of performance tag is present.
- Personnel shall rinse any arsenic exposed areas of skin and/or eyes with copious amounts of water for at least 15 minutes.
  - After flushing exposed skin, place an emollient over the afflicted skin.
- If inhalation occurs, move the individual to fresh air. If the individual is not breathing, provide artificial respiration. Seek immediate medical assistance.
- If ingestion has occurred, do NOT induce vomiting unless directed by medical personnel. Rinse the mouth of the victim. Seek immediate medical assistance.
- All equipment, materials and work surfaces that have / potentially have become contaminated with arsenic shall be washed with soap and water prior to storage and re-use.

**Section 9: Waste Disposal Procedures**

Arsenic waste is considered hazardous and must be disposed of in accordance with LSUHSC Chemical Waste Management Procedures (EHS 200.04).

- Waste storage – Arsenic waste should be placed in a tightly sealed and labeled plastic container with the words "HAZARDOUS WASTE" clearly marked, the primary constituents of the waste, and the starting accumulation date.
- To schedule a waste pick-up by EH&S, use the bob.lsuhsc.edu service request system.

**Section 10: Laboratory Specific Protocol(s):**

Attach laboratory protocol for specific handling and operational practices.