Laboratory Specific Standard Operating Procedures

TITLE: SOP for the safe use of Osmium Tetroxide

Date: Review: Date Revised:

Principle 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 Osmium Tetroxide (CAS # 20816-12-0). In addition to use of this SOP, persons working with Osmium Tetroxide 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 MSDSs should be available and reviewed prior to use.

Section 3: Potential Hazards
Physical Hazards

- Pale yellow, corrosive solid.
- Strong oxidizer that will sublime (pass directly from solid to vapor and back to solid) readily at room temperature and significantly when refrigerated.
- Incompatibilities and reactivities: acids, metals, excess heat, bases, combustible materials, hydrogen chloride, reducing agents and strong oxidizing agents.

Health Hazards

- Acute toxicity of osmium tetroxide is high.
- Severe irritant of the eyes and respiratory tract.
- Vapor exposure can damage the cornea of the eye and can cause blindness
- Inhalation can cause headache, coughing, dizziness, lung damage, difficult breathing and may be fatal.
- Contact of vapor with skin can cause dermatitis, and direct contact with the solid can lead to severe irritation and burns.
- Ingestion of very small amounts can cause death.
- Chronic exposure can lead to systemic toxic effects involving liver and kidney damage among a larger range of more conspicuous chronic signs/symptoms
- Osmium tetroxide is regarded as a substance with poor warning properties.
- Osmium tetroxide has not been shown to be carcinogenic or to show reproductive or developmental toxicity in humans.

An employee demonstrating symptoms which might be a result of exposure to osmium tetroxide shall report immediately to 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 osmium tetroxide.
- Eye/ Face Protection
  - Chemical goggles are required for all circumstances of use (safety glasses alone are not adequate protection because of osmium tetroxide's severe effects on the eyes).
  - Ordinary (street) prescription glasses do not provide adequate protection.
- Hand Protection
  - Disposable nitrile gloves (NOT latex). Double-gloving is recommended when working with pure osmium tetroxide 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 osmium tetroxide to evaluate exposures and need for respiratory protection.

Section 5: Engineering Controls

- Osmium tetroxide should be purchased as a liquid (in the minimum concentrations necessary) to avoid particulate exposure from the powdered form.
- All osmium tetroxide solutions must be prepared and handled in a certified chemical hood. Use of a Biological Safety Cabinet is especially not appropriate for working with osmium tetroxide.
- The working surfaces of any hood for which osmium tetroxide is used should be protected with plastic backed absorbent pads to insure containment of any spills. The side and back walls shall be covered to a minimum height of 12"

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

Section 6: Special Handling and Storage Requirements

- Pure osmium tetroxide and concentrated solutions should be stored in a location that is secure to unauthorized access. A refrigerator containing osmium tetroxide must be labeled with a caution sign noting its presence and hazards.
- Store pure osmium tetroxide and its concentrated solutions in appropriate, sealed glass containers within an unbreakable secondary containment. **Note** - plastic containers can be penetrated by osmium tetroxide and should never be used. Label all containers, including secondary containment, with the chemical name and hazard warning.
- When moving pure osmium tetroxide to a chemical hood, do not remove it from the secondary containment until it is in the hood.
- Prepare the smallest amount of solution necessary for the procedure.
- Under no circumstances should osmium tetroxide vapors be inhaled.
- Prior to conducting any work with osmium tetroxide, 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 MSDS.

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 osmium tetroxide. All labs maintaining osmium tetroxide must have an inert absorbent material (i.e., kitty litter, vermiculite, sand) and corn oil (1 liter minimum) available for spill clean-up and neutralization.
- 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).
- Spill volumes less than approximately 2 ml can be cleaned by lab personnel and only with assistance from EH&S.
- Spill volumes greater than approximately 2 ml shall be cleaned only by EH&S. Personnel should immediately evacuate the area and contact LSUHSC Police for spills greater than 2 ml. **Note** – due to the highly oxidative nature of osmium tetroxide, spills should be absorbed with corn oil saturated in an inert absorbent material.
- All spills, to include those in fume hoods, can be cleaned with an inert absorbent material saturated with corn oil. Residual spill volume shall be neutralized in accordance with the following protocol:
  - A 2% solution of osmium tetroxide can be fully neutralized by twice its volume of corn oil. For every 1 ml of 2% osmium tetroxide solution, 2ml of corn oil is required. Pour the corn oil into the osmium tetroxide solution.
  - Wait for the oil to completely turn black
  - To confirm that the osmium tetroxide is fully neutralized, hold a piece of filter paper soaked in corn oil over the solution. Blackening indicates that osmium tetroxide is still present and more corn oil should be added.

    - Dispose of the neutralized solution as hazardous waste as directed in Section 9.
    - After all spills have been absorbed and the area confirmed to be neutralized, wash with soap and water solution to complete decontamination.
- Personnel cleaning the spill shall, at minimum, wear the same PPE required for handling/use
- 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.

Section 8: Decontamination Procedures

- Where the eyes or body of any person may be exposed to osmium tetroxide, 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 osmium tetroxide exposed areas of skin and/or eyes with copious amounts of water for at least 15 minutes.
- All equipment, materials and work surfaces that have/ potentially have become contaminated with osmium tetroxide shall be neutralized with corn oil and thoroughly cleaned with soap water solution prior to storage and re-use.

Section 9: Waste Disposal Procedures

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

Section 10: Laboratory Specific Protocol(s):

Attach laboratory protocol for specific handling and operational practices.