



ENVIRONMENTAL AND OCCUPATIONAL HEALTH AND SAFETY SERVICES

STANDARD OPERATING PROCEDURES

Safe Work Practices for the use of Osmium Tetroxide in the Laboratory

Effective Date: April 16, 2004

Revision Date:

INSTRUCTIONS: Please have each staff member who will be working on this project review this Standard Operation Procedure (SOP). In Section 7 – Signatures, list each of the personnel assigned to the project, and have them initial in the box provided to indicate that he/she has read and understands this SOP. Send a completed copy to your campus' EOHSS.

1. PURPOSE

This policy establishes procedures for safe handling, transport and storage of osmium tetroxide, also known as osmic acid, perosmic oxide, and osmium(IV) oxide. (CAS # 20816-12-0). Osmium tetroxide is acutely toxic and can cause blindness and skin burns. It is rapidly absorbed through the skin and its relatively high volatility makes it especially hazardous to work with outside of a chemical hood. The rat intraperitoneal LD₅₀ for osmium tetroxide is 14 mg/kg and the mouse oral LD₅₀ is 162 mg/kg.

2. SCOPE:

This SOP addresses the use of pure osmium tetroxide and its solutions in the laboratory. It assumes that all of the UMDNJ minimum safety requirements, as detailed in the latest version of the UMDNJ Laboratory Safety Plan have been implemented.

3. RESPONSIBILITY

- 3.1. All staff engaged in the use or handling of osmium tetroxide, or working within a laboratory using osmium tetroxide, are responsible for understanding all hazards associated with its use, and for using appropriate personal protective equipment (PPE).
- 3.2. The Principal Investigator is responsible for ensuring that his/her staff has been trained in the use, storage and handling of osmium tetroxide.

Osmium tetroxide use is restricted to the specific staff members who have had prior training in proper use, handling and storage. Each staff member's name

must appear on the listing in Section 6 of this document, and each staff member must initial by his/her name.

4. PROCEDURES

4.1. Training

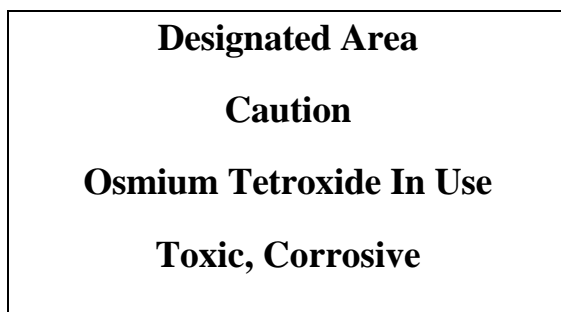
- 4.1.1. Prior to conducting any work with osmium tetroxide, the Principal Investigator must provide training to his/her laboratory personnel specific to the hazards involved in working with this substance, work area decontamination, and emergency procedures.
- 4.1.2. The Principal Investigator must provide his/her laboratory personnel with a copy of this SOP and a copy of the osmium tetroxide MSDS provided by the manufacturer.
- 4.1.3. The Principal Investigator must ensure that his/her laboratory personnel have attended initial laboratory safety training or refresher training within the last two years.

NOTE: EOHSS is available to assist in the education and/or training of personnel concerning safe work practices.

4.2. Signage

- 4.2.1. When osmium tetroxide is in use, warning signs must be posted on the chemical hood and laboratory door until the osmium tetroxide has been returned to storage.
- 4.2.2. Signs will include the information shown in the following sample:

Sample Chemical Hood Sign



4.3. Storage

- 4.3.1. Pure osmium tetroxide and concentrated solutions must be stored in a location that is secure to unauthorized access. Examples are a locked drawer or cabinet, or a refrigerator within a laboratory that is locked when

authorized personnel are not present. A refrigerator containing osmium tetroxide must be labeled with a caution sign noting the presence of osmium tetroxide and its hazards (toxic, corrosive).

- 4.3.2. Store pure osmium tetroxide and its concentrated solutions in appropriate, sealed glass containers within unbreakable secondary containment (i.e., a bottle or vial within a sealed compatible plastic jar or metal can with lid). Store away from organic materials. Label all containers, including secondary containment, with the chemical name and hazard warning.

4.4. Handling and Solution Preparation

- 4.4.1. When moving pure osmium tetroxide to a chemical hood, place the vial in a padded metal can and cover. Place on a lab cart with a supply of a neutralizing absorbent consisting of kitty litter soaked in corn oil.
- 4.4.2. Prepare the smallest amount of solution necessary for the procedure, typically 50mL or less. Prepare the solution volumetrically rather than gravimetrically. If a balance must be used, weighing must take place in the chemical hood.
- 4.4.3. Pure osmium tetroxide or its concentrated solutions must be opened only in a chemical hood that has been certified within the last 12 months. Just before use, the operation of the chemical hood must be verified by the use of an installed chemical hood monitoring device, a smoke test using a smoke generating tube, or a mechanical or electronic device that indicates air flow. During use, the sash must be lowered to operating height.
- 4.4.4. All lab ware that has come in contact with osmium tetroxide must be decontaminated by rinsing or dipping in corn oil before removing from the chemical hood.
- 4.4.5. Immediately after work with osmium tetroxide, decontaminate any spills with kitty litter that has been soaked with corn oil. Discard kitty litter as hazardous waste. Reference Section 5.2

NOTE: The literature on osmium tetroxide decontamination also mentions using a “mild” solution of sodium hydroxide in water. However, sodium hydroxide poses its own danger as a highly corrosive chemical and therefore, corn oil is recommended for decontamination

- 4.5. The following minimum Personal Protective Equipment must be worn during operations with pure osmium tetroxide and concentrated solutions:
 - 4.5.1. Chemical goggles (safety glasses alone are not adequate protection because of osmium tetroxide’s severe effects on the eyes).
 - 4.5.2. 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.
Wash hands immediately after removing gloves.

4.5.3. A standard or disposable laboratory coat or disposable coveralls. A standard laboratory coat may be reused before laundering if it has not been contaminated with osmium tetroxide. If a garment is contaminated, remove, place in chemical hood, and decontaminate with corn oil before disposing of in hazardous waste or laundering.

4.5.4. Closed-toed, leather shoes (not fabric or mesh).

4.5.5. Wash hands thoroughly immediately after working with any concentration of osmium tetroxide.

4.6. Neutralizing Osmium Tetroxide.

4.6.1. To reduce the hazards involved in discarding osmium tetroxide, the following neutralization procedure should be employed:

4.6.1.1. Perform neutralization in a chemical hood.

4.6.1.2. A 2% solution of osmium tetroxide can be fully neutralized by twice its volume of vegetable oil (corn oil is preferred because of its high percentage of unsaturated bonds). For every 10ml of 2% osmium tetroxide solution, 20ml of corn oil is required. Pour the corn oil into the osmium tetroxide solution.

4.6.1.3. Wait for the oil to completely turn black.

4.6.1.4. 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.

4.6.1.5. Dispose of the neutralized solution as hazardous waste.

5. EMERGENCIES

5.1. Spill of Osmium Tetroxide Outside of the Chemical Hood:

5.1.1. Phone the Public Safety Emergency number (Newark: 2-4490; Piscataway/New Brunswick: 5-4000; Camden and Stratford: 7-7777) immediately. Ask them to have EOHSS respond. **DO NOT** attempt to clean up a spill.

5.1.2. Isolate the area to prevent the spread of contamination (e.g., close doors to affected area and post a warning sign).

5.1.3. Alert personnel in the immediate area to evacuate.

5.1.4. Attend to any injured personnel.

5.1.5. Direct the EOHSS response team to the location of the spill, where corn oil-soaked kitty litter will be used for spill decontamination.

NOTE: Personnel must not attempt to clean up a spill of pure osmium tetroxide or its concentrated solution that occurs outside of a chemical hood.

5.2. Spill of Osmium Tetroxide Inside the Chemical Hood:

- 5.2.1. Cover the spill with corn oil-soaked kitty litter.
- 5.2.2. Use the test in 4.5.1.4 to insure that the spill has been neutralized.
- 5.2.3. Scoop up the kitty litter and dispose of as hazardous waste. Clean the area with detergent solution.

5.3. Accidental Exposure to Osmium Tetroxide

- 5.3.1. If osmium tetroxide vapor has been inhaled from a spill, move the victim to fresh air immediately.
- 5.3.2. If osmium tetroxide has been spilled on skin or clothing, rinse the affected area with water, using a safety shower or eyewash, as appropriate, for a minimum of 15 minutes. During washing, remove contaminated clothing. A disposable laboratory coat or jumpsuit should be available for the exposed individual to wear after using a safety shower.
- 5.3.3. Notify the victim's supervisor, if immediately available. The supervisor, a co-worker, or the victim must contact Employee Health at Notify the victim's supervisor, if immediately available. The supervisor, a co-worker, or the victim must contact the campus Employee/Occupational Health Program to determine what additional steps should be taken.

Newark: Employee Health (973) 972-2900

Piscataway/New Brunswick: EOHSI Employee Health Services (732) 445-0123

Stratford: Kennedy Hospital (856) 346-7816

Camden: Cooper Occupational Health Services (856) 342-

- 5.3.4. If the incident occurs off-hours, or an ambulance is needed because of injury, contact Public Safety to advise them of the medical emergency

Newark: 2-4490

Piscataway/New Brunswick: 5-4000;

Camden and Stratford: 7-7777

6. SIGNATURES

Principal Investigators: Use the following table to list all personnel who will handle osmium tetroxide. The staff member's initials indicate that the staff member has read this SOP and understands the I hazards and safe work practices as detailed in this therein.

Name	Job Title	Lab Staff Initials*

Principal /Responsible Investigator: (Print): _____

Principal /Responsible Investigator (Signature): _____

Date: _____

7. IF ADDITIONAL ASSISTANCE IS REQUIRED:

7.1. The current version of this form and additional information is posted at:
<http://www2.umdnj.edu/eohssweb/forms.htm>

7.2. EOHSS Campus Contact Information:

7.2.1. **Newark**
65 Bergen Street
Bergen Building Room 443
Newark, NJ 07107
(973) 972-4812
Fax (973) 972-3694

7.2.2. **Piscataway**
675 Hoes Lane - Trailer #1
Piscataway, NJ 08854
(732) 235-4058
Fax (732) 235-5270

7.2.3. **New Brunswick**
Liberty Plaza Building Suite 2119
335 George Street
New Brunswick, NJ 08903
(732) 235-8376
Fax (732) 235-8370

7.2.4. **Camden/Stratford**
Primary Care Center
40 E. Laurel Road Suite 101
Stratford, NJ 08084
(856) 566-6189
Fax (856) 566-6352

8. REFERENCES

- 8.1. Cooper, K.; Neutralization of Osmium Tetroxide in case of accidental spillage and for disposal. Bulletin of The Microscopical Society of Canada. 1988. 8:24-28
- 8.2. Lunn, G.; Sansone, E.B. Osmium Tetroxide. Destruction of Hazardous Chemicals in the Laboratory; Program Resources, Inc. Frederick, MD; pg. 211-213
- 8.3. Acros Organics, N.V. Material Safety Data Sheet, Osmium Tetroxide, ACC#96359
- 8.4. Florida Atlantic University, Standard Operating Procedures, Osmium Tetroxide: www.fau.edu/divdept/enohs/sop/otetroxide.doc
- 8.5. Bozzola, John J.; Electron Microscopy Principles and Techniques for Biologists; p. 19
- 8.6. Prudent Practices in the Laboratory: Handling and Disposal of Chemicals. 1995, National Academy of Sciences, National Academy Press, Washington, D.C. Laboratory Chemical Safety Summary (LCSS)
<http://www.hhmi.org/research/labsafe/lcss/lcss.html>