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Developed By: University Department of Environmental Health and Safety

Standard Operating Procedures For Handling, Storage and Disposal of Osmium Tetroxide

Purpose

The purpose of this document is to establish specific standard operating procedures for handling, storage, and disposal of Osmium Tetroxide. The requirements established in this SOP are in conjunction with the University's Chemical Hygiene Plan.

Overview

Osmium Tetroxide, an intermediate of osmium ore refining, is an inorganic compound that is highly toxic, even at low exposure levels and must be properly handled at all times. Low concentrations, even below those that may be smelled (about 2ppm), can lead to pulmonary edema and subsequent death when inhaled. Other symptoms of inhalation include coughing, headaches, irritation of the respiratory tract, wheezing, shortness of breath, and visual disturbances. Additional care must be used as this compound readily sublimates. It may take hours after exposure for any noticeable symptoms to appear. Osmium tetroxide is also a strong oxidant and corrosive, capable of burning and blistering human tissues. Osmium tetroxide may also stain the cornea, leading to potential blindness.

Despite the relative scarcity of osmium, osmium tetroxide has a number of uses, including: Biological staining, Organic synthesis, Polymer staining, and as an adduct of buckminsterfullerene. Despite its expense, osmium tetroxide has the potential to be used as a chemical weapon and is believed to have been used in at least one failed plot.

Standard Operating Procedures

Handling

1. The Material Safety Data Sheet and this SOP must be reviewed before use of osmium tetroxide in the laboratory.

2. The laboratory's principal investigator must develop specific written experimental procedures for the use of osmium tetroxide in the laboratory before any work can be permitted to begin. The written procedures must be approved by the Department of Environmental Health and Safety.
3. As this material may sublime and is a significant inhalation hazard, all manipulations with osmium tetroxide must be done in a properly working chemical fume hood, glove box, local exhaust system or other suitable containment device that exhaust directly outside. Even aqueous solutions. Use a NIOSH/MSHA approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced. If a respirator is to be used, the lab personnel must be admitted into the Drexel Environmental Health and Safety Respiratory Protection Program.
4. Designate an area in the laboratory chemical fume hood (or glove box, etc.) for only osmium tetroxide manipulations. This area must be labeled with the appropriate hazard communication labels (i.e. carcinogen in use area). All equipment and PPE must remain in this designated area. Never remove contaminated equipment or PPE from designated area.
5. Proper personal protection equipment (PPE) must be worn at all times to prevent eye and skin contact. Consult the MSDS for PPE recommendations. The minimum requirements are lab coats, chemical safety goggles, and rubber or neoprene gloves.
6. Be sure to inspect all PPE prior to and after use.
7. Any amount of osmium tetroxide spilled must be immediately reported as a major spill event. Keep container tightly closed at all times unless actively removing some material.
8. The laboratory must be equipped with a working eyewash station and safety shower.
9. Always practice good laboratory hygiene. Wash hands, face, neck and forearms frequently. Wash hands before eating and do not eat, drink, or smoke in the laboratory.
10. Keep good housekeeping procedures. All disposable materials contaminated with osmium tetroxide must be disposed as hazardous waste.
11. Containers of this product may be hazardous when empty as they may contain product residues (vapors, liquids).

Storage

1. The osmium tetroxide must be stored in tightly closed secondary containment that are opened only in the chemical fume hood.
2. The secondary containment container must be labeled according to University guidelines (i.e. full chemical name; hazard warning words – toxic; oxidizer).
3. The lid of both the primary and secondary containers must remain tightly closed at all times. The container should not be left open for any more time than what is necessary to measure out the required material, as this material sublimates.
4. Store away from combustible materials, reducing agents, finely powdered metals and heat. Contact with hydrochloric acid will cause the formation of poisonous chlorine gas.
5. Due to the hazardous nature of the material only minimal quantities of material should be purchased and stored.

Disposal

1. All waste must be collected in a sealable compatible container and disposed as hazardous waste as per University Hazardous Waste Guidelines.

2. All residual materials and rinsate from empty containers of this material must be collected and disposed as hazardous waste.
3. The rinsate from decontamination of all non-disposable equipment must be collected and disposed as hazardous waste.
4. All disposable materials contaminated with this material must be disposed as hazardous waste.
5. **Drain disposal of any of these materials is strictly forbidden.**
6. A chemical pick-up request form must be completed and submitted when the hazardous waste needs to be removed.