



Date: 08/18/2012
SOP Number: 0083

Effective: 08/18/2012
Review Date: 08/18/2013

Developed By: University Department of Environmental Health and Safety

Standard Operating Procedures For Handling, Storage and Disposal of Pyrophoric Chemicals

Purpose

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

Overview

Pyrophoric compounds may spontaneously ignite in the air at or below temperatures of 130.2°F (54.6°C). Because of this, extreme care is required in the handling, storage, and disposal of this material, requiring air-free techniques. Many are also a water-reactive (releasing highly flammable gases on contact with water or highly humid air), corrosive organic base capable of causing burns. While these compounds are useful in the synthesis of organic chemicals, their highly reactive nature often requires any manipulation in an inert atmosphere (i.e. nitrogen or argon) using specialized glassware.

Examples include organometallic compounds such as alkyllithiums, alkylzincs, and alkylmagnesiums (Grignards). Specific examples include diethylzinc and *tert*-butyllithium. Other pyrophoric chemicals include silane, arsine, diborane, diphosphine, metallic hydrides, phosphorus, alkali metals, hydrogenation catalysts, some finely grated metal powders, and iron sulfide.

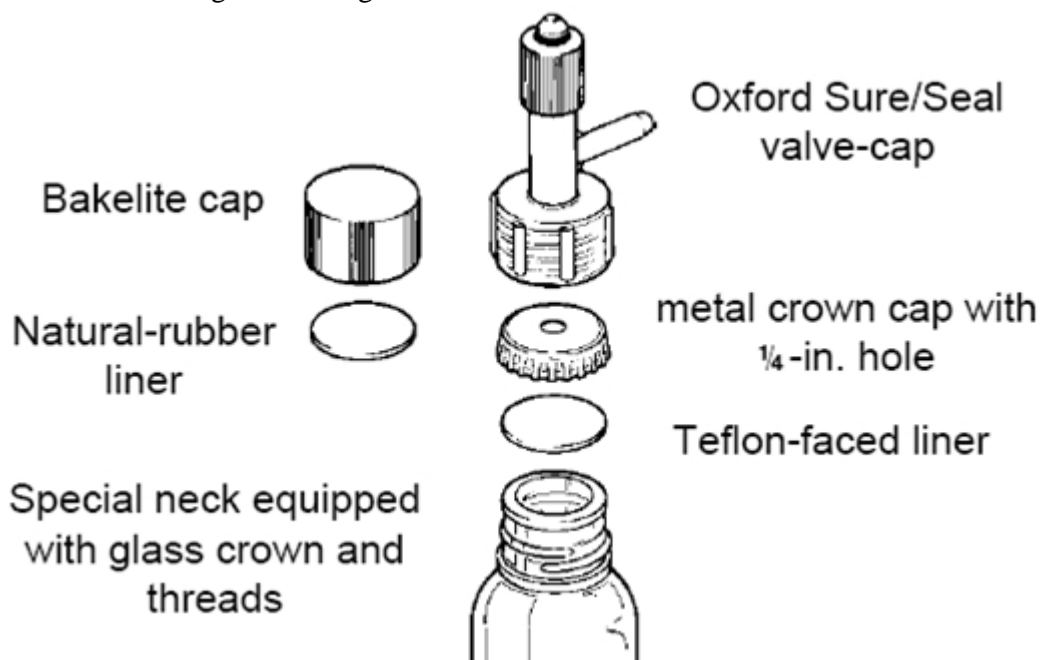
Standard Operating Procedures

Handling

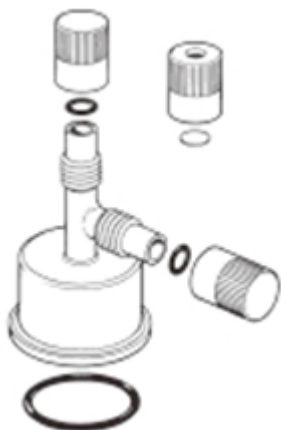
1. The Material Safety Data Sheet and this SOP must be reviewed before use of any pyrophoric materials in the laboratory.
2. The laboratory's principal investigator must develop specific written experimental procedures for the use of any pyrophoric materials in the laboratory before any work can be

permitted to begin. The procedure must completely describe the air-free techniques to be used. The written procedures must be approved by the Department of Environmental Health and Safety.

3. Pyrophoric users must be trained in the proper laboratory techniques. Practice with non-hazardous materials first is strongly recommended.
4. Never work alone when using these materials.
5. All equipment, such as syringes and glassware, must be free of moisture and purged with inert gas before use.
6. All manipulations with pyrophorics must be done in a properly working chemical fume hood (with the sash lowered as far as possible), glove box, local exhaust system or other suitable containment device that exhaust directly outside. Glove boxes are recommended when an inert or dry atmosphere are required.
7. The use of smaller syringes is encouraged. If handling more than 20 ml of sample, one should use a cannula for transfer or use a 20 ml syringe repeatedly.
8. Use long needles to withdraw the material. Do not invert the bottle to get at it.
9. Use of a wide bore needle of 18 gauge or larger is recommended.
10. Bottles of pyrophoric materials must be secured with a stand and clamp when in use. Stabilizing the bottle with one hand while manipulating a syringe in the other is not acceptable.
11. Air-Free techniques must be used when handling pyrophorics.
 - a. The Sigma-Aldrich Sure/Seal Packaging system provides a convenient method for storing and dispensing air sensitive reagents. Replace the plastic cap after each use, particularly for long term storage.



- b. The Sure/Seal septum-inlet transfer adapter must be used when repeated dispensing is necessary.



12. Keep container tightly closed at all times unless actively removing some material.
13. Proper personal protection equipment (PPE) must be worn at all times to prevent eye and skin contact. Consult the MSDS for PPE recommendations.
 - a. A face shield is required at any time there is a risk of explosion, large splash or highly exothermic reaction.
 - b. Lab coats or aprons, not made of easily ignited materials such as nylon or polyester must be worn. Fire-resistant lab coats made from materials such as Nomex are required.
 - c. Fire-retardant gloves are required.
14. Be sure to inspect all PPE prior to and after use.
15. Under your PPE, clothing made from natural fibers are preferred over synthetic fibers as they tend to only char rather than melt when burning.
16. The laboratory must be equipped with a working eyewash station and safety shower.
17. 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.
18. Keep good housekeeping procedures.
19. All disposable materials contaminated with pyrophorics must be rinsed with a non-reactive solvent before they can be disposed. Collect the rinsate in a container, under an inert atmosphere if possible, as hazardous waste.
20. Containers of this product may be hazardous when empty as they may contain product residues (vapors, liquids). These must be rinsed with an inert solvent before disposal.
21. Any amount of pyrophorics spilled must be immediately reported as a major spill event.

Storage

1. Store in cool, dry conditions in well-sealed containers. Storage under an inert gas is recommended. Storage in a glove box or freezer may be sufficient.
2. The lid of the container must remain tightly closed at all times.
3. Pyrophorics must be stored away from ignition sources, exposure to air, contact with water, organic materials, strong oxidants, organic halogens, direct sunlight, exposure to moist air or water, dehydrating agents, and other incompatible materials (*See MSDS for specifics*).
4. 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 (an inert solvent) from empty containers of this material must be collected and disposed as hazardous waste.
3. The rinsate (an inert solvent) from decontamination of all non-disposable equipment must be collected and disposed as hazardous waste.
4. Excess pyrophorics may be dispersed in an inert solvent.
5. All disposable materials contaminated with this material must be appropriately disposed as hazardous waste.
6. Waste pyrophorics must be stored and handled the same as reagent pyrophorics.
7. **Drain disposal of any of these materials is strictly forbidden.**
8. A chemical pick-up request form must be completed and submitted when the hazardous waste needs to be removed.