Laboratory Standard Operating Procedure for:

Pyrophoric Materials

Principal Investigator (PI) Approval is Required Prior to Performing this Procedure

Description

Proper care must be exercised when handling pyrophoric materials to avoid the possibility of grievous personal injury and/or damage to property. This SOP is intended to inform on safe working practices to follow whenever pyrophoric liquids are utilized in the research laboratory; however, it is not a substitute for hands-on training by an experienced co-worker. The SOP should be read and understood prior to the commencement of relevant work and used to complement supervised practical familiarization with the various techniques described. Personnel unfamiliar with safe handling procedures for pyrophoric liquids MUST NOT attempt experiments using such reagents until properly trained and confident in their ability to perform the appropriate protocols. It is recommended that the Aldrich technical bulletin on handling air-sensitive reagents [AL-134], and its companion piece specific to pyrophoric reagents [AL-164], also be read in combination with this SOP.

Work Practice Controls

A designated area shall be established in the lab for working with pyrophoric materials.

Potential Hazards

Pyrophoric materials ignite spontaneously on exposure to air, reacting violently with oxygen and in most cases also with water. The most significant hazard presented by pyrophoric liquids is the obvious risk of fire.

To avoid accidental ignition, a protective anhydrous inert atmosphere of either nitrogen or argon gas must be maintained over the surface of the liquid at all times. Even a momentary exposure to air may result in spontaneous combustion and the possibility of a fire spreading throughout the laboratory. The use of appropriate engineering controls and personal protective equipment, together with good laboratory housekeeping, will help to minimize the severity and impact of an accidental fire.

A majority of pyrophoric liquids are chemically aggressive and very corrosive reagents; accordingly, all exposure via the skin or by inhalation should be avoided. The Safety Data Sheet (SDS) will serve to identify other possible health risks that may be attendant with the use of a particular reagent.

Given the significant hazards presented by pyrophoric liquids, any researcher performing an experiment with this class of reagent MUST NOT WORK ALONE.

Engineering Controls

All manipulation of liquid pyrophoric materials must be conducted inside an inert glove box or properly functioning fume hood with the sash level at the lowest height possible to perform the required operations. Before starting work, clear

the fume hood or glove box of any unnecessary equipment or chemicals. Solids must be transferred under an inert atmosphere in a glove box.

Personal Protective Equipment (PPE)

Eye Protection

Chemical Splash goggles or safety glasses that meet the ANSI Z.87.1 2010 standard must be worn whenever handling pyrophoric chemicals. Ordinary prescription glasses will NOT provide adequate protection unless they also meet this standard. When there is the potential for splashes, goggles must be worn, and when appropriate, a face shield added.

A face shield is required any time there is a risk of explosion, large splash hazard or a highly exothermic reaction. All manipulations of pyrophoric chemicals which pose this risk should occur in an inert glove box or a fume hood with the sash in the lowest feasible position. Portable shields, which provide protection to all laboratory occupants, are acceptable.

Skin Protection

Gloves must be worn when handling pyrophoric liquids. Nomex flight gloves are recommended for general use. Heavy fire-resistant gloves are required when large quantities are used. The SDS for specific chemicals to be used should be consulted for direction on which glove type is recommended.

A fire resistant fully-buttoned knee-length laboratory coat must be worn to protect the body. Synthetic materials tend to melt rather than char so natural fiber clothing should be worn when possible. In addition, fully enclosed shoes which cover the entire foot (with no holes in the top) must be worn.

Transportation and Storage

Containers carrying pyrophoric materials must be clearly labeled with the complete chemical name and hazard warning. Glass bottles of pyrophoric reagents should not be handled or stored unprotected. The reagent bottle should be kept within a secondary containment vessel (the metal can that the reagent bottle ships in is convenient for this purpose) and stored appropriately with other materials of the same hazard class. Note that flammables and pyrophorics may not be stored together.

Pyrophoric liquid reagents are typically shipped in bottles provided with gas impermeable septa such that transfers can be made via needles under a chemically inert atmosphere (e.g., the "Sure/Seal" packaging system used by Aldrich). NEVER remove the protective septum from such a bottle in an air atmosphere without good reason and unless you are sure that the contents are neither pyrophoric nor toxic.

Many pyrophoric liquids benefit from being stored in a refrigerator below 10 °C (SDS and supplier information will indicate if this is essential); however, the material should usually be allowed to warm to ambient temperature shortly before being dispensed. The refrigerator must be designed for the storage of flammable liquids, and must also be designated for the storage of pyrophoric liquids.

Specialized glass bottles equipped with glass or teflon stopcocks are superior for the storage of pyrophoric liquids and can be purchased from most laboratory suppliers (e.g., Aldrich Cat. No. Z10 733-6).

Waste Disposal

Disposal of Pyrophoric Reagents

Even in small quantity or at low molarity, pyrophoric reagents present a fire hazard and a container with any residual material within it MUST NEVER be opened directly to the atmosphere.

Disposal of Pyrophoric Contaminated Materials

All materials that are contaminated with pyrophoric chemicals must be disposed of as hazardous waste by EHS. Contact EHS at (313) 593-0921 to notify them of any wastes contaminated by pyrophoric chemicals. The contaminated waste should not be left overnight in the open laboratory but must be properly contained to prevent fires. Also refer to EHS's Hazardous Waste Webpage for more information.

Exposures/Unintended Contact

 ***If the employee is in need of emergency medical attention, call 911 immediately.*** 

If anyone is exposed, or on fire, apply copious amounts of water.

An eyewash/safety shower station must be within a ten second travel time of the site of the experiment. Familiarize yourself with the location of this important safety equipment. Before beginning any work with pyrophoric materials, check that the eyewash is functioning (pass water through it until it runs clear) and the safety shower passed a recent inspection (within last 12 months). Also before starting work, know the location of the nearest fire extinguisher and fire alarm pull station. Check that the fire extinguisher passed recent inspection and that it is not empty.

Report all work related accidents, injuries, illnesses or exposures to WorkConnections within 24 hours by completing and submitting the Illness and Injury Report Form. Follow the directions on the WorkConnections website Forms Instructions to obtain proper medical treatment and follow-up.

Complete the EHS Laboratory Incident and Near-Miss Report form.

Health Care Providers

Medical consultations and examinations for employees are provided via:

Concentra Medical Center
17500 Federal Drive, Ste. 750
Allen Park, MI
Phone: 313-982-1376
MON – FRI: 8:00am – 5:00pm

Concentra Medical Center (After Hours and Non-Emergency)
11700 Metro Airport Center Drive, Ste. 104
Romulus, MI
Phone: 734-955-7000
24 hours – 7 days a week

Henry Ford Medical Center-Fairlane -- University students (non-life threatening conditions)
19401 Hubbard Drive
Dearborn, MI 48126
Phone: 313-928-8278

Click here for additional information.

Spill Procedure

- When a spill occurs, ***personal safety should always come first***.
- Alert and clear everyone in the immediate area where the spill occurred.
- Powdered lime should be used to completely smother and cover any spill that occurs.
- Collect contaminated materials and residues and place in container. Contact EHS at (313) 593-4914 for proper disposal.

A container of powdered lime should be kept within arm's length when working with a pyrophoric material.

MAJOR CHEMICAL SPILL OR FIRE

- Attend to injured or contaminated persons and remove them from exposure.
- Alert people in the laboratory to evacuate.
- **Call Public Safety at (313) 593-5333 or 911 from a campus phone immediately for assistance.**
- Close doors to affected area.
- Post warnings to keep people from entering the area.
- Have person available that has knowledge of incident and laboratory to assist emergency personnel.

Additional Spill Links:

- Chemical Spill Control Information

Report all emergencies, suspicious activity, injuries, spills, and fires to Public Safety by calling at (313) 593-5333 or 911 from a campus phone. Register with the University of Michigan-Dearborn Emergency Alert System.

Training of personnel

All personnel are required to complete the ***Comprehensive Laboratory Safety*** session (**BLS009** *or equivalent*). Furthermore, all personnel shall read and fully adhere to this SOP when handling pyrophoric materials.

Certification

I have read and understand the above SOP. I agree to contact my Supervisor or Lab manager if I plan to modify this procedure.

Name	Signature	UM ID #	Date

Principal Investigator _____ **Revision Date** _____