Subject: Pyrophorics Safety Guidelines

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1.0 Definition

Pyrophoric material can spontaneously ignite in air. Many pyrophoric materials are also water reactive, reacting vigorously with water or high humidity, often igniting upon contact. If you use pyrophorics in your lab, make sure that there are adequate control measures in place fulfill the following steps:

- Make sure that users are fully trained and are aware of the hazards
- Follow written standard procedures
- Use EH&S BOCCE tool for new experiment startup and when an existing experiment needs to be modified
- Refer to the NC State Chemical Hygiene Plan (CHP) and contact EH&S for further information
- Read through this document and follow the links for further information

2.0 Abstract

The following is a brief summary of a very tragic laboratory incident at UCLA, which highlights the need, among other things, to utilize the proper personal protective equipment. Please make sure that all personnel in your work area use lab coats and other protective equipment when using hazardous materials:

http://pubs.acs.org/cen/email/html/cen_87_i04_8704news1.html

3.0 Safety Procedures

Pyrophoric/water reactive reagents are commonly used in chemistry laboratories. Potential for serious accidents is great if strict handling procedures are not followed. Because of this, we are asking your help in taking the following steps to protect against such a tragic accident occurring here at NC State:
1) Lab coats and/or aprons, safety glasses, and protective gloves must be worn at all times when working with hazardous chemicals in the laboratory. This needs to be enforced by the Principal Investigator and followed by each member of the laboratory.

Lab coats made of Nomex fabrics are known to provide better protection against pyrophorics and flammable liquids, compared to non-Nomex Fire resistant (FR) fabrics and FR-treated cotton fabrics. Whenever pyrophoric chemicals are in use, employees/students are required to use NOMEX lab coats. See Fisher Scientific and Grainger website for models on state contract where best pricing should be available. NCSATE discounted price for Nomex lab coats are currently $81.65 per lab coat (Bulwark* Nomex IIIA* HRC1 Lab Coats) by Fisher Scientific and $94.59 (Workrite Nomex IIA lab coat) by Grainger.

Note: Researchers/users shall be aware that lab coats provide only limited protection against chemicals (as any other protective equipment). Engineering controls along with good safety practices are always required to minimize exposure risk in laboratories. In most cases use of lab coats will also need to be supplemented with the use of additional protective equipment.

2) Never work alone when handling highly hazardous chemicals such as organic lithium reagents. Always let others in the laboratory know you are working with these solutions.

3) All chemical laboratories have a safety shower within or nearby the lab. Be sure to know where the safety showers are and the procedures to follow in the event of an emergency. Immediately assist any person who is on fire to the nearest emergency shower and contact 911. Stay with the person until help arrives. Be sure to keep them under the shower for at least 15 minutes and remove any clothing to ensure all chemical is washed from the body.

4) Organo-lithium compounds are normally purchased in a highly flammable solvent such as hexane or pentane. Because these compounds will react spontaneously with moisture in the air, they cannot be exposed to the atmosphere. They are purchased primarily from Sigma Aldrich in special "Sure/Seal" bottles that allow the reagent to be dispensed through a syringe or double-tipped needle inserted through a hole in the cap. The Teflon/elastomer liner in the cap will self-seal to protect against atmospheric exposure. However, these cannot be stored for very long after initial use, as there may be leakage after a while and the reagent will degrade. Therefore, any unused portion of reagent left in the bottle should be disposed of as hazardous waste after 1 month.

5) In order to avoid an excessive amount of chemical waste, only purchase the amount that you plan to use for each experiment.

6) NCSU EH&S highly recommends that you order these reagents from Sigma Aldrich, which has their patented Sure/Seal bottle. Contact EH&S if you desire to use a different vendor for these reagents.

7) All Principal Investigators need to develop written Standard Operating Procedures (SOPs) and must review the safe procedures for handling highly reactive reagents with their lab members. Everyone should be familiar with the Aldrich technical bulletins AL-134 "Handling Air-Sensitive Reagents" and AL-164 "Handling Pyrophoric Reagents". Only trained, experienced, and authorized employees shall be allowed to manipulate pyrophoric chemicals. Working alone in a lab with pyrophorics shall never be allowed.

8) All manipulations of pyrophoric chemicals shall occur in a functional chemical laboratory hood with the sash in the lowest feasible position (or with the horizontal sash positioned in front of you) to
protect you from any splash that may occur. Using a splashguard positioned in front of the bottle when drawing the liquid into the syringe and using face shield along with eye protection is also recommended. Glove boxes are also an excellent device to control pyrophoric chemicals when inert or dry atmospheres are required.

9) Please go through your inventories and dispose of any opened containers of these reagents that you are not planning on using in the near future.

If you have any questions related to this incident or other areas of laboratory safety, please contact Mahdi Fahim (mhfahim@ncsu.edu) or check the topic specific information and contacts listed in the A-Z menu at the NC State Environmental Health and Safety website.
Please visit EH&S website for any questions regarding available lab coat laundry vendors/services on campus.

5.0 Useful Links and Videos
The following videos contain information that researchers may find useful for safe handling of pyrophoric material:

a. Yale Organolithium Compounds Training
http://www.yale.edu/ehs/onlinetraining/OrganoLithium/OrganoLithium.htm

b. UCLA Pyrophoric Safety Video
http://www.youtube.com/watch?v=RaMXwNBAxc