**Pyrophoric Chemicals Guidance**

The following information is intended to provide general guidance on how to safely work with a specific class of chemical or hazard. This information is generic in nature. It addresses the use and handling of substances by hazard class only.

Pyrophoric chemicals are liquids, solids, and gases that will ignite spontaneously in air at or below 130 °F.

**Gas cylinders**

Cylinders of compressed pyrophoric gases must be handled as high energy sources. When storing or moving a cylinder, have the cap securely in place to protect the stem. Use suitable racks, straps, chains or stands to support cylinders.

The use of pyrophoric gases requires EHS approval.  If you anticipate the need to use pyrophoric gases in your work the Office of Environmental Health and Safety is available to provide guidance.

**Supervision and Training**

All users of pyrophoric reagents in the laboratory must receive hands-on instruction from the Principal Investigator or Post-Doctoral Fellow and must be closely supervised until safe work practices are consistently demonstrated.  This training must be documented so that proof of training is available upon request.

* [This video](http://www.youtube.com/watch?v=RaMXwNBAbxc) from UCLA is recommended as a training aid; however, it may not be used as a substitute for hands-on demonstration and instruction.
* The Sigma-Aldrich Technical Bulletins “[Handling of Air-Sensitive Reagents (AL-134)](http://www.sigmaaldrich.com/etc/medialib/docs/Aldrich/Bulletin/al_techbull_al134.Par.0001.File.tmp/al_techbull_al134.pdf)”   and “[The Aldrich Sure/PacTM System (AL-136)](http://www.sigmaaldrich.com/etc/medialib/docs/Aldrich/Bulletin/al_techbull_al136.Par.0001.File.tmp/al_techbull_al136.pdf.)” provide further guidance.

**Hazard assessment**

Hazard assessment for work involving pyrophoric chemicals should thoroughly address the issue of fire safety (including the need for Class D fire extinguishers), proper use and handling techniques, chemical toxicity, storage, and spill response.

Contact EHS if you would like assistance in performing a thorough hazard assessment prior to starting your work.

**Engineering Controls**

**Ventilation**

Always handle liquid pyrophoric chemicals in a fume hood or glove box. If your research does not permit the handing of pyrophoric chemicals in a fume hood or glove box you must contact the Office of Environmental Health and Safety to review the adequacy of all special ventilation.

**Fume hood**

Many pyrophoric chemicals release noxious or flammable gases and should be handled in a hood. In addition, some solid pyrophoric materials are stored under kerosene (or other flammable solvents), therefore the use of a fume hood is required to prevent the release of flammable vapors in the laboratory. Glove boxes may also be used (see special ventilation).

**Glove (dry and inert) box**

Glove boxes must be used to handle pyrophoric chemicals if sufficient inert or dry atmospheres cannot be achieved using a vacuum gas manifold.

**Gas Cabinet**

Ventilated compressed gas cylinder storage cabinets may be required for high hazard gases such as pyrophorics. Consult EHS before purchasing any pyrophoric gases.

**Safety shielding**

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

The Principal Investigator/Course Director is responsible to the select the appropriate shielding.

The Office of Environmental Health and Safety is available to provide guidance.

**Vacuum protection**

Evacuated glassware can implode and eject flying glass, and splattered chemicals. Vacuum work involving pyrophoric chemicals must be conducted in a fume hood or isolated in an acceptable manner.

Mechanical vacuum pumps must be protected using cold traps and, where appropriate, filtered to prevent particulate release. The exhaust for the pumps must be vented into an exhaust hood. Vacuum pumps should be rated for use with pyrophoric chemicals.

**Personal Protective Equipment**

**Protective apparel**

Lab coats, closed toed shoes and long sleeved clothing should be worn when handling pyrophoric chemicals. Additional protective clothing should be worn if the possibility of skin contact is likely.

Unless work will be performed in a glove box, it is highly recommended that a Nomex lab coat be worn while manipulating quantities of liquid pyrophorics over 10 mL or solid pyrophorics over 1 gram.

The Principal Investigator/Course Director is responsible to the select the appropriate PPE.

The Office of Environmental Health and Safety is available to provide guidance.

**Gloves**

Gloves should be worn when handling pyrophoric chemicals. Disposable nitrile gloves provide adequate protection against accidental hand contact with small quantities of most laboratory chemicals but are highly combustible.  Consider the use of Nomex/Leather pilot’s gloves, which provide fire resistance without compromising manual dexterity.  The pilot’s gloves should be worn over nitrile gloves and are required during syringe/cannula transfers of pyrophoric liquids.

The Principal Investigator/Course Director is responsible to the select the appropriate chemical resistant gloves.

The Office of Environmental Health and Safety is available to provide guidance.

**Eye protection**

Eye protection in the form of safety glasses must be worn at all times when handling pyrophoric chemicals. Ordinary (street) prescription glasses do not provide adequate protection. (Contrary to popular opinion these glasses cannot pass the rigorous test for industrial safety glasses.) Adequate safety glasses must meet the requirements of the Practice for Occupational and Educational Eye and Face Protection (ANSI Z.87. 1 1989) and must be equipped with side shields. Safety glasses with side shields do not provide adequate protection from splashes; therefore, when the potential for splash hazard exists other eye protection and/or face protection must be worn.

The Principal Investigator/Course Director is responsible to the select the appropriate eye protection.

The Office of Environmental Health and Safety is available to provide guidance.

**Emergencies**

**Emergency procedure**

Emergency procedures which address response actions to fires, explosions, spills, injury to staff, should be developed by each laboratory.  The procedures should address as a minimum the following:

* **Who to contact:** (University police, Principal investigator/Course Director of the laboratory including evening phone number, and EHS).
* The location of all safety equipment (showers, eye wash, fire extinguishers, spill clean-up materials, etc.).
* The method used to alert personnel in nearby areas of potential hazards.
* Special spill control materials based on the specific pyrophoric chemical handled.

**Eyewash**

Where the eyes or body of any person may be exposed to pyrophoric chemicals, suitable facilities for quick drenching or flushing of the eyes and body shall be provided within the work area for immediate emergency use. Bottle type eyewash stations are not acceptable.  Eyewashes should be activated by lab personnel weekly.

**Safety shower**

A safety or drench shower should be available in a nearby location where the pyrophoric chemicals are used.  Researchers should familiarize themselves with the location of the two nearest safety showers and eyewash stations both in and outside the lab prior to beginning work with pyrophoric materials.

**Spill response**

Anticipate spills by having the appropriate clean up equipment on hand. The appropriate clean up supplies can be determined by consulting the material safety data sheet. This should occur prior to the use of any pyrophoric chemicals. Spill control materials for pyrophoric chemicals are designed to be inert and will not react with the reagent.

Many pyrophoric reagents must not be extinguished using a CO2 fire extinguisher.  Sand or soda ash (powdered lime) should be readily available where work is performed.  Also, a small beaker of sand can be used to safely extinguish any small fires occurring at the tips of needles used to transfer liquid pyrophorics.

In the event of a spill alert personnel in the area. Do not attempt to clean-up a large spill of pyrophoric chemicals. Turn off all ignition sources and vacate the laboratory immediately. Call for assistance.

* University Police 856-256-4911.  This is a 24 hour service.
* Office of Environmental Health Safety, 856-256-5105 or [EHS@Rowan.edu](mailto:EHS@Rowan.edu).

Remain on the scene, but at a safe distance, to receive and direct safety personnel when they arrive.

**Storage and Disposal**

**Signs and labels**

**Containers:** All pyrophoric chemicals must be clearly labeled with the correct chemical name, hazard information and CAS#. Pyrophoric chemicals should always be stored in their original commercial container. Chemical containers must be dated upon receipt as well as when opened.

**Special storage**

Pyrophoric chemicals should be stored under an atmosphere of inert gas or under an appropriate liquid. Do not store pyrophoric chemicals with flammable materials or in a flammable-liquids storage cabinet. Store these materials away from sources of ignition. Minimize the quantities of pyrophoric chemicals stored in the laboratory.  Store bottles of liquid pyrophorics inside the original metal shipping can, if available, to provide additional protection/secondary containment.

Never return excess chemicals to the original container. Small amounts of impurities may be introduced into the container which may cause a fire or explosion.

Date containers upon initial receipt and upon opening.  Take note of any printed expiration dates on the container label and dispose of them as required.  Many pyrophoric reagents become unstable or more dangerous with age.

Purchase pyrophoric reagents in the minimum quantity required for the work to be performed.  Initial cost per volume/weight may be lower when reagents are purchased in bulk, but repeated opening of containers and puncturing of septa leads to product degradation and loss. Wasted material and disposal cost will often offset any initial savings.

**Designated area**

Any area where pyrophoric reagents will be handled must be carefully prepared prior to starting work.  All equipment and materials needed for the experiment should be readily available, including appropriate extinguishing media.  The work area should be clear of reagents and equipment not pertinent to the current experiment, including flammable and combustible reagents and materials.

Other lab occupants should be made aware when and where work with hazardous materials will be performed.

**Waste disposal**

Mixtures of chemicals such as reaction mixtures containing pyrophoric reagents should be carefully and completely quenched before combining with waste or packaging for disposal.

Empty septa-sealed pyrophoric reagent containers (such as Sure-SealTM­ bottles) will be disposed of through the hazardous waste vendor at Rowan University.  There is no need to quench or rinse these containers.

Expired or unused reagent will be disposed of in the original commercial bottle through the hazardous waste vendor at Rowan University.  There is no need to empty, quench, or rinse these containers.

Questions regarding waste pick up should be directed to the Office of Environmental Health and Safety at 856-256-5105 or [EHS@Rowan.edu](mailto:EHS@Rowan.edu). This office can also assist you in minimizing waste generation.