

Pyrophoric Chemicals Overview



The information presented in this overview is intended to provide general guidance regarding the hazards associated with pyrophoric chemicals. It is not intended to be a specific written safety procedure for your laboratory. Specific written procedures are the responsibility of the Principal Investigator. If you have any questions concerning the applicability of any items listed in this overview, contact Risk Management & Safety (RMS) at 334-740-9711, or the Principal Investigator of your laboratory.

Pyrophoric chemicals are liquids and solids that will ignite spontaneously in air at about 130 °F. Examples of pyrophoric chemicals are: Alkylolithium reagents in hydrocarbon solvents (tert-butylolithium), Alkenylolithium, Alkynylolithium and Arylolithium reagents in hydrocarbon solvents, Grignard reagents (RMgX in hydrocarbon solvents), Alkylaluminum reagents (e.g. Trimethyl aluminum, Tributylaluminum, Neat or in hydrocarbon solvents, neat are very pyrophoric), Alkylzinc reagents (such as diethylzinc, neat reagents are pyrophoric), Boranes (neat reagents are pyrophoric) and finely divided metals (e.g. aluminum, lithium, magnesium, titanium, zinc, zirconium, sodium, and potassium)

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. Not all risks can be eliminated from work with hazardous chemicals, but through informed risk assessment and careful risk management, laboratory safety is greatly enhanced. Do not begin work with a pyrophoric chemical unless you have been adequately trained in proper handling and emergency response procedures. Avoid working alone and utilize appropriate engineering controls. Minimize hazards by removing incompatible and flammable materials from the work area as well as selecting reliable tools e.g. proper syringe types and pyrophoric liquid transfer techniques.

Personal Protective Equipment and Engineering Controls

- Lab coats, closed toed shoes, and long sleeved clothing should be worn when handling pyrophoric chemicals. A long-sleeved fire-resistant lab coat (such as Nomex or Kevlar) should be worn at all times when working with pyrophoric chemicals. Shorts and open-toed shoes are inappropriate laboratory attire for working with pyrophorics and/or any other hazardous chemicals.
- Gloves should be worn when handling pyrophoric chemicals. Disposable nitrile gloves provide adequate protection but they are combustible. Use adequate protection to prevent

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skin exposures, heavy gloves should be worn when working with large quantities. Contact RMS, the glove manufacturer or use this [glove chart](#) for glove suitability and/ or selection.

- Researchers should assess the risks associated with an experiment and use the appropriate level of eye protection. Chemical splash goggles or safety glasses that meet ANSI Z.87.1 1989 standard must be worn when handling pyrophoric chemicals. A face shield is required whenever there is a risk of explosion, large splash hazard or highly exothermic reactions.
- All manipulations of pyrophoric chemicals that pose these risks should be handled in a fume hood with the sash in the lowest feasible position. Glove boxes may be used to handle pyrophoric chemicals if inert or dry atmospheres are required. Always attempt to handle pyrophoric chemicals in a fume hood or glove box. Portable shields, which provide protection to all laboratory occupants, are acceptable.

Contact RMS to review the adequacy of all special ventilation if your research does not permit the handling of pyrophoric chemicals in a fume hood or glove box.

Emergency Procedure

Emergency procedures which address response actions to fires, explosions, spills, injury to staff, or the development of sign and symptom of overexposure should be developed. The complete Emergency and Spill Response Procedures can be found [here](#), however the laboratory procedures should address as a minimum the following:

- Who to Contact - (911, RMS, and the Principal investigator of the laboratory including evening phone number). How to alert personnel in nearby areas of potential hazards.
- Know the location of the nearest class D fire extinguisher, emergency safety showers and emergency eyewashes. For more information on Safety Showers and Eyewashes, click [here](#).
- A container of powdered lime (Calcium Oxide, CaO) or dry sand should be kept within arm's length when working with pyrophoric materials. This can be used to completely smother and cover any small spills that occur.

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, glove box, or isolated in an acceptable manner.

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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.

Labels

Containers: All pyrophoric chemicals must be clearly labeled with the correct chemical name. Handwritten labels are acceptable; chemical formulas and structural formulas are not acceptable. Labels can be found here: <https://cws.auburn.edu/rms/pm/chemguidestools>

Special Storage

Pyrophoric chemicals should be stored under an atmosphere of inert gas or under kerosene, as appropriate. Ensure that sufficient protective solvent, oil, kerosene, or inert gas remains in the container while the material is stored

Do not store pyrophoric chemicals with flammable materials or other incompatible materials. An inert gas-filled desiccator or glove box is suitable storage location for most materials. Store these materials away from sources of ignition. Minimize the quantities of pyrophoric chemicals stored in the laboratory.

If pyrophoric or water reactive reagents are received in a specially designed shipping, storage or dispensing container (such as the Aldrich Sure/Seal packaging system) ensure that the integrity of that container is maintained.

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.

General Guidelines

Use these two links for general guidance on how to safely work with pyrophoric chemicals

- [Aldrich Technical Bulletins AL-134: Handling Air Sensitive Reagents](#)
- [Aldrich Technical Bulletin AL-164: Handling Pyrophoric Materials](#)