

Pyrophoric Usage

Pyrophoric materials can ignite spontaneously upon contact with air, presenting a very serious fire or explosion hazard. This fact sheet describes some general precautions that are to be taken when working with pyrophorics. This is complicated by the fact that many pyrophoric materials are present in mixtures with highly flammable materials. More specific information MUST be provided by your laboratory, addressing the issues your particular use presents.

STEP ONE:

Thoroughly read the Material Safety Data Sheets for the materials in question. Understand the hazards and precautions they describe. Contact EH&S with any questions.

STEP TWO:

Gather the proper Personal Protective Equipment for the work you will be doing. You will need eye protection, typically a full face shield. Additional protection, under shield, such as safety glasses, may also be required.

You will also need proper protective gloves, designed for not only the pyrophoric material, but also the hazards of all other materials in a mixture. This typically means a Nomex fire retardant glove, over a glove designed for the chemical issues.

You will also need a fire-retardant lab coat, which must be worn during all manipulations with the pyrophoric. Nomex or all-cotton are acceptable materials for the coat. It may NOT be polyester!

Finally, wear closed toed shoes, as you are required to do in all labs, anyway.

STEP THREE:

Ensure that you have the appropriate equipment present so that the work can be performed safely. You will need the following:

Ventilated enclosures: Work must be performed in a fume hood or glove box. Glove boxes are indicated if there needs to be an inert atmosphere to perform the work. If the pyrophoric is in gaseous form (such as a silane) you will need to store the gas in a gas cabinet designed to protect the material and automatically detect and shut off any gas leaks.

Emergency Response Equipment: There must be an emergency eyewash and shower within a ten second travel distance from where the work will be performed. There must also be an appropriate fire extinguisher for the materials present, typically an ABC type or a Class D for solid metal fires. Contact EH&S for assistance in determining the right extinguisher for your situation.

STEP FOUR:

Since pyrophorics are Particularly Hazardous Substances (according to OSHA) there must be a PHS form prepared for these materials in the lab. The form must address the details of the use, storage and disposal of the pyrophoric. Emphasis must be made to ensure that the chemical is protected from air, oxygen and water, where indicated. Include specifics for the type and construction of syringes, containers, septa and purging gases where appropriate.

Examples of Pyrophorics

- Grignard reagents, RMgX
- Metal alkyls and aryls, such as RLi, RNa, R3Al, R2Zn
- Metal carbonyls, such as Ni(CO)₄, Fe(CO)₅, Co₂(CO)₈
- Alkali metals such as Na, K
- Metal powders, such as Al, Co, Fe, Mg, Mn, Pd, Pt, Ti, Sn, Zn, Zr
- Metal hydrides, such as NaH, LiAlH₄
- Nonmetal hydrides, such as B₂H₆ and other boranes, PH₃, AsH₃
- Nonmetal alkyls, such as R₃B, R₃P, R₃As
- Phosphorus (white)