ECKERD COLLEGE

Safe Operating Procedure

(2/04)

PYROPHORIC CHEMICALS

The term "Pyrophoric" describes chemicals that are extremely reactive toward oxygen. In most cases, these chemicals are also water reactive and can react with moisture in the air. Some pyrophoric chemicals must never be exposed to the atmosphere. Others are less reactive and can tolerate brief exposure to the atmosphere without undergoing violent reaction. Failure to follow proper handling techniques can result in spontaneous combustion, which could cause serious burns or other injuries to the person handling the reagent or others in the immediate area. Resulting fires can destroy laboratories.

EXAMPLES OF PYROPHORIC COMPOUNDS

Grignard reagents: RMgX	Metal hydrides: NaH, $LiAlH_4$
Metal alkyls and aryls: RLi, RNa, R_3Al,	Nonmetal hydrides: B_2H_6 and other
R_2Zn	boranes,PH_3, AsH_3
Metal carbonyls: $Ni(CO)_4$, $Fe(CO)_5$,	Nonmetal alkyls: R_3B, R_3P, R_3As
$C0_2(CO)_8$	Phosphorus (white)
Metal powders: Al, Co, Fe, Mg, Mn, Pd, Pt,	Gases: silane, disilane, dichlorosilane,
Ti, Sn, Zn, Zr	diborane (borane), phosphine,

General safe-handling techniques for pyrophoric chemicals are listed below. Be sure to follow any additional requirements provided by your supervisor, during training, or on applicable Material Safety Data Sheets or chemical labels.

- Remove all excess and unessential chemicals and equipment from the area where pyrophoric chemicals are in use. This will minimize the amount of other chemicals at risk should a fire occur.
- Use and store minimal amounts of pyrophoric chemicals.
- If packaged in a specially designed shipping/storage/dispensing container, ensure that the integrity of the container is maintained. Some reactive metals are packaged, shipped, and stored under oil or kerosene. Ensure that sufficient protective solvent remains in the container while the material is stored.
- Conduct operations in a manner to prevent exposure to the atmosphere. Several techniques, depending on the physical state and quantity used, are available. These techniques range from use of gas-tight syringes to glove boxes (both available in chemistry labs). Any operation not conducted within a glove box should be conducted within a fume hood to provide secondary protection in case of an adverse event.

- Never return excess chemicals to the original container. Small amounts of impurities may be introduced into the container that may cause a fire or explosion.
- Do not store pyrophoric chemicals with flammable materials or in a flammable-liquids storage cabinet.
- Combustible materials, including paper products, should not be allowed to come in contact with any pyrophoric reagent at any time.
- Class D fire extinguishers, soda ash, or dry sand can be used to smother and extinguish small fires.
- DO NOT use carbon dioxide fire extinguishers as they can actually enhance the combustion of some pyrophoric compounds. See also: Aldrich Technical Bulletin AL-134, Handling Air-Sensitive Reagents and; Aldrich Technical Bulletin AL-164, Handling Pyrophoric Reagents (available at: www.sigmaaldrich.com/Brands/Aldrich/Tech_Bulletins.html, AL-164.