

# Syracuse University

## Laboratory Guidance Document

# Pyrophoric Materials

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This Laboratory Guidance Document was created by Syracuse University Environmental Health & Safety Services (EHSS) to assist researchers in developing laboratory specific standard operating procedures for the safe storage, handling, and disposal of pyrophoric materials.

### Potential Hazards:

The main hazard associated with pyrophoric materials is fire upon contact with air or moisture.

- The high level of reactivity associated with these materials requires them to be handled in inert atmospheres free of ignition sources.
- Pyrophoric materials stored in highly flammable solvents (e.g., diethyl ether, hexane) further increases the risk and severity of fires.
- Many pyrophoric materials are also classified as acutely toxic, corrosive, or reproductive toxins. Safe use requires assessing all potential hazards.

### Physical & Chemical Properties:

Pyrophoric liquids, solids, and gases are materials that may ignite or react violently when exposed to air.

- Many pyrophoric materials are also water reactive and become spontaneously flammable or emit flammable gases that may ignite upon contact with water.

### General Precautions:

The use of pyrophoric materials requires extreme care; if not stored, handled, and disposed of properly, these materials pose a serious threat to the health and safety of laboratory personnel, emergency responders, and waste handlers.

#### 1. Training

The Principal Investigator is responsible for ensuring all personnel under their supervision are made aware of hazards of pyrophoric materials, have received the appropriate hands-on training, adhere to the laboratory standard operating procedures, and are provided with the appropriate personal protective equipment.

#### 2. Work under the buddy system

*Pyrophoric materials should never be handled while working alone.* At least one additional person trained in the safe handling of pyrophoric materials should be present in the general vicinity of the work area while a pyrophoric material is used.

#### 3. Handle only under an inert atmosphere

*Never expose a pyrophoric material to the atmosphere.* Handle solid pyrophoric materials inside a glove box flooded with inert gas (e.g., nitrogen). Liquid pyrophoric materials may be handled inside a fume hood using the air-sensitive materials transfer techniques described in the Aldrich Technical Bulletins [AL-134](#) and [AL-164](#).

## Personal Protective Equipment (PPE):

In addition to the standard laboratory attire (i.e., long pants and closed toe shoes), the following PPE is recommended:

- ANSI certified (Z87) chemical splash goggles.
- Full face shield when handling pyrophoric materials inside a fume hood.
- Knee-length flame resistant (FR) lab coat.
- Chemically compatible gloves.

## Best Practices for the Safe Handling of Pyrophoric Materials:

1. Review the Safety Data Sheet (SDS), laboratory standard operating procedure (SOP), and emergency procedures before starting any work requiring pyrophoric materials.
2. Ensure the apparatus and transfer techniques are suitable by performing a trial run with solvent only. Identify and correct any issues discovered during the trial run before incorporating pyrophoric material.
3. Inspect all glassware and transfer devices for cracks or leaks.
4. Design an appropriate quenching procedure for residual pyrophoric material.
5. Oven-dry all glassware and transfer devices to eliminate moisture.
6. Work away from water sources or areas where there is the potential for a water splash.
7. Purge all glassware and syringes/cannula multiple times with inert gas.
8. When transferring pyrophoric liquids inside a fume hood, use a bubbler to ensure that the entire transfer system is airtight and under slight positive pressure of inert gas.
9. Transfer pyrophorics slowly one drop at a time.
10. Secure containers using clamps to avoid tip overs and spills.
11. Use only thin gauge (<16G) and flexible needles. Needles should be of adequate length to easily reach to the bottom of chemical bottles and allow for a greater range of movement inside the glovebox/fume hood.
12. Use a needle and syringe to transfer small volumes (<10 mL). Select a syringe that will hold twice the volume that is to be transferred (i.e., use a 20 mL syringe to transfer 10 mL). To ensure a leak-free connection, use only Luer-locking devices.
13. Use a cannula (double-tipped needle) to transfer large volumes (>10 mL).
14. Never return excess chemical to the original container.
15. Never use water to extinguish a pyrophoric material fire as it can enhance the combustion of some of these materials.

## Storage Considerations:

Whenever possible, store all forms of pyrophoric materials in an inert gas-filled desiccator or glove box. Never leave a pyrophoric material container on the bench top.

- Procure and store only the smallest practical quantities for the experiment performed.
- Store in a dry area away from ignition and combustion sources.
- Segregate from all other chemicals in the laboratory during use and storage.
- Consult the chemical's SDS for proper storage conditions.
- If a pyrophoric material is received in a specially designed storage or dispensing container (e.g., Aldrich Sure/Seal) ensure that the integrity of that container is maintained, and the container remains under inert gas.
- Ensure solid pyrophoric material are maintained under inert liquids (i.e., oil, kerosene, etc.)

**Disposal & Waste Management:**

Pyrophoric material in the original manufacturer container should be disposed of by placing in the lab's Hazardous Waste Satellite Accumulation Area.

Any pyrophoric material not contained in a manufacturer container must be quenched prior to disposal. An appropriate quenching procedure must be determined prior to disposal. Contact EHSS at [ehss@sy.edu](mailto:ehss@sy.edu) or 315.443.4132 to request assistance in determining the appropriate quenching procedure.

Contact the EHSS Hazardous Waste Group at 315-443-6545 for removal.

**Spill Response & Clean Up:**

In the event of a pyrophoric material spill, EHSS will oversee and direct the cleanup. Depending on the location and/or severity of the spill, EHSS may seek assistance from an outside emergency response services provider.

**Incident Response:**

All laboratory emergencies must be reported to the Department of Public Safety at 315-443-2224.

**Additional Resources:**

1. United States Department of Energy: [Handling Pyrophoric Reagents](#)
2. Sigma-Aldrich Technical Bulletins: [AL-134 Handling Air-Sensitive Reagents](#)  
[AL-164 Handling Pyrophoric Reagents](#)