

5. Pyrophoric Chemicals

Standard operating procedures (SOP) are intended to provide you with general guidance on how to safely work with a specific class of chemical or hazard. This SOP is generic in nature. It addresses the use and handling of substances by hazard class only. In some instances multiple SOPs may be applicable for a specific chemical (i.e., both the SOPs for flammable liquids and carcinogens would apply to benzene). If you have questions concerning the applicability of any item listed in this procedure, contact Vanderbilt Environmental Health and Safety (322-2057) or the Principal Investigator of your laboratory. Specific written procedures are the responsibility of the principal investigator.

If compliance with all the requirements of this standard operating procedure is not possible, the principal investigator must develop a written procedure that will be used in its place. This alternate procedure must provide the same level of protection as the SOP it replaces. Vanderbilt Environmental Health and Safety is available to provide guidance during the development of alternate procedures.

Pyrophoric chemicals are liquids and solids that will ignite spontaneously in air at a temperature of 130 degrees F (54.4 degrees C) or below. Titanium dichloride and white phosphorus are examples of pyrophoric solids; tributylaluminum and related compounds are examples of pyrophoric liquids.

Training:

All Vanderbilt employees who work with hazardous chemicals must be apprised of the hazards of chemicals present in their work area. This training must be provided before initial assignment and before new exposure situations. Before a lab worker may begin work with Pyrophoric Chemicals they must be trained on the lab specific Standard Operating Procedure for these materials. The primary factors that workers need to be trained on in regard to pyrophoric chemicals are the nature of their ignitability, the identity and location of pyrophoric chemicals in the lab and the handling and storage requirements of pyrophoric chemicals.

Securing of gas cylinders:

See Appendix O, section 10

Decontamination procedures:

Wash hands and arms with soap and water immediately following any skin contact with pyrophoric chemicals.

Designated area:

Not applicable

Emergency procedure:

Emergency procedures, which address response actions to fires, explosions, spills, injury to staff, or the development of sign and symptom of overexposure, must be developed. The procedures should address as a minimum the following:

- Who to contact: University police, and Office of Vanderbilt Environmental Health and Safety, Principal investigator of the laboratory including evening phone number.
- The location of all safety equipment (showers, spill equipment, eye wash, fire extinguishers, etc.)

- The location and quantity of all reactive solids in the laboratory.
- The method used to alert personnel in nearby areas of potential hazards.
- Specific first aid treatment required by the type of reactive material handled in the laboratory (Student Health Clinic or Occupational Health Clinic should be consulted for first aid procedures.)

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 and 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.

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.

Glove (dry) box:

Glove boxes may be used to handle pyrophoric chemicals if inert or dry atmospheres are required.

Gloves:

Gloves should be worn when handling pyrophoric chemicals. Nitrile gloves provide adequate protection against accidental hand contact with small quantities of most laboratory chemicals. However, when larger quantities are handled or regular contact is involved more protective gloves should be used. Lab workers should contact VEHS for advice on chemical resistant glove selection when direct or prolonged contact with hazardous chemicals is anticipated. A glove assessment chart can be found in Appendix H.

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.

Lab hood:

Many pyrophoric chemicals release noxious or flammable gases and should be handled in a hood. In addition some 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 be also be used (see special ventilation).

Labels

All pyrophoric chemicals must be clearly labeled with the correct chemical name. Handwritten labels are acceptable; chemical formulas and structural formulas or abbreviations are not acceptable.

Notification:

Not applicable

Protective apparel:

Appropriate lab attire (lab coats, closed-toe shoes and long-sleeved clothing) should be worn when handling reactive chemicals. Additional protective clothing should be worn if the possibility of skin contact is likely.

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 position. Portable shields, which provide protection to all laboratory occupants, are acceptable.

Safety shower:

A safety shower should be available in a nearby location where the pyrophoric chemicals are used.

Special storage:

Pyrophoric chemicals should be stored under an atmosphere of inert gas or under kerosene as appropriate. 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.

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.

Special ventilation:

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

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.

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

- Vanderbilt University Police Department 1-1911 or 322-2745.
Remain on the scene, but at a safe distance, to receive and direct safety personnel when they arrive.

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.

Waste disposal:

All materials contaminated with pyrophoric chemicals should be disposed of as hazardous waste. Questions regarding waste disposal should be directed to Vanderbilt Environmental Health and Safety (VEHS). This department can also assist you in minimizing waste generation.