Pyrophoric and Self-heating Materials

Last Reviewed: December 2022

A pyrophoric material is defined as a material that will ignite after being exposed to air for five minutes or less. A self- heating material is one which reacts with air, in the absence of external energy, to produce heat and may ignite if stored in large quantities for long periods of time. These materials typically also react violently with water and require special handling and storage procedures within the lab. A process-specific or laboratory-specific standard operating procedure may need to be considered for working with these substances. Specific examples include sodium, potassium and finely divided metals such as aluminum powder and zinc dust.

Personal Protective Equipment & Personnel Monitoring

Lab Coat

Flame resistant lab coat.

Gloves

Fire-resistant hand protection (e.g. chloroprene gloves over flame-resistant glove liners).

Eye Protection

ANSI Z87.1-compliant safety glasses or safety goggles if a splash hazard is present

Labeling & Storage

Store upright & tightly closed in a desiccator, a flammable storage cabinet, or in a refrigerator rated for flammable storage away from incompatible materials (e.g., strong oxidizers, strong corrosives, and water/aqueous solutions). Items must be stored under an inert atmosphere or under kerosene, mineral oil or some other solvent to prevent contact with the atmosphere. Pyrophoric liquids or pyrophoric compounds dissolved in liquid should be stored in sealed containers with PTFE-lined septa. These materials should not be stored near any water source such as a sink, safety shower, eyewash, or out in the open on a lab bench where an activated sprinkler head or busted water pipe could more easily cause problems. Always consult the safety data sheet for additional storage compatibility information before ordering these substances and verify that your lab is able to appropriately accommodate the manufacturer's storage recommendations. Many pyrophorics will come from the manufacturer in plastic bags or metal cans; it is best to keep the reagents inside of these secondary containers even when these materials are designated for a hazardous waste pickup.

The storage of self-heating materials in large quantities or for long periods of time exposed to the atmosphere must be avoided.

Engineering Controls, Equipment & Materials	
Working Alone	Work with pyrophoric chemicals must not be conducted alone.
Glove Box	Solid or pure pyrophorics must be handled inside of a glove box or under an inert atmosphere.
Fume Hoods & Transfers	Working with pyrophoric liquids (i.e., pyrophoric compounds dissolved in liquids) must be conducted in a fume hood with all transfers done via cannula or syringe to avoid exposure to the atmosphere. The hood sash must be kept at the lowest practicable working height. The use of a blast shield may also be advisable in certain cases. It is recommended that all other reagents and potential hazards be removed from the hood while working with pyrophorics.
Signage	Temporary signage indicating the storage location and/or use of pyrophoric materials is recommended in the specific area of the lab where they are used and or stored. This signage should clearly state that pyrophoric materials are stored or in use and also list immediate action to take in the event of a release or fire. A template sign is provided in the appendix to this SOP as an example.

Housekeeping, Spills, and Waste	
Spills	If pyrophoric materials spill in a glove box, quench the spilled material slowly with isopropanol. Absorb with a non-combustible absorbent and dispose as hazardous waste. If pyrophoric materials spill outside of a glove box, cover the spill with dry sand, clay based kitty litter or some other absorbent appropriate for pyrophoric materials (e.g., MET-L-X powder). Please refer to the Spill Control Guidelines in the UGA Lab Safety Library for additional information or contact the Office of Research Safety.
Quenching	Do not return unused pyrophoric materials to their original container. Unused pyrophoric materials must be quenched under inert atmosphere with adequate cooling by slowly adding first isopropanol, then methanol, then water. These materials must then be disposed of as hazardous waste.
Waste	Any waste from these chemical classes should be disposed of through the UGA Hazardous Waste Program. For assistance with arranging a waste pickup, you may contact the Environmental Safety Division (ESD) at 706-542-5801. Prior to pickup, any container used to hold hazardous waste should be labeled with the following: - "Hazardous Waste" - Chemical contents: Enough detail should be provided so that the full

contents of the container are readily apparent. Labeling may include any of the following:

- Percentages (Ex: 70% water, 30% hydrochloric acid)
- Volumes (Ex: 1L of acetone, 500mL of water)
- Chemical classes (Ex: halogenated solvents)
- Method (Ex: EPA 515.1 Herbicide Extraction Solvent Waste)
- Referenced Log (Ex: See Laboratory Waste Log, Volume 2)
- Utilizing Chematix waste profiles
- Any other labeling method providing enough detail to accomplish this requirement

One or more of the following waste characteristics recognized by EPA: Ignitable, Corrosive, Reactive, or Toxic.

First Aid & Emergencies

Fire	**DO NOT** use water to put out fire. Class ABC dry chemical extinguishers may be safely used for fires involving organic solvents. Class D fire extinguishers may be necessary if working with certain metals. Additional options may include MET-L-X powder or dry sand for small contained fires.
Skin or Eye Contact	Remove contaminated clothing and accessories; flush affected area with water if there are no serious burns. Seek medical attention.
Inhalation	Move person into fresh air. Seek medical attention.
Ingestion	Rinse mouth with water. Seek medical attention.

References

Prudent Practices in the Laboratory: Handling and Management of Chemical Hazards, National Research Council, 2011.

Handling Pyrophoric Reagents, Sigma Aldrich, Technical Bulletin AL-164, Rev. June 1995.

Handling Air Sensitive Reagents, Sigma Aldrich, Technical Bulletin AL-134, Rev. 2012.

Globally Harmonized System of Classification and Labelling of Chemicals (GHS), 9th Rev. Ed., United Nations, 2021

Contacts

Office of Research Safety: 706-542-5288
Environmental Safety Division: 706-542-5801

CAUTION: Pyrophorics stored or in-use.

A pyrophoric material is defined as a material that will ignite after being exposed to air for five minutes or less.

Any flammable or reactive items not involved in the current process, must be kept clear of this area until this sign is removed. In the event of a fire, call 911 and evacuate the lab. DO NOT use water to put out the fire.

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