



Air and Water Reactive Materials Fact Sheet

This fact sheet is for general safety awareness. Individual SOPs for all experiments and processes involving air and water reactive materials must be developed by the laboratory.

PROPERTIES & HAZARDS

Pyrophoric chemicals spontaneously ignite when exposed to air. Many pyrophoric materials are also water reactive, reacting vigorously with water or high humidity, often igniting upon contact. Pyrophoric chemicals are not common, but they can be solid, liquid, or gas. Examples include titanium dichloride (solid), tert-butyllithium (liquid), or silane (gas).

Water reactive substances undergo a chemical reaction with water. This reaction may release a gas that is either flammable or toxic. Heat generated from the reaction may cause the substance to combust or explode. For example, sodium metal reacts with water to form hydrogen gas, which can ignite due to the exothermic reaction.

Consider less hazardous materials or preparations to substitute for air or water reactive chemicals.

There are no specific GHS symbols for air or water reactive chemicals, though many have flammable GHS pictogram. Information about the reaction with air or water will be listed in the hazard statements, precautionary statements or reactivity/incompatibility sections on the Safety Data Sheet.

CONTROLS

Engineering Controls

- Chemical Fume Hood
- Glovebox
- Safety Shower (within 55 feet of the work area)
- Portable Safety Shield

Personal Protective Equipment

- Flame Retardant Gloves
- Splash Goggles
- Face Shield
- Flame Resistant Lab Coat
- Clothing that leaves no exposed skin on legs or feet
- Closed-toe shoes that fully cover the top of the foot

Training

- Laboratory Specific Training must cover all processes using air and water reactive materials and include information on safe use and emergency response.

STORAGE

- Store air/water reactive chemicals in an inert environment when possible.
- Avoid storing air/water reactive chemicals near sources of heat, oxidizers, and sources of water. These chemicals should ideally be separated from all other chemicals in storage.
- Storage location must be consistent with storage recommendations on the chemical's Safety Data Sheet.
- All containers of air/water reactive chemicals should be labeled with the chemical name and indicate that they are air/water reactive.
- Full size pyrophoric gases must be stored in a sprinklered, ventilated gas cabinet. Lecture sized cylinders can be stored in a chemical fume hood.
- Dispose of these materials as soon as active work with them is completed.

USE

- Individuals should have extensive hands-on training by experienced laboratory personnel before working with these materials.
- No one should work with air or water reactive materials alone, including experienced laboratory personnel.
- All procedures that utilize air or water reactive chemicals must have a written standard operating procedure with safety information and detailed instructions. This document is not sufficient.
- Use the absolute minimum quantity of air or water reactive chemical possible for a procedure. If larger volumes are necessary, transfer in multiple small volume batches rather than a single large volume transfer.
- Wear appropriate PPE and avoid wearing highly flammable clothing or clothing that will melt in a fire while working with air/water reactive chemicals.
- Remove all unnecessary flammable and combustible material from the work area prior to working with air or water reactive chemicals.
- Do not try to add excess materials back into the original container.
- When working with air or water reactive chemicals in a fume hood, use a portable safety shield.

Waste

- Waste should be managed so that incompatible materials are not mixed.
- Waste containers should be compatible with their contents and should be segregated by hazard class into separate secondary containers.
- For questions regarding waste management contact ESSR, Environmental Affairs at envaffairs@umd.edu.

SPILL CLEANUP

- Spill cleanup must follow the items specified in the Emergency Response Guide posted in the laboratory.
- If the laboratory is equipped and personnel are trained, minor spills can be handled by laboratory personnel.
- If a spill is beyond the capacity of the laboratory to address, call (301) 405-3333 from a safe location.

REFERENCES AND ADDITIONAL RESOURCES

1. University of California Irvine [Procedures for Safe Use of Pyrophoric Reagents](#)
2. University of California [Procedures for Safe Use of Pyrophoric Solids](#)
3. University of California Riverside [Procedures for Safe Use of Pyrophoric Organolithium Reagents](#)
4. Sigma Aldrich Technical Bulletin [Handing Air-Sensitive Reagents](#)
5. Cornell University, EHS [Safe Handling of Pyrophoric Chemicals](#)
6. University of Pennsylvania, EHRS [SOP: Pyrophoric Chemicals](#)
7. National Academy Press, [Prudent Practices in the Laboratory: Handling and Management of Chemical Hazards](#)