

Explosives, Self-Reactives, and Organic Peroxides

Last Reviewed: December 2022

Explosives are liquid or solid materials capable by chemical reaction of producing gas at such a temperature and pressure and at such a speed as to cause damage and injury to surrounding personnel and structures. A self-reactive substance is thermally unstable and liable to undergo a strongly exothermic decomposition with or without exposure to air. Examples include: nitrocellulose, picrate salts, and most 'trinitro-' compounds. Chemicals covered by this SOP **do not** include peroxide-forming chemicals but could include certain organic peroxides such as dibenzoyl peroxide.



-OR-



Personal Protective Equipment & Personnel Monitoring



Lab Coat

Flame resistant lab coat.



Gloves

Nitrile or neoprene gloves.



Eye Protection



Face Shield

ANSI Z87.1-compliant safety goggles and face shields. Consider using a blast shield for extra protection.

Labeling & Storage

Store at the manufacturer's recommended temperature in an explosion-proof refrigerator/freezer or an explosion-proof cabinet that does not contain flammables or chemically incompatible materials. Keep away from heat, light, and any potential initiating mechanisms. 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.

Engineering Controls, Equipment & Materials

Fume Hood

Work in a chemical fume hood, glove box, or dry box whenever possible. For fume hoods, keep the sash at the lowest practical height while working, and close the sash when the fume hood is not in use.

Blast Shield

When working with explosives the use of a portable blast shield inside the fume hood is highly recommended.



Cautions and Considerations

Initiating Mechanism

Before working with any potentially explosive chemicals, determine the initiating mechanism that could lead to an explosion: friction, impact, catalysts, light, or heat. Incompatible chemicals can also generate heat if they are inadvertently mixed or stored together so they themselves could be an initiating mechanism as well. Refer to the chemical safety data sheets (SDS) for this information. Also consider working with equipment that cannot generate static electricity or sparks.

Administrative Controls

Many items in this category will arrive at the lab already desensitized with a phlegmatizer. Nevertheless, care and attention should still be paid to the handling and storage of these substances. Additionally, any work involving the synthesis of new compounds should evaluate the likelihood of explosive derivatives or by-products. When working with potentially explosive compounds, avoid changing approved protocol parameters by adjusting reagent concentrations, volumes, environmental conditions, or designed supplies, equipment, and instrumentation. If changes are necessary, protocol modifications must be formally approved by the Principal Investigator prior to the onset of new conditions. A process-specific or laboratory-specific standard operating procedure must be written and approved before working with these substances.

Other Potentials for Explosions

It is worth noting that just because an item does not get classified as an explosive within the Globally Harmonized System (GHS), that does not mean that it cannot cause an explosion within the lab under the right circumstances. A very common example is sodium azide which is rated as an acute toxin and environmental hazard under GHS, but can form explosive and shock sensitive materials when in contact with certain metals.

Housekeeping

Spills

Notify others in the area of the spill, including your supervisor. Remove sources of ignition if possible. Laboratory personnel should refer to the Spill Control Guidelines in the UGA Lab Safety Manual for additional information or contact the Office of Research Safety.



Decontamination

Decontamination methods vary based on the materials handled and equipment being used. Please review the chemical Safety Data Sheet for guidance on cleaning materials.

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

Use a dry chemical or CO2 extinguisher (ABC or BC) to put out a small fire.

Skin or Eye Contact

Remove contaminated clothing and accessories; flush affected area with water if there are no serious burns. Basic first aid may be required in the event of impact injuries or cuts and bruises due to flying debris. An appropriate first aid kit must be close by when working with these substances. Seek get 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

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