

Explosives Hazard Class Standard Operating Procedure

1. Purpose

This standard operating procedure (SOP) is intended to provide guidance on how to safely work with explosive chemicals in a University of Arizona (UA) laboratory. Laboratory personnel should review this SOP, as well as the appropriate Safety Data Sheet(s) (SDSs), before using explosive chemicals. If you have questions concerning the requirements within this SOP, contact the Approval Holder (AH)/Approval Safety Coordinator (ASC), or the Research Laboratory & Safety Services (RLSS).

2. Scope

This hazard class SOP only addresses safety issues specific to the explosive hazard of a chemical; several hazard class SOPs may be applicable for a specific chemical. In addition, some explosive chemicals may fall under the regulatory purview of the Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF) or the UA Export Control Office. If you are using an explosive chemical that falls under one of these categories, refer to the University Chemical Hygiene Plan for additional requirements.

3. Hazard Description

Explosives are chemicals or combinations of chemicals that may cause a sudden release of pressure, gas and heat when subjected to sudden shock, pressure or high temperature. This hazard class is not to be confused with the “explosive materials” regulated by the ATF, which are designed with the primary function to explode.

Common chemical explosives include acetylides, azides, organic nitrates, nitro compounds and organic peroxides. The explosive nature of compounds may vary widely; some are set off by the action of a metal spatula on the solid (e.g. organic azides) and others may decompose explosively when exposed to a ground glass joint (e.g. diazomethane). Organic peroxides are considered to be both explosives and highly reactive chemicals; refer to both hazard class SOPs for work with these chemicals.

4. General Control of Hazards

The following general control measures must be implemented whenever using or handling explosive chemicals:

- Limit your inventory of explosive chemicals, especially azos, peroxides and peroxidizables; use minimum amounts in experiments.
- Keep away from heat, sparks, open flames and hot surfaces.
- Consult the SDS. Do not handle explosive chemicals until all safety precautions have been read and understood.
- When planning a reaction, consider the potential for explosion and plan accordingly.
- If drying out increases the explosion hazard of a chemical, keep the chemical wetted.
- If the explosive is electrostatically sensitive, ground/bond the container and receiving equipment.

- Immediately discard any organic compounds that are prone to peroxidation (e.g. secondary alcohols) that become contaminated.
- Do not subject the chemical to grinding, shock or friction.

5. Engineering Controls

Explosive chemicals should be used in a chemical fume hood (or other ventilated enclosures) whenever possible. Safety shields (i.e. blast-protective shields) must be used when:

- a reaction is attempted for the first time (small quantities should be used to minimize hazards),
- a familiar reaction is carried out on a significantly larger scale than usual (e.g. 5-10 times more material), or
- operations are carried out at increased temperature and/or pressure.

Safety shields must be placed so all laboratory workers in the area are protected from the explosion hazard. These shields or barricades can provide protection not only against the exploding chemicals, but any flying particles that may result from the explosion. Shields should also be used when performing a reaction that will be left unattended for a period of time. If your laboratory is performing unattended reactions, you must also adhere to the Unattended Reaction SOP and post the Unattended Reaction Form (available on the RLSS website) in a visible location near the experiment.

6. Personal Protective Equipment

At a minimum, all laboratory workers must wear safety glasses, long pants, closed-toed shoes, a laboratory coat and examination gloves when working with hazardous chemicals in a laboratory.

Laboratory personnel working with explosive chemicals, or performing an experiment that may lead to an explosion, must also wear a full face shield over their safety glasses. Blast-protective clothing (e.g. aprons) may be required, depending on the amounts and stability of the explosives used. Heavy leather gloves may be required if it is necessary to reach behind a shielded area while the experiment is in progress.

7. Handling and Storage Requirements

Store explosive chemicals away from incompatible materials, including flammable materials and oxidizers. Ideally, this segregation would occur via separate cabinets. If space is limited, however, storing all compatible explosives in sealed secondary containment (i.e. plastic trays or Tupperware) within the same cabinet as incompatible chemicals is acceptable. Consult the SDS for more specific information on compatibility.

Record the opening date and the date the chemical should be discarded on the label of chemicals that may degrade to become potentially explosive (e.g. organic peroxides).

8. Waste Disposal

Dispose of explosive chemicals as soon as possible; explosive waste should not be allowed to accumulate. Contact Risk Management Services for further information on the disposal of explosive chemicals.



9. Spill and Incident Procedures

In the case of a spill of explosive chemicals, do not attempt to clean the spill yourself. Evacuate the area and follow the procedures illustrated in the University Chemical Hygiene Plan section on major chemical spills. Inform the RLSS of all major chemical spills.

In the case of an explosion in the laboratory, leave the area immediately and call 911 from a campus phone, or call 911 from a non-campus phone and mention the incident is on the UA campus.

If a laboratory worker is injured or exposed to explosive chemicals, immediately notify the AH/ASC. If a laboratory worker requires immediate medical attention, call 911. Remove contaminated clothing and immediately flush the contaminated areas with water for at least 15 minutes. For eye exposures, immediately remove contact lenses, if present, and flush the eyes with water for at least 15 minutes. Consult the chemical's SDS for more specific information on appropriate first aid. Inform the RLSS and Risk Management Services of the incident as soon as practicable.

10. Designated Area

Designated areas are not required for this hazard class. However, chemicals may belong to multiple hazard classes, and an explosive chemical may require a designated area if it belongs to a hazard class that includes particularly hazardous chemicals.