

Standard Operating Procedure (SOP)

This Standard Operating Procedure (SOP) describes basic chemical safety information for peroxide forming chemicals. Prior to conducting work with peroxide forming chemicals personnel must obtain approval from their Principal Investigator (PI) and/or Supervisor and attend the appropriate laboratory safety training. The PI must complete the Lab-Specific Use Procedures section and provide their personnel with a copy of this SOP and a copy of the SDS from the manufacturer.

Peroxide Forming Chemicals

Date SOP was written:	
Date SOP was approved by PI/lab supervisor:	
Principal Investigator:	
Principal Investigator Signature:	
Type of SOP:	<input type="checkbox"/> Process <input type="checkbox"/> Hazardous Chemical <input checked="" type="checkbox"/> Hazardous Class

Purpose

The purpose of this standard operating procedure is to acquaint you with the proper and safe handling, use, storage, and disposal of peroxide forming chemicals.

Properties & Hazards

General Hazards:

Chemicals in this band can form peroxides over time and can become sensitive to heat, shock, and/or friction. Accumulation of peroxide formers in the laboratory has resulted in numerous explosions. Peroxide formation is an autoxidation reaction that can be initiated by light, heat, concentration, contamination, and/or loss of an inhibitor. Peroxide-forming chemicals are divided into three categories (Class A, B, and C) outlined in the table below.

	Class A	Class B	Class C
Definition	Class A Chemicals form explosive levels of peroxides without concentration. These are the most hazardous and can form explosive peroxide levels even if not opened.	Class B Chemicals form explosive levels of peroxides upon concentration through distillation, evaporation, or exposure to air after opening.	Class C Chemicals may autopolymerize as the result of peroxide formation.
Testing for Peroxides Frequency	Test or discard after 3 months of receiving.	Test or discard after 12 months.	Test or discard after 12 months.
Common Examples	Isopropyl ether Divinyl acetylene Potassium metal Potassium amide Sodium amide Vinylidene chloride	Benzyl Alcohol Dicyclopentadiene Diethyl ether Tetrahydrofuran 1,4-Dioxane Vinyl Ethers Sec. Alcohols	Acrylic acid Acrylonitrile Butadiene Chloroprene Methyl methacrylate Styrene Vinyl acetate

All peroxide forming chemicals are considered highly hazardous. There are no specific hazard classifications for peroxide forming chemicals defined by Cal/OSHA or GHS.

Personal Protective Equipment (PPE)

Skin and Body Protection:

A flame resistant Nomex® lab coat, long pants (or equivalent) completely covering legs, and closed toed shoes must be worn. Do not wear synthetic clothing when working with peroxide formers.

Hand Protection:

Nitrile or neoprene gloves are typically adequate for minor splashes. Thicker gloves should be used for longer operations, larger quantities, or direct contact. Consult the SDS, and/or the lab specific use section to determine whether alternative hand protection is required.

If there is a high risk of fire, fire-resistant hand protection should be worn, including a chemical resistant outer glove (neoprene) over an approved fire-resistant (Nomex®) inner glove/liner.

Eye Protection:

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

Administrative Controls

- Never work alone with peroxide forming chemicals.
- Due to the strict limitations on prolonged storage of peroxide formers, do not order large containers, only order the amount of peroxide formers you need for planned or foreseeable experiments.
- Always keep a testing record for peroxide forming chemicals including the date received, date opened, and date last tested. Each bottle should be labeled with this information.
- Review the Safety Data Sheets (SDSs) for all chemicals used in the experiment. Online SDSs can be accessed at <https://ehs.uci.edu/sds/index.php>.

Engineering Controls

- All manipulations of peroxide formers should be conducted in containment devices (e.g. fume hoods, gloveboxes, or similar devices). When working in a fume hood keep the sash as low as possible.
- If there is a high probability of fire or explosion a portable blast shield inside the fume hood is recommended.

Special Storage and Handling Requirements

Storage:

- Label every container of peroxide forming chemicals with the date received, date opened, and date last tested.
- Segregate peroxide forming chemicals from incompatible materials.
- Store away from ignition and initiation sources such as flames, static electricity, heat, and light.
- Peroxide forming chemicals should be stored in their original manufacturer's container.
- Minimize the quantity of peroxide forming chemicals stored in the lab.
- If possible, keep the material under an inert atmosphere (e.g. nitrogen, argon) when not in use, except for chemicals that contain an inhibitor that requires oxygen to function.

Handling:

- Test for peroxides before any distillation or purification of peroxide forming chemicals. Use extreme caution when concentrating or purifying peroxide forming chemicals as explosions can occur (https://ehs.uci.edu/safety/pdfs/lesson-learned_peroxide.pdf).
- Never allow peroxide formers to evaporate to dryness, such as during distillation, always leave a minimum of 20% liquid.
- Peroxide crystals formed in a chemical container are particularly likely to accumulate within the threads of the screw cap and may explode when subject to heat, light, friction, or mechanical shock (e.g. unscrewing the cap). Never open, move, or disturb a bottle that is suspected to have peroxides.
- Explosive peroxides can form when exposed to air, stored for a time, or upon concentration. Peroxide formers that might be exposed to air over an extended period of time should be tested for peroxides.
- For liquids evidence of possible peroxide formation includes: formation of solids or crystals, visible discoloration, and liquid stratification.
- For solids evidence of possible peroxide formation includes: formation of a surface crust, and discoloration of the solid.
 - Alkali metals and amides should be evaluated based on visual criteria only. There are no peroxide tests that can be used on these materials.
- Never open, disturb, or move a container suspected of having peroxides, notify EHS immediately for evaluation or disposal (Text a pick up to hwp@uci.edu).

Spill, Accident, and First Aid Procedures

Spills:

Refer to the spill response flowchart. Notify others in the area of the spill. Evacuate and prevent access to the location where the spill occurred. Notify your supervisor and EHS at x4-6200 immediately.

Skin or Eye Contact:

Remove contaminated clothing or contact lenses and flush the affected area with water for at least 15 minutes. Obtain medical attention immediately.

Inhalation:

Move to fresh air. Obtain medical attention immediately.

Ingestion:

Obtain medical attention immediately. (The poison control center, (800) 222-1222, is available 24 hours every day).

Waste Disposal Procedure

Disposal:

- Hazardous waste must be transferred to EHS for disposal within 6 months of being generated.
- Hazardous Waste Disposal
 - Text a pick up to hwp@uci.edu, EHS will pick up your waste within 1-3 days
 - Or visit <https://ehs.uci.edu/enviro/haz-waste/>

APPENDIX A: **Lab-Specific Use Procedures**

The following procedures describe how the subject chemicals are used in this laboratory beyond the practices described above.

Please see the General Information for ***Hazardous Materials Standard Operating Procedure*** for specific instructions on writing lab-specific use produces.

This section must describe lab-specific procedures to address the safe use of all highly hazardous chemicals from this band in use in the laboratory. These procedures may be organized around specific chemicals, specific tasks or the band as a whole.

