



PEROXIDE FORMING CHEMICALS

Effective Date: 8/23/2013

Revised Date: 10/10/2022

Introduction

- This SOP applied to the various chemicals that can form PEROXIDES. Peroxide forming chemicals should be tested every three to six months to ensure that PEROXIDES have not formed.
- Some **organic chemicals** that are prone to peroxide formation are:
 - ethers, acetals,
 - olefins,
 - vinyl monomers,
 - dienes,
 - acrylates and methacrylates,
 - secondary alcohols, and
 - ketones.
- While aldehydes, ureas, amides, and lactams readily peroxidize, the products are degraded and do not accumulate to a hazardous level.
- Some **inorganic chemicals** that form PEROXIDES are:
 - alkali metals,
 - metal amides,
 - organometallic compounds with a metal atom bonded to carbon, and
 - metal alkoxides.

POTENTIAL HAZARDS

- Peroxides and hydroperoxides are highly reactive materials and may be extremely shock-sensitive explosives.
- Moving or unscrewing the cap from a bottle contaminated with peroxides can lead to explosion, injury and/or death.
- Many chemicals form PEROXIDES when allowed access to air over a period of time. Enough air can be introduced upon opening the container for PEROXIDES to form. Some PEROXIDES become explosive upon concentration, as happens in distillation experiments. Others cause potentially explosive polymerization reactions to occur. Organic PEROXIDES are extremely sensitive to shock, heat, friction, light, strong oxidizers or reducers, or other forms of ignition.
- Friction, grinding, and all forms of impact shall be avoided near PEROXIDES (especially solid ones). Glass containers that have screw cap lids or glass stoppers shall not be used. Polyethylene bottles that have screw-cap lids may be used.
- Metal spatulas shall not be used to handle PEROXIDES because contamination by metals can lead to explosive decomposition. Ceramic or wooden spatulas may be used.

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- Pure compounds are more likely to have peroxide formation. Volatile compounds usually present greater hazard, as the PEROXIDES become concentrated when evaporation occurs.

Health Hazards

- See SAFETY DATA SHEET for specific health hazards

Personal Protective Equipment

EYE PROTECTION

- Safety glasses, goggles or face shields shall be worn during operations in which PEROXIDE FORMING CHEMICALS might contact the eyes (e.g., through vapors or splashes of solution).
- Ordinary (street) prescription glasses do not provide adequate protection. Adequate safety glasses must meet the requirements of the Practice for Occupational Education Eye and Face Protection (ANSI Z87.1-1989) and must be equipped with side shields.

HAND PROTECTION

- Use disposable nitrile gloves when working with chemicals. Check chemical compatibility chart for breakthrough time when using
- Laboratory personnel should thoroughly wash hands with soap and water before and immediately upon removal of gloves.

LAB COATS, ETC.

- Button lab coats, closed toed shoes, long pants and long sleeved clothing shall be worn when handling PEROXIDE FORMING CHEMICALS. Protective clothing shall be worn to prevent any possibility of skin contact with PEROXIDE FORMING CHEMICALS.

WORK PRACTICES

- All work with PEROXIDES FORMING CHEMICALS shall be done in the laboratory fume hood.
- Peroxide hazard on concentration—do not distill or evaporate without first testing for the presence of PEROXIDES—discard or test for PEROXIDES after 6 months.
- The quantity of peroxide forming chemicals used and stored shall be limited to the minimum amount required.
- **Date peroxide forming chemicals when received and first opened.**
- It may be dangerous to assume that a compound can be used for any procedure out of an unopened bottle. Tests have shown that 0.008 percent or more of peroxide (tested as H₂O₂) in

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any compound might be dangerous. According to the catalogs of several suppliers, no tetrahydrofuran presently sold is guaranteed to have less than 0.015 percent peroxide. Thus, even unopened containers might have dangerous quantities of PEROXIDES for a distillation or refluxing experiment. All containers shall be tested for PEROXIDES prior to a use that might concentrate a hazard, such as a distillation procedure.

- The sensitivity of most PEROXIDES to shock and heat can be reduced by dilution with inert solvents, such as aliphatic hydrocarbons. However, toluene is known to induce the decomposition of diacyl PEROXIDES.
- Solutions of PEROXIDES in volatile solvents shall not be used under conditions in which the solvent might be vaporized because this will increase the peroxide concentration in the solution.
- Metal spatulas shall not be used to handle PEROXIDES because contamination by metals can lead to explosive decomposition. Ceramic or wooden spatulas may be used.
- Smoking, open flames, and other sources of heat shall not be permitted near PEROXIDES.
- Friction, grinding, and all forms of impact shall be avoided near PEROXIDES (especially solid ones). Glass containers that have screw cap lids or glass stoppers shall not be used. Polyethylene bottles that have screw-cap lids may be used.
- Polymerizable monomers shall be stored with a polymerization inhibitor from which the monomer can be separated by distillation just before use. Common acrylic monomers such as acrylonitrile, acrylic acid, ethyl acrylate, and methyl methacrylate can form PEROXIDES, they have not been reported to develop hazardous levels in normal use and storage. The hazard from PEROXIDES in these compounds is substantially greater when they are stored in the liquid phase.
- Although air will not enter a gas cylinder in which gasses are stored under pressure, these gasses are sometimes transferred from the original cylinder to another in the laboratory, and it is difficult to be sure that there is no residual air in the receiving cylinder. An inhibitor shall be put into any such secondary cylinder before one of these gasses is transferred into it; the supplier can suggest inhibitors to be used. The hazard posed by these gasses is much greater if there is a liquid phase in such a secondary container, and even ignited gasses that have been put into a secondary container under conditions that create a liquid phase shall be discarded within 12 months.
- Carry out distillation behind shields.
- Do not leave ethers for long periods of time (about six months), in a half-filled container or in the light.

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- Do not store with incompatible material
- **PEROXIDE FORMING CHEMICALS may not be stored for more than one year.** After one year these materials must be disposed of.
- Store flammable PEROXIDE FORMING CHEMICALS in a flammable storage cabinet.
- Store peroxide forming chemicals away from heat and light.
- To minimize the rate of decomposition, PEROXIDES shall be stored at the lowest possible temperature consistent with their solubility or freezing point. Liquids or solutions of PEROXIDES shall not be stored at or lower than the temperatures at which the PEROXIDES freeze or precipitate because PEROXIDES in these forms are extremely sensitive to shock and heat.

Waste Disposal

- PEROXIDE FORMING CHEMICALS may not be stored for more than one year. After one year these materials must be disposed of.
- Excess PEROXIDE FORMING CHEMICALS and all waste material containing PEROXIDE FORMING CHEMICALS must be placed in a container labeled with the following **“HAZARDOUS WASTE PEROXIDE FORMING CHEMICALS”** , AND INCLUDE THE FULL CHEMICAL NAME.
- Contact EHS at x3427 for hazardous waste removal.

Emergency Numbers

Emergency Numbers:

Fire and Medical Emergencies	x5911 (911 on cell phone)
Environmental Health and Safety	x3427
FastMed Urgent Care (employees)	(336) 714-4616
Student Health (students only)	x5218
Poison Control	800-222-1222

First Aid

- See SAFETY DATA SHEET for First Aid information on the chemical in use.

Spill and Accident Procedure

- See SAFETY DATA SHEET for SPill Response information.
- Alert Lab Manager and call EHS at x3427.