



Safe Handling and Disposal of Peroxide Forming Chemicals

Certain chemicals can react with oxygen to create “peroxides”, which are compounds that can explode with impact, heat, or friction. Peroxide-forming chemicals can be divided into four hazard classes based on the method of reaction as described in Tables 1-4.

GUIDELINES FOR SAFE HANDLING AND DISPOSAL

1. PURCHASE

- 1.1. Do not purchase large quantities of peroxide forming chemicals. Purchase the amount that you will use in a 3-6 month time period.
- 1.2. When possible, purchase peroxide forming chemicals that have peroxide inhibitors added by the manufacturer.
- 1.3. Label all peroxide forming chemicals with date received and date opened. Maintain an inventory of your peroxide forming chemicals and their expiration dates.

2. STORAGE

- 2.1. Store peroxide forming chemicals in sealed, opaque, airtight containers with tight-fitting caps. DO NOT store these chemicals in open, partially empty, or transparent containers since these conditions promote peroxide formation.
- 2.2. Store peroxide forming chemicals (especially those in **Table 1**) under nitrogen or other inert gas or in an inert atmosphere chamber. **Note:** Some inhibitors actually need small amounts of oxygen to prevent peroxide formation and it is recommended that inhibited chemicals are not stored under an inert atmosphere. Follow the manufacturer’s recommendations.

3. HANDLING AND USE

- 3.1. Test for the presence of peroxides before distilling peroxide forming chemicals. Most explosions of peroxide forming chemicals occur when a material is distilled to dryness (leave at least 10-20% bottoms). Stir distillations with a mechanical stirrer or a bubbling inert gas. Never use air or an oxygen-containing mixture for bubbling or stirring a peroxide forming chemical.
- 3.2. DO NOT OPEN the container of a peroxide forming chemical that has obvious crystal formation; the friction caused by opening a crystallized lid can cause an explosion. Do not handle the container or force open lid. Treat as potentially explosive material. CALL EH&S IMMEDIATELY at 412-624-9505.

4. DISPOSAL

- 4.1. With the exception of those provided in **Table 1**, discard all peroxide forming chemicals within 6 months of opening (or within 1 year if unopened). All peroxide forming chemicals must be properly disposed through the University’s chemical waste program, as long as the chemical has not expired and no crystal formation is evident.
- 4.2. If the peroxide forming chemical has expired and/or crystal formation is evident, CALL EH&S IMMEDIATELY at 412-624-9505.

PEROXIDE FORMING CHEMICALS

TABLE 1 - Severe Peroxide Hazard: Chemicals that can spontaneously decompose, becoming explosive after exposure to air without concentration. These chemicals must be stabilized or decontaminated and discarded within 3 months of opening.

Isopropyl ether	Potassium amide	Divinylacetylene
Potassium metal	Sodium amide (sodamide)	Vinylidene chloride
Butadiene (liquid monomer)	Chloroprene (liquid monomer)	Tetrafluoroethylene (liquid monomer)

TABLE 2 - Concentration Hazard: These chemicals require external energy for spontaneous decomposition, forming explosive peroxides when distilled, evaporated or otherwise concentrated. These chemicals must be tested for peroxides and discarded within 6 months of opening.

Acetal	Diethyl ether	2-Pentanol
Acetaldehyde	Diethylene glycol dimethyl ether (diglyme)	4-Penten-1-ol
Benzyl alcohol	Dioxanes	1-Phenylethanol
2-Butanol	Ethylene glycol dimethyl ether (glyme)	2-Phenylethanol
Cumene	4-Heptanol	2-Propanol
Cyclohexanol	2-Hexanol	Tetrahydrofuran
2-Cyclohexen-1-ol	Methylacetylene	Tetrahydronaphthalene
Cyclohexene	3-Methyl-1-butanol	Vinyl ethers
Decahydronaphthalene	Methylcyclopentane	Other secondary alcohols
Diacetylene	Methyl isobutyl ketone	
Dicyclopentadiene	4-Methyl-2-pentanol	

TABLE 3 - Shock and Heat Sensitive: These chemicals are highly reactive and can auto-polymerize as a result of internal peroxide accumulation. The peroxides formed in these reactions are extremely shock and heat sensitive. **NOTE:** The liquid chemicals in this group should be tested for peroxides and discarded within 6 months of opening.

Acrylic acid	Methyl methacrylate	Vinyl chloride (gas)
Acrylonitrile	Styrene	Vinylpyridine
Butadiene (gas)	Tetrafluoroethylene (gas)	Vinyladiene chloride
Chloroprene	Vinyl acetate	
Chlorotrifluoroethylene	Vinylacetylene (gas)	

Table 4 - Potential Peroxide Forming Chemicals: Over 200 organic and inorganic compounds are capable of forming peroxides under the right conditions. The investigator should refer to the MSDS, contact the chemical manufacturer, or contact EH&S to determine if chemicals are potential peroxide formers. A sample list of potential peroxide forming chemicals is located at the EH&S website at the following link: www.ehs.pitt.edu/waste/Peroxides-Table4.pdf.