



Peroxide-Forming Chemicals

Some common laboratory chemicals can form peroxides on exposure to air. Peroxides are shock-sensitive and can be violently explosive in concentrated form or as solids. Others can result in rapid polymerization and can initiate a runaway, explosive reaction. The most commonly used peroxide-forming chemicals are diethyl ether (ethyl ether), tetrahydrofuran (THF), and dioxane. Isopropyl ether (diisopropyl ether) is a severe peroxide hazard. Additional information on peroxides can be found at the [Sigma-Aldrich website](#).

I. Storage Procedures

The best way to manage chemicals that have the potential for forming shock sensitive peroxides is to purchase only the quantity that is needed for one month use. Store the material in a tightly closed, properly labeled container in a flammable storage cabinet, away from flames, heat, sources of ignition, light, oxidizers and oxidizing acids. Some peroxide formers and peroxides, including styrene and organic peroxy compounds, in common use (e.g., dibenzoyl peroxide, *m*-chloroperoxybenzoic acid, magnesium monoperoxyphthalate, *t*-butylhydroperoxide, hydrogen peroxide $\geq 30\%$) must be kept in an explosion-proof refrigerator or freezer.

Caution: All peroxide forming compounds should be stored away from heat and light. They should be protected from physical shock/damage and ignition sources.

A. Severe Peroxide Hazards (*Discard within 3 months*)

- Diisopropyl ether (isopropyl ether)
- Potassium metal
- Divinylacetylene (DVA)
- Sodium amide (sodamide)
- Potassium amide
- Vinylidene chloride (1,1-dichloroethylene)

B. Peroxide Forming Chemicals (*Discard or test for peroxides after 6 months*)

- Acetaldehyde diethyl acetal (acetal)
- Ethylene glycol dimethyl ether (glyme)
- Cumene (isopropylbenzene)
- Ethylene glycol ether acetates
- Cyclohexene
- Ethylene glycol monoethers (cellosolves)
- Cyclopentene
- Furan

- Decalin (decahydronaphthalene)
- Methylacetylene
- Diacetylene
- 1,3-butadiene
- Methylcyclopentane
- Dicyclopentadiene
- Methyl isobutyl ketone
- Diethyl ether (ether)
- Tetrahydrofuran (THF)
- Diethylene glycol dimethyl ether (diglyme)
- Tetralin (tetrahydronaphthalene)
- Dioxane
- Vinyl ether
- Styrene

C. Organic peroxides

Due to the unstable nature of organic peroxides and organic hydroperoxides, contact EH & IS prior to discarding these chemicals.

II. Warning Labels

Affix a warning label to all containers of peroxide forming compounds, as illustrated below, to indicate the date of receipt and the date the container was first opened.

Peroxide Forming Compound
 Date Received _____
 Date Opened _____
 Discard or Test within 1/3/6 months after opening (Circle one)

III. Testing Procedures

Routinely test the chemical on a monthly basis, after its expiration date, for peroxide formation. **NOTE: The testing of chemicals for peroxide formation must be performed by qualified individuals.**

If you determine the container is safe to open, test the peroxide-forming chemical with a commercial test strip. Commercial test strips have a test range of 0.5 to 50 ppm (mg/L) or 3 to 100 ppm. If peroxides are greater than the concentration range measured by the test strip, a serial dilution with deionized water is necessary to determine a semi-quantitative concentration of peroxides.

The following peroxide concentration guidelines apply:

If: Less than 80 ppm	Then: Solution is OK to use
80 ppm to 400 ppm	Call EH&IS for packaging and removal
Greater than 400 ppm	Call EH&IS who will contact the NSM Response Team to determine the handling procedures

Commercial test strips can be purchased from the following vendors. : Test strips *must* be used per manufacturer's recommendations to give accurate results.

Sigma Aldrich Customer service (800) 325-3010
[Quantofix® peroxides test sticks 1-100 mg/L range of application](#)

Fisher Scientific Customer service (800) 766-7000
[EM* Quant* Test Strips Test: Peroxide; Range: 1 to 100ppm](#)

IV. Disposal Procedures

A. At Expiration

When peroxide-forming chemicals reach their expiration date, it is recommended that you process the chemicals for collection by EH&IS personnel. If peroxide concentrations are greater than 80 ppm, call Environmental Health & Instructional Safety at x7233

B. Post Expiration

If a peroxide forming chemical is older than its expiration date or is stored longer than the time limits listed in Section I, then follow these procedures:

- Call EH&IS at x7233 (1-657-278-7233 if calling from off-campus).
- If crystals are visible in the solution or if crystals are on or in the container, EH&IS will notify an NSM Response Team member for evaluation. Closely examine the container near the cap for the presence of crystals. Some peroxide crystals in solution have a very fine, spun glass-wool appearance. If any crystals are present, do not open or move the container.
- Do not open the container to test the compound for peroxides if crystals are present.
- If the container has a metal screw cap or if the material has been stored longer than two years, do not open or move the container.
- EH&IS and the NSM Response Team will determine the appropriate response or disposal.

3/8/09 tjw

Thanks to the University of California, Berkeley, University of Minnesota, and Philadelphia University for the above information obtained on their websites.