

## STORAGE AND HANDLING OF PEROXIDE FORMING CHEMICALS

Materials that are susceptible to peroxide formation are ones that typically react with air, moisture or impurities and produce a change in their chemical composition in normal storage. Certain organic solvents are susceptible to peroxide formation and can form potentially explosive peroxides over time. Unless these materials are properly handled they can pose a serious safety hazard to users and a difficult disposal problem to the Environmental Health and Safety Office.

Peroxide forming chemicals are divided into three classes as follows:

**Class A:** Chemicals that form explosive levels of peroxides without concentration. These are the most hazardous and can form explosive peroxide levels even if not opened.

Divinyl Acetylene                      Divinyl Ether                      Isopropyl Ether

Sodium or Potassium Amide      Vinylidene Chloride

**Class B:** Chemicals that form explosive levels of peroxides when concentrated through distillation evaporation or exposure to air after opening.

Acetal                                      Cumene                                      Dioxane

Cyclohexene                              Cyclopentene                              Dicyclopentadiene

Diethyl Ether                              Tetrahydrofuran                              Methyl Isobutyl Ketone

Ethyl Vinyl Ether                              Methyl Acetylene \*                              Furan

Diacetylene \*                              Methyl Cyclopentane                              Tetrahydronaphthalene

Glyme (ethylene glycol dimethyl ether)

**Class C:** Chemicals which are a hazard due to peroxide initiation of polymerization.

Butadiene                                      Chlorobutadiene                                      Chlorotrifluoroethylene \*

Acrylonitrile                                      Vinyl Acetate                                      Vinyl Acetylene\*

Vinyl Chloride\*                                      Vinyl Pyridine                                      Tetrafluoroethylene\*

Styrene                                      Methyl Methacrylate

\* Gas

## **General Precautions for Storage and Handling of Peroxide Forming Chemicals**

Minimize the quantity of peroxides or peroxide forming chemicals in the lab.

Know the properties and hazards of all chemicals you are using through adequate research and study, including reading the label and MSDS.

Label each container with the Date Received, Date Opened and Date Last Tested.

Segregate these compounds from incompatible materials. Store away from ignition sources. Protect from flames, static electricity, and sources of heat.

Test chemicals for peroxide before any distillation or purification of peroxide forming chemicals. Use extreme caution before concentrating or purifying peroxide forming chemicals as most explosions occur during these processes.

Wear proper personal protective equipment, including safety eyewear and face shields, when working with peroxide forming chemicals.

Minimize peroxide formation in ethers by storing in tightly sealed containers in a cool place in the absence of light.

If solids or crystals are observed in either the liquid or around the cap of peroxide forming chemicals, do not open or move the container but contact EHSO for disposal.

### **Storage Limits for Each Class of Peroxide Forming Chemicals**

**Class A.** Storage Unopened: six (6) months maximum. Storage Opened: test upon opening. If the test indicates > 80 ppm peroxides dispose. If < 80 ppm peroxide retest every 3 months and dispose when the test indicates > 80 ppm peroxides, the manufacturer expiration date is reached or one (1) year from the date of receipt which ever occurs first.

**Class B.** Storage Unopened: one (1) year maximum. Storage Opened: test upon opening. If the test indicates > 80 ppm peroxides dispose. If < 80 ppm peroxide retest every 3 months and dispose when the test indicates > 80 ppm peroxides or the manufacturers expiration date is reached which ever occurs first.

**Class C.** Storage Unopened: one (1) year maximum. Storage Opened: test upon opening. If the test indicates > 80 ppm peroxides dispose. If < 80 ppm peroxide retest every 3 months and dispose when the test indicates > 80 ppm peroxides or the manufacturers expiration date is reached which ever occurs first.

## SHOCK SENSITIVE AND POTENTIALLY EXPLOSIVE CHEMICALS

The following chemicals are known to be shock sensitive or potentially explosive and need to be handled with care. The shock sensitivity and explosive potential of those which are solids is increased if they become dry. This list is not all inclusive, but is limited to those chemicals which may be present at the University.

Benzoyl Peroxide	White crystalline solid; requires 25-35% water
Dinitrophenyl hydrazine +	Red crystalline solid, requires >30% water.
Methyl Ethyl Ketone Peroxide	Colorless liquid; strong oxidizer
Nitroglycerin	Colorless liquid
Nitromethane	Colorless liquid; highly flammable, incompatible with Amines, oxidizers, strong acids or bases.
Picramide + (syn. Trinitroaniline)	Yellow crystalline solid; requires >30 % water
Picric Acid + (syn. Trinitrophenol)	Yellow crystalline solid; requires >30% water Incompatible with metals, oxidizers or reducers.
Picryl Chloride	White crystalline solid; requires >30% water Incompatible with oxidizers, inorganic nitrates
Picryl Sulfonic Acid + (syn. Trinitrobenzenesulfonic acid)	Flammable solid, corrosive; requires >30% water
Trinitroanisole (syn. Methyl Picrate)	
Trinitrobenzene +	Yellow crystalline solid; requires >30% water
Trinitrobenzoic Acid	
Trinitrotoluene+	
Urea Nitrate +	Colorless crystalline solid; requires >10% water

+ These items require EHSO approval to purchase per University HMMP.

**PEROXIDE FORMING CHEMICAL**

Date Received \_\_\_\_\_ Date Opened \_\_\_\_\_

Date/Test Results \_\_\_\_\_

Date/Test Results \_\_\_\_\_

Date/Test Results \_\_\_\_\_

Date/Test Results \_\_\_\_\_

Date/Test Results \_\_\_\_\_

**EXAMPLE**

**PEROXIDE FORMING CHEMICAL**

Date Received 9/16/05 Date Opened 9/26/05

Date/Test Results 9/26/05 10 PPM

Date/Test Results 12/26/05 10 PPM

Date/Test Results 3/25/06 30 PPM

Date/Test Results 6/25/06 100 PPM

Date/Test Results \_\_\_\_\_

In the above example the chemical was a Class A peroxide forming chemical. It had a manufacturer's expiration date of 10/15/06.

The chemical was opened within the 6 months allowable unopened storage time. The initial test after opening was satisfactory. Subsequent tests every three months were satisfactory until the test on 6/25/06. As this test result is >80 ppm. The chemical must be disposed of as soon as possible.

## **ADDITIONAL INFORMATION**

Peroxide Forming Chemical Labels are available from EHSO

Peroxide Test Strips are available from the following sources.

University of Hawaii at Manoa Chemistry Department Stockroom, Bilger 116  
Phone: 956-6021

Hawaii Chemical and Scientific 2363 N. King St. Honolulu, HI, 96819  
Phone: 841-4265

Laboratory Safety and Supply (800) 356-0783 Online at [www.labsafety.com](http://www.labsafety.com)