Working With Chemicals SBMS Update

Flammable Storage Cabinet & Prolonged Storage Chemicals (Peroxide Forming)

COMMUNICATION PLANS

R. Selvey
Safety and Health Services Division
July 16, 2008

BROOKHAVEN NATIONAL LABORATORY
a passion for discovery

Office of Science
U.S. DEPARTMENT OF ENERGY

BHSO Surveillance (03/19/08)

- NFPA 45 Issue: Incompatible Chemicals in Flammable Cabinets
- NFPA 45 Issue: Dated Chemicals (Peroxide forming container not tested)

Corrective Action Plan

1. Causal Analysis done
2. SBMS ***Working with Chemicals*** was revised to address causes
3. **Communication Plan** to transfer knowledge of changes to users
4. Self Assessment of implementation

Changes in SBMS regarding incompatibles in flammable storage cabinets

BROOKHAVEN

Brookhaven National Laboratory

Handbook on Chemical Use in Laboratories

(OSHA Laboratory Standard)

6.0/1702e011.doc 1 (06/2008)

Table of Contents

4. Acids

- Do not store acids and caustic liquids above eye level.
- A typical storage location for these types of corrosive liquids is dedicated cabinet or a special acid storage cabinet.
- Segregate acids appropriately. See Guidance on Acid below

Below is the suggested organization of laboratory acids in secondary Nalgene® Trays. Trays may be kept in the same acid cabinet.

Tray Organization	Acids allowed in Tray	Incompatibilities with the acids in the tray
Inorganic Acid Tray #1 (Nitric Acid)	Nitric Acid – Nitric Acid is very reactive. It is recommended that it should be separated from all other acids.	All organic acids (e.g. Acetic Acid), Chlorosulfonic Acid, Hydrofluoric Acid, Hydrozoic Acid, Perchloric acid, Phthalic Acid, Salicylic Acid, Sulfamic acid, Sulfuric acid
Inorganic Acid Tray #2	Hydrochloric Acid, Hydrobromic Acid, Chromic Acid, Phosphoric Acid, Chlorosulfonic Acid, Hydriodic Acid	All organic acids (e.g. Acetic Acid), Perchloric Acid, Sulfuric Acid
Inorganic Acid Tray #3	Hydrofluoric Acid – Hydrofluoric Acid is a Highly Acute Toxin and should be stored in a area accessible only by authorized personnel. Relatively small burns from this acid can be lethal. Do not store in glass. Use plastic containers and secondary containment.	All organic acids (e.g. Acetic Acid), Bismuthic acid, Chlorosulfonic acid, Metaantimonic acid, Nitric acid, Perchloric acid, Sulfuric acid
Inorganic Acid Tray #4	Sulfuric Acid	All organic acids (e.g. Acetic Acid), Chlorosulfonic acid, Hydrochloric acid, Perchloric acid
Inorganic Acid #5	Perchloric Acid	All organic acids (e.g. Acetic Acid), Hydrochloric acid, Hydrofluoric acid, Nitric acid, Oleic acid, o-Periodic acid, Sulfuric acid
Organic Acid Tray #1	All Organic Acids, e.g. Acetic Acid, Formic Acid, Propionic Acid, Butyric Acid, Chloroacetic Acid, Trichloroacetic Acid, Oxalic Acid, Salicylic Acid.	All Inorganic (mineral) acids e.g. Chlorosulfonic acid, Chromic Acid, Hydrochloric Acid, Hydrofluoric Acid, Nitric Acid, Perchloric acid, Sulfuric Acid

9. Food

- Do not place food in chemical storage area refrigerators. These refrigerators are to be used for storage of chemicals only. Place a label on the refrigerator "*prohibiting food*".
- Do not place chemicals in food storage refrigerators. Place a label on the refrigerator "*prohibiting chemicals*".

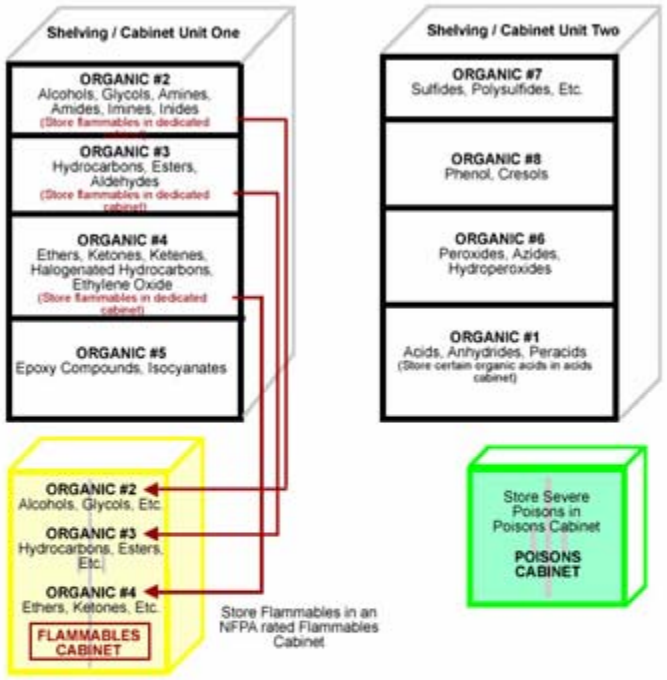
APPENDIX A

Information contained in this table was compiled from the following sources: Academic Laboratory Chemical Hazards Guidebook by William J. Mabo, Published by Van Nostrand Reinhold, 1991; Fire Protection Guide to Hazardous Materials 11th edition, National Fire Protection Association, 1991; Hazardtext® Hazard Management Database; INFOTEXT® Documents Database; Better Science Through Safety by Jack A. Gerlovich and Gary E. Downs, © 1981 by the Iowa State University Press. Document Revision Date 07-24-07 Ken Erickson CHO

Chemical	Chemical Hazard and Compatibility Information
Acetic Acid	HAZARDS & STORAGE: Corrosive and combustible liquid. Serious health hazard. Reacts with oxidizing and alkali materials. Keep above freezing point (62 degrees F) to avoid rupture of carboys and glass containers. INCOMPATIBILITIES: 2-amino-ethanol, Acetaldehyde, Acetic anhydride, Acids, Alcohol, Amines, 2-Amino-ethanol, Ammonia, Ammonium nitrate, 5-Azidotetrazole, Bases, Bromine pentafluoride, Caustics (strong), Chlorosulfonic acid, Chromic Acid, Chromium trioxide, Chlorine trifluoride, Ethylene imine, Ethylene glycol, Ethylene diamine, Hydrogen cyanide, Hydrogen peroxide, Hydrogen sulfide, Hydroxyl compounds, Ketones, Nitric Acid, Oleum, Oxidizers (strong), $P(OCN)_3$, Perchloric acid, Permanganates, Peroxides, Phenols, Phosphorus isocyanate, Phosphorus trichloride, Potassium hydroxide, Potassium permanganate, Potassium-tert-butoxide, Sodium hydroxide, Sodium peroxide, Sulfuric acid, n-Xylene.
Acetone	HAZARDS & STORAGE: Store in a cool, dry, well ventilated place. INCOMPATIBILITIES: Acids, Bromine trifluoride, Bromine, Bromoform, Carbon, Chloroform, Chromium oxide, Chromium trioxide, Chromyl chloride, Dioxygen difluoride, Fluorine oxide, Hydrogen peroxide, 2-Methyl-1,2-butadiene, NaOBr, Nitric acid, Nitrosyl chloride, Nitrosyl perchlorate, Nitryl perchlorate, NOCl, Oxidizing materials, Permonosulfuric acid, Peroxomonosulfuric acid, Potassium-tert-butoxide, Sulfur dichloride, Sulfuric acid, thio-Diglycol, Trichloroacetyl perchlorate, Trichloromelamine, 2,4,6-Trichloro-1,3,5-triazine
Acetylene	HAZARDS & STORAGE: Flammable gas. Forms explosive mixtures with air. Low ignition energy. Reacts with active metals to form explosive compounds. Isolate from oxidizing gases, especially chlorine. Do not store in copper or brass containers. INCOMPATIBILITIES: Brass, Bromine, Cesium hydride, Chlorine, Cobalt powder, Copper carbide, Copper, Copper salts, Cuprous acetylide, Fluorine, Halogens, Mercuric nitrate, Mercury, Mercury salts, Nitric acid, Oxidizing materials, Oxygen, Potassium, Potassium hydroxide, Rubidium hydride, Silver, Silver salts, Sodium hydride, Trifluoromethyl hypofluorite.
Ammonia (anhydrous)	HAZARDS & STORAGE: Corrosive, Flammable. Separate from other chemicals, particularly oxidizing materials, acids, and halogens. INCOMPATIBILITIES: Acids, Bromine, Calcium hypochlorite, Chlorine, Halogens, Hydrogen fluoride (hydrofluoric acid), Iodine, Mercury, Oxidizing gases
Ammonium hydroxide	HAZARDS & STORAGE: Store in a cool and well ventilated area away from combustibles INCOMPATIBILITIES: Acids, Acrolein, Acrylic acid, Chlorosulfonic acid, Dimethyl sulfate, Halogens, Hydrogen chloride (Hydrochloric acid), Hydrogen fluoride [illegible] propylene
Ammonium Nitra[illegible]	[illegible] oxides of [illegible] explosive that [illegible] reducing agents, and combustible materials. Do not store above 130 degrees F.

5 pages

SUGGESTED SHELF STORAGE PATTERN - ORGANIC



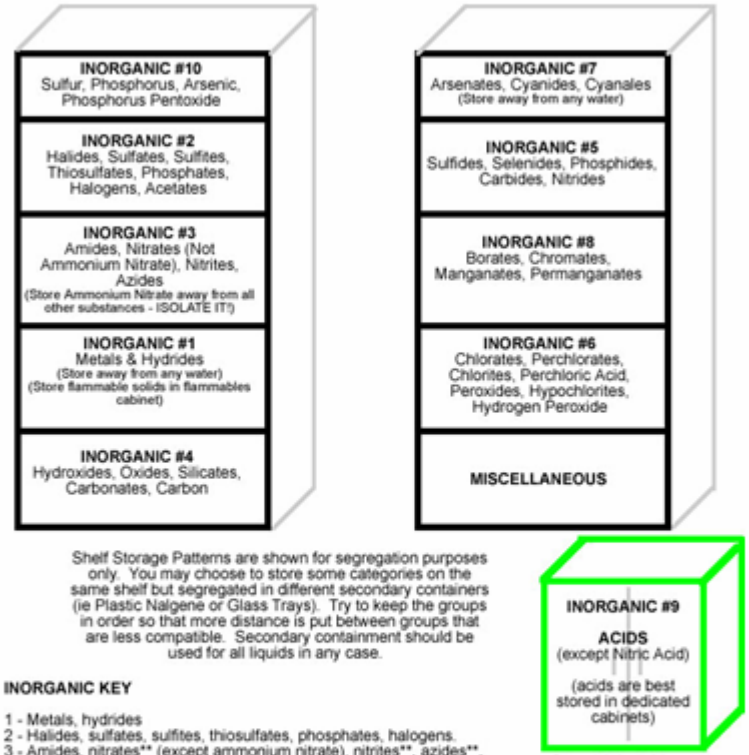
Shelf Storage Patterns are shown for segregation purposes only. You may choose to store some categories on the same shelf but segregated in different secondary containers (ie Plastic Nalgene or Glass Trays). Try to keep the groups in order so that more distance is put between groups that are less compatible. Secondary containment should be used for all liquids in any case.

ORGANIC KEY

1 - Acids, Anhydrides, Peracids
2 - Alcohols, glycols, amines, amides, imines, imides
3 - Hydrocarbons, esters, aldehydes
4 - Ethers**, Ketones, Ketenes, Halogenated hydrocarbons, Ethylene Oxide
5 - Epoxy compounds, Isocyanantes
6 - Peroxides, hydroperoxides, azides**
7 - Sulfides, Polysulfides, sulfoxides, nitriles
8 - Phenols, Cresols

**** These Chemicals deserve special attention due to their potential instability.**

SUGGESTED SHELF STORAGE PATTERN - INORGANIC



Shelf Storage Patterns are shown for segregation purposes only. You may choose to store some categories on the same shelf but segregated in different secondary containers (ie Plastic Nalgene or Glass Trays). Try to keep the groups in order so that more distance is put between groups that are less compatible. Secondary containment should be used for all liquids in any case.

Store Nitric Acid away from other acids unless your acid cabinet provides a seperate compartment or secondary containment for Nitric Acid.

INORGANIC KEY

1 - Metals, hydrides
2 - Halides, sulfates, sulfites, thiosulfates, phosphates, halogens.
3 - Amides, nitrates** (except ammonium nitrate), nitrites**, azides**, nitric acid.
4 - Hydroxides, oxides, silicates, carbonates, carbon.
5 - Sulfides, selenides, phosphides, carbides, nitrides.
6 - Chlorates, perchlorates**, perchloirc acid**, chlorites, hypochlorites, peroxides**, hydrogen peroxide.
7 - Arsenates, cyanides, cyanates.
8 - Borates, chromates, manganates, permanganates.
9 - Acids (except nitric)
10 - Sulfur, phosphorus**, arsenic, phosphorus pentoxide**.

**** These Chemicals deserve special attention due to their potential instability.**

Communication Plan: Flammable Storage Cabinet Incompatible (4149.3.3)

Action	Description of Action	Owner	Due Date	Status
1.1	Subject Area revision made	K. Erickson	06/15/08	Done
1.2.	Subject Area notification via SBMS Subscription Service	K. Orta	06/15/08	Done
1.3	ESH Coordinators meeting overview of changes	R. Selvey	07/16/08	Done
1.4	Draft of e-mail message circulated for approval	R. Selvey	07/18/08	
1.5	Email addresses of all *Laboratory Standard* attendees compiled	B. Schwaner	07/31/08	Done
1.6	Email with information on SBMS changes sent to targeted *Laboratory Standard* attendees	R. Selvey	08/01/08	

E-Mail Message

The Brookhaven Site Office conducted a Surveillance of Hazardous Material Storage in March 2008.

The Corrective Action Plan for the Findings included changes to the SBMS Subject Area *Working with Chemicals* in the exhibit ***Handbook on Chemical Use in Laboratories***:

- The *Chemical Storage in Laboratories* section was updated and reorganized to provide clearer guidance on chemical compatibility and storing chemicals;
- A new section on segregation on acids was added; and
- An Appendix was added to include chemical compatibility guidance and suggested storage organization to maintain proper segregation.

Changes in SBMS regarding Prolonged Storage Chemicals

2.7 Storing Chemicals in Laboratories

Step 1	Store chemicals according to the exhibit Handbook on Chemical Use in Laboratories to address flammability, reactivity, compatibility, and spill containment.
Step 2	Ensure that the Chemical Management System (CMS) inventory is consistent with the chemicals stored. Keep the inventory up to date by: • Deleting the bar-code number when chemicals are consumed, converted, or disposed; • Transferring bar-codes to new owners or locations; • Adding bar-codes when chemicals are obtained. Use the forms or Web Transactions from the Chemical Management System (CMS) Web Site or contact the CMS Team.
Step 3	Minimize inventory in the following ways: • Keep quantities on hand for immediate use; • Monitor time-sensitive chemicals for expiration dates; • Identify chemicals that no longer serve a purpose and process for disposal (see the subsection Disposing Chemicals From Laboratories).
Step 4	Follow the instructions in the exhibit Storing Materials That Might Become Hazardous During Prolonged Storage. Work Planning and Control documentation (Work Permit or ESR) must specifically address how all special provisions of the exhibit are met.

3.4 Storing Chemicals for HazCom Operations

Step 1	Store chemicals according to the exhibit Handbook on Chemical Use in HazCom Operations to address flammability, reactivity, compatibility, and secondary containment.
Step 2	Ensure that the Chemical Management System (CMS) inventory is consistent with the chemicals stored. Keep the following up to date: • Deleting the bar-code number when chemicals are consumed, converted, or disposed; • Transferring bar-code to new owners or locations; • Adding bar-codes when chemicals are obtained. Contact the CMS Team or use the forms from the Chemical Management System (CMS) Web Site.
Step 3	Minimize inventory, including the following: • Keep quantities on hand to quantity needed for immediate use; • Monitor time-sensitive chemicals for expiration dates; • Identify chemicals that no longer serve a purpose and process for disposal (see subsection Disposing of Chemicals From HazCom Operations).
Step 4	Follow the instructions in the exhibit Storing Materials That Might Become Hazardous During Prolonged Storage. Work Planning and Control Documentation (Work Permit or ESR) must specifically address how all special provisions of the exhibit are met.

Changes in SBMS regarding Prolonged Storage Chemicals

New exhibit

Storing Materials That Might Become Hazardous During Prolonged Storage

1. Peroxide Forming Liquid Compounds
2. Peroxidizable Gases
3. Hygroscopic or water-reactive compounds
4. Picric acid (synonym: 2,4,6-trinitrophenol (TNP).

1. Peroxide Forming Liquid Compounds

Peroxides can form in solvents, reagents, gases, and solids by the autoxidation or peroxidation of a compound with molecular oxygen.

- Peroxides in solution at concentrations up to about 1 percent (10,000 ppm) do not normally present thermal or shock hazards. Such solutions may be safely disposed of or treated to remove peroxides.
- However, if crystals form in a peroxidizable liquid or discoloration occurs in a peroxidizable solid, peroxidation may have occurred and the product should be considered extremely dangerous and should be destroyed without opening the container. Contact your Departmental ESH Coordinator for assistance in arranging for disposal through the Waste Management Division.

1a. Materials Likely to Form Peroxides in Storage (This list contains materials likely to form peroxides in storage. Consult the MSDS to identify other materials which may produce peroxides and test these materials accordingly.)

LIST A: Severe Peroxide Hazard on Storage with Exposure to Air Compounds that may explode even without being concentrated.	
• Diisopropyl ether (isopropyl ether) • Divinyl acetylene (DVA)	• Divinyl ether • Vinylidene chloride (1,1-dichloroethylene)
LIST B: Peroxide Hazard on Concentration. Compounds that require concentration (such as distillation or evaporation) in order to present a hazard.	
• Acetal (diethyl acetal) • Cumene (isopropyl benzene) • Cyclohexene • Cyclooctene • Cyclopentene • Decalin (decahydronaphthalene) • Diacetylenes (butadiyne, etc.) • Dicyclopentadiene • Diethyl ether (ether; ethyl ether) • Diethylene glycol dimethylether (diglyme) • Dioxane (p-dioxane; 1,4-dioxane)	• Ethylene glycol dimethyl ether (glyme) • Ethyleneglycol ether acetates • Ethylene glycol monoethers (cellosolves) • Furan • Methyl acetylene • Methylcyclopentane • Methyl isobutyl ketone • Tetrahydrofuran (THF) • Tetralin (tetrahydronaphthalene) • Vinyl ethers
LIST C: Hazard of Rapid Polymerization Initiated by Internally Formed Peroxides [1,2] Vinyl monomers may form internal peroxides that can then initiate rapid polymerization of the bulk monomers.	
• Acrylic acid • Acrylonitrile • Chloroprene (2-chloro-1, 3-butadiene) • Methyl methacrylate	• Styrene • Vinyl acetate • Vinylpyridine • Vinylidene chloride

[1] Store Polymerizable monomers with a polymerization inhibitor from which the monomers can be separated by distillation just before use.

[2] Although common acrylic monomers, such as acrylonitrile, acrylic acid, ethyl acrylate, and methyl acrylate can form peroxides, they have not been reported to develop hazardous levels in normal use and storage.

1b. Testing and Labeling Peroxide Forming Liquid Compounds

- Label the container with the "date" described below or label the container with a reference to an equivalent record log where this information is kept.
- Test the contents of container using a method from *1c Detection of Peroxides*.

List A:

- Affix a date label upon receipt of the container.
- Test for peroxide within three months of receipt.
- Retest every three months.
- Re-date material if tested negative (<100 ppm).
- Contact ES&H Coordinator if tested positive (>100 ppm).
- Keep the containers labeled with most recent of "Received Date", "Opened Date", or "Tested Date."

Peroxide Forming Compound
Received:_____

Peroxide Forming Compound
Opened:_____

Peroxide Forming Compound
List A: Test every 3 months
Tested:_____

List B &C:

- Affix a date label upon receipt of the container.
- Test for peroxide within six months of opening.
- Retest every six months.
- Re-date material if tested negative (<100 ppm).
- Contact ES&H Coordinator if tested positive (>100 ppm).
- Keep the containers labeled with most recent of "Received Date", "Opened Date", or "Tested Date."

Peroxide Forming Compound
Received:_____

Peroxide Forming Compound
Opened:_____

Peroxide Forming Compound
List B or C: Test every 6 months
Tested:_____

1c. Detection of Peroxides

The following tests can detect most (but not all) peroxy compounds, including all hydroperoxides. Use one of these methods for testing:

I. Add 1 to 3 milliliters (ml) of the liquid to be tested to an equal volume of acetic acid, add a few drops of 5% aqueous potassium iodide solution, and shake. The appearance of a yellow-to-brown color indicates the presence of peroxides.

II. Add 1 ml of a freshly prepared 10% solution of potassium iodide to 10 ml of an organic liquid in a 25-mL glass cylinder. Produces a yellow color if peroxides are present.

II) Add 0.5 ml of the liquid to be tested to a mixture of 1 ml of 10% aqueous potassium iodide solution and 0.5 ml of dilute hydrochloric acid to which has been added a few drops of starch solution just before the test. The appearance of a blue or blue-black color within a minute indicates the presence of peroxides.

III) Peroxide test strips, which turn to an indicative color in the presence of peroxides, are available commercially. Note that these strips must be air-dried until the solvent evaporates and then exposed to moisture for proper operation.

None of these tests should be applied to materials (such as metallic potassium) that may be contaminated with inorganic peroxides.

"Prudent Practices in the Laboratory," National Research Council, National Academy Press, Washington, DC, 1995.

1d. Distillation and Evaporation Precautions

- Test all List A or B compounds for peroxide before distillation or evaporation (or treated to positively ensure peroxide destruction). If the material tests positive, it must be disposed of or treated to remove the peroxides. Add a suitable polymerization inhibitor before distilling any List C material.
- Most accidents associated with distillation of peroxidizable compounds have occurred when peroxides have become concentrated in the distillation residue. It is therefore essential to never distill a peroxidizable solvent to a dry residue.
  - One solution for compounds showing no more than a trace of peroxide on testing is to discontinue the distillation when a 10 per cent heel remains.
  - Another solution is to add a high molecular weight inerting solvent, which will not distill, such as mineral oil or a phthalate ester. This solvent will act as a desensitizing diluent for residual peroxides when distillation is complete.
- In addition to safety glasses, use a shield when evaporating or distilling mixtures that may contain peroxides.

1e. Removal of Peroxides from Peroxide Forming Liquid Compounds

Only knowledgeable laboratory workers should carry out these procedures. Peroxides can be removed from a solvent by passing it through a column of basic activated alumina, by treating it with Indicating Molecular Sieves, or by reduction with ferrous sulfate. Although these procedures remove hydroperoxides, which are the principle hazardous contaminants of peroxide-forming solvents, they do not remove dialkyl peroxides, which may also be present in low concentrations. Commonly used peroxide reagents, such as acetyl peroxide, benzoyl peroxide, t-butyl hydroperoxide, and di-t-butyl peroxide, are less dangerous than the adventitious peroxides formed in solvents.

I) **Removal of Peroxides with Alumina**
A 2 x 33 cm column filled with 80 g of 80-mesh basic activated alumina is usually sufficient to remove all peroxides from 100 to 400 ml of solvent, whether water-soluble or water-insoluble. After passage through the column, test the solvent for peroxide content. Peroxides formed by air oxidation are usually decomposed by the alumina, not merely absorbed on it. However, for safety, it is best to slurry the wet alumina with a dilute acidic solution of ferrous sulfate before it is properly discarded.

II) **Removal of Peroxides with Molecular Sieves**
Reflux 100 ml of the solvent with 5 g of 4- to 8-mesh indicating activated 4A Molecular Sieves for several hours under nitrogen. The sieves are separated from the solvent and require no further treatment because the peroxides are destroyed during their interaction with the sieves.

III) **Removal of Peroxides with Ferrous Sulfate**
A solution of 6 g of $FeSO_4$-$7H_2O$, 6 ml of concentrated sulfuric acid, and 11 ml of water is stirred with 1 L of water-insoluble solvent until the solvent no longer gives a positive test for peroxides. Usually only a few minutes are required.
Dialkyl peroxides can be destroyed by this reagent as well as by aqueous sodium hydrogen sulfate, sodium hydroxide, or ammonia. However, diacyl peroxides with low solubility in water, such as dibenzoyl peroxide, react very slowly. A better reagent is a solution of sodium iodide or potassium iodide in glacial acetic acid.

iv) **Destruction of Diacyl Peroxides**
For 0.01 mol of diacyl peroxide, 0.022 mol (10% excess) of sodium or potassium iodide is dissolved in 70 ml of glacial acetic acid, and the peroxide added gradually with stirring at room temperature. The solution is rapidly darkened by the formation of iodine. After a minimum of 30 minutes, the solution may be properly discarded.
Most dialkyl peroxides (ROOR) do not react readily at room temperature with ferrous sulfate, iodide, ammonia, or the other reagents mentioned above. However, these peroxides can be destroyed by a modification of the iodide procedure.

v) **Destruction of Dialkyl Peroxides**
One milliliter of 36% (w/v) hydrochloric acid is added to the above acetic acid/potassium iodide solution as an accelerator, followed by 0.01 mol of the dialkyl peroxide. The solution is heated to 90° to 100°C on a steam bath over the course of 30 minutes and held at that temperature for 5 hours, before being properly discarded.

"Prudent Practices in the Laboratory," National Research Council, National Academy Press, Washington, DC, 1995.

1f. Waste Disposal Prerequisites for Peroxide Forming Liquid Compounds

Prior to submitting a Waste Control form, the container is tested within the last six months. Notify WMD on the Waste Control form of containers that cannot be tested.

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2. Peroxidizable Gases

The following gases pose a potential hazard of rapid polymerization initiated by internally formed peroxides:

- Butadiene
- Chlorotrifluoroethylene
- Methylacetylene (propyne)
- Tetrafluoroethylene (TFE)
- Vinylacetylene
- (MVA) Vinylchloride

2a. Although air will not enter a gas cylinder in which gases are stored under pressure, these gases 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 container. Before transferring these chemicals into secondary container, first purge the receiving container with nitrogen.

2b. Put an inhibitor into secondary cylinders before one of these gases is transferred into it; the supplier can suggest inhibitors to be used.

2c. The hazard posed by these gases is much greater if there is a liquid phase in the secondary container. Peroxidizable gases (even if inhibited) that have been put into a secondary container under conditions that create a liquid phase should be discarded within twelve months.

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3. Hygroscopic or water-reactive compounds

Hygroscopic or water-reactive compounds can autoignite on exposure to air or moisture.

Reactive, Oxidizable Solids

- Potassium (K),
- Potassium Amide (KNH_2),
- Sodium (Na),
- Sodium Amide ($NaNH_2$)

3a. Store and handle these highly reactive materials only under a hydrocarbon solvent (e.g., hexane, xylene, mineral oil).

3b. Avoid all contact with water or humid air, since the hydrogen gas released upon reaction with water can cause a fire.
3c. Reaction of sodium with oxygen forms sodium peroxide (Na_2O_2), and reaction of potassium with oxygen forms superoxide (KO_2), but these cannot be tested by the conventional peroxide tests.

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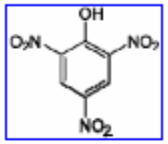
4. Picric acid (synonym: 2,4,6-trinitrophenol (TNP).



Picric Acid becomes highly shock-sensitive when its normal water content is allowed to evaporate.

- When the material appears dry, do not open the container.
- Inspect the material monthly to insure it is wet.
- Rehydrate the material every six months with deionized water to maintain a wet paste.
- Dispose of picric acid within two years of receipt.
- Store picric acid wet (i.e. store in a bottle under a layer of water.) When picric acid is dry (to less than 10% water by volume), it is relatively sensitive to shock and friction and poses an explosion hazard.
- Use Glass or plastic bottles.
- Do not use metal container or containers with metal lids. Picric acid can form metal picrate salts that are even more sensitive and hazardous than the acid.
- Do not use metal spatulas to remove material.
- Clean the bottleneck, caps, and threads with a wet cloth before resealing.
- When possible, purchase premixed solutions of 1% or less.
- Do not pour it down a drain, it could react with copper or iron piping to form explosive salts.
- Handling Questionable Containers:
- If an old container is found with a metal cap, shock sensitive metal picrates may have formed on the cap contact area. Explosives experts should be contacted via Environmental and Waste Management Services Division.
- If a plastic cap is present but the acids inside has dried, some crystals may be on the threads and the friction of removing the plastic cap might be enough to detonate the container. Place the container in pale of water and allow the water to enter the caps ands threads and dissolve the crystals. Leave it for several days until water can be seen inside the bottle.

Communication Plan: Date Sensitive Chemical (Peroxidizable) (4149.1.5)

Action	Description of Action	Owner	Due Date	Status
2.1	Subject Area revision made	R. Selvey	06/15/08	Done
2.2.	Subject Area notification via SBMS Subscription Service	K. Orta	06/15/08	Done
2.3	ESH Coordinators meeting overview of changes	R. Selvey	07/16/08	Done
2.4	Draft of e-mail message circulated for approval	R. Selvey	07/18/08	
2.5	Email addresses of all Peroxide chemical and Picric Acid owners in CMS compiled	R. Petricek	07/31/08	
2.6	Email with information on SBMS changes sent to targeted list of CMS Peroxide and Picric Acid owners	R. Selvey	08/01/08	

E-Mail Message

The Brookhaven Site Office conducted a Surveillance of Hazardous Material Storage in March 2008.

The Corrective Action Plan for the Findings included changes to the SBMS Subject Area *Working with Chemicals* which are described briefly below:

- A new exhibit *Storing Materials That Might Become Hazardous During Prolonged Storage* was created.
- Changes were made to decrease the period between testing of peroxide forming compounds from 12 months to 6 months (required in NFPA 45).
- A step was added to section ***2.7 Storing Chemicals in Laboratories*** and section ***3.4 Storing Chemicals for HazCom Operations*** to include a link to the new exhibit.

Surveillance of Implementation and Compliance

Action	Description of Action	Owner	Due Date	Status
3.1	Testing Supplies ordered	R. Selvey	08/01/08	done
3.2	Checklist for Surveillance prepared	R. Selvey/ K. Erickson	07/31/08	
3.3	Auditors qualified on checklists	R. Selvey/ J. Peters	08/01/08	
3.4	Field test and surveillance conducted for peroxide testing and flammable cabinets	S&H Reps, J. Peters	08/04/08-08/13/08	
3.4	Surveillance results compiled into report	R. Selvey	08/15/08	