



## Safe Storage of Hazardous Chemicals



1. **PURPOSE:** To provide a guideline on the safe storage requirements of hazardous chemicals in the VCU community.
2. **SCOPE/APPLICABILITY:** This guideline is applicable to all users of hazardous chemicals at VCU.

3. **TABLE OF CONTENTS:**

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4. **BACKGROUND:** This guideline was created as a tool to assist VCU personnel on the safe storage of hazardous chemicals to minimize the potential for chemical spills, chemical reactions and potential exposures.
5. **RESPONSIBILITIES:** It is the responsibility of all VCU personnel working with hazardous chemicals to adhere to this guideline when storing any hazardous chemicals. All safe chemical storage guidelines must be delineated within the lab specific Chemical Hygiene Plan (CHP). A copy of the CHP can be downloaded from the [VCU OEHS website](#).
6. **GUIDELINES FOR SAFE CHEMICAL STORAGE:**
  - a. Maintain a chemical inventory. Safe chemical handling requires regular inspections of chemical storage areas and maintenance of stringent inventory control.
  - b. Read all chemical labels and Safety Data Sheets (SDS) for specific storage instructions
  - c. Ensure all chemicals are properly labeled and time sensitive chemicals are dated.
  - d. Return chemical containers to the proper storage location after use.
  - e. Do not store hazardous chemicals above eye level.
  - f. Chemical storage area should have a cool, dry atmosphere, sufficient lighting in all areas, a ventilation system that exhausts to the outside
  - g. Chemical storage areas should be secure and have sufficient shelving and unobstructed aisles with no blind areas.
  - h. Do not overcrowd shelving.



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7. **SEPARATING HAZARDOUS CHEMICALS:** Chemicals should be segregated and stored according to their physical or health hazard class as delineated by the [OSHA Hazard Communication Standard \(29CFR1910.1200\)](#). Do not store chemicals alphabetically as this may place incompatible chemicals next to each other. The general hazard classes are:

- a. Flammables/Self Heating (liquids, gasses or solids)
- b. Corrosives (acids and bases should be stored separately)
- c. Oxidizers (liquids, gasses, solids or mixtures such as Piranha solutions)
- d. Carcinogens/acute toxins/mutagens/reproductive toxins/aspiration toxins
- e. Water reactive chemicals
- f. Pyrophoric/Self Reactive (liquids, gases or solids)
- g. Explosives/Organic Peroxides

Additionally for safe hazardous chemical storage

- a. Separate acids from bases and store on lower shelves
- b. Separate acids from organic solvents
- c. Isolate perchloric acid from organic materials
- d. DO NOT store perchloric acid on a wooden shelf
- e. Separate highly toxic chemicals and carcinogens from all other chemicals. This storage location must have a warning label and should be in a controlled or locked area
- f. DO NOT allow picric acid to dry out
- g. Flammables should be stored in a flammable storage cabinet
- h. If flammables need to be chilled, store in a laboratory-safe refrigerator. (Not a standard refrigerator)

### 8. INCOMPATIBILITY TABLES:

Chemical	Reaction
Acetic acid and acetaldehyde	Polymerization of acetaldehyde
Copper (II) sulfide and cadmium chlorate	Explosive reaction
Hydrogen peroxide and iron (II) sulfide	Reacts vigorously
Sodium nitrite and sodium thiosulfate	Explosive when heated



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### Examples of Incompatible Chemicals

<b>Chemical</b>	<b>Is Incompatible and Should Not Be Mixed or Stored With</b>
<b>Acetic acid</b>	Chromic acid, nitric acid, hydroxyl compounds, ethylene glycol, perchloric acid, peroxides, permanganates
<b>Acetylene</b>	Chlorine, bromine, copper, fluorine, silver, mercury
<b>Acetone</b>	Concentrated nitric and sulfuric acid mixtures
<b>Alkali and alkaline earth metals (such as powdered aluminum or magnesium, calcium, lithium, sodium, potassium)</b>	Water, carbon tetrachloride or other chlorinated hydrocarbons, carbon dioxide, halogens
<b>Ammonia (anhydrous)</b>	Mercury, chlorine, calcium hypochlorite, iodine, bromine, hydrofluoric acid (anhydrous)
<b>Ammonium nitrate</b>	Acids, powdered metals, flammable liquids, chlorates, nitrates, sulfur, finely divided organic or combustible materials
<b>Aniline</b>	Nitric acid, hydrogen peroxide
<b>Arsenical materials</b>	Any reducing agent
<b>Azides</b>	Acids
<b>Bromine</b>	See Chlorine
<b>Calcium oxide</b>	Water
<b>Carbon (activated)</b>	Calcium hypochlorite, all oxidizing agents
<b>Carbon tetrachloride</b>	Sodium
<b>Chlorates</b>	Ammonium salts, acids, powdered metals, sulfur, finely divided organic or combustible materials
<b>Chromic acid and chromium trioxide</b>	Acetic acid, naphthalene, camphor, glycerol, alcohol, flammable liquids in general
<b>Chlorine</b>	Ammonia, acetylene, butadiene, butane, methane, propane (or other petroleum gases), hydrogen, sodium carbide, benzene, finely divided metals, turpentine
<b>Chlorine dioxide</b>	Ammonia, methane, phosphine, hydrogen sulfide
<b>Copper</b>	Acetylene, hydrogen peroxide
<b>Cumene hydroperoxide</b>	Acids (organic or inorganic)
<b>Cyanides</b>	Acids
<b>Flammable liquids</b>	Ammonium nitrate, chromic acid, hydrogen peroxide, nitric acid, sodium peroxide, halogens
<b>Fluorine</b>	Everything
<b>Hydrocarbons (such as butane, propane, benzene)</b>	Fluorine, chlorine, bromine, chromic acid, sodium peroxide
<b>Hydrocyanic acid</b>	Nitric acid, alkali
<b>Hydrofluoric acid (anhydrous)</b>	Ammonia (aqueous or anhydrous)



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<b>Hydrogen peroxide</b>	Copper, chromium, iron, most metals or their salts, alcohols, acetone, organic materials, aniline, nitromethane, combustible materials
<b>Hydrogen sulfide</b>	Fuming nitric acid, oxidizing gases
<b>Hypochlorites</b>	Acids, activated carbon
<b>Iodine</b>	Acetylene, ammonia (aqueous or anhydrous), hydrogen
<b>Mercury</b>	Acetylene, fulminic acid, ammonia
<b>Nitrates</b>	Sulfuric acid
<b>Nitric acid (concentrated)</b>	Acetic acid, aniline, chromic acid, hydrocyanic acid, hydrogen sulfide, flammable liquids, flammable gases, copper, brass, any heavy metals
<b>Nitrites</b>	Acids
<b>Nitroparaffins</b>	Inorganic bases, amines
<b>Oxalic acid</b>	Silver, mercury
<b>Oxygen</b>	Oils, grease, hydrogen, flammable liquids, solids or gases
<b>Perchloric acid</b>	Acetic anhydride, bismuth and its alloys, alcohol, paper, wood, grease, oils
<b>Peroxide, organic</b>	Acids (organic or mineral), avoid friction, store cold
<b>Phosphorus (white)</b>	Air, oxygen, alkalis, reducing agents
<b>Potassium</b>	Carbon tetrachloride, carbon dioxide, water
<b>Potassium chlorate</b>	Sulfuric and other acids
<b>Potassium perchlorate (see also chlorates)</b>	Sulfuric and other acids
<b>Potassium permanganate</b>	Glycerol, ethylene glycol, benzaldehyde, sulfuric acid
<b>Selenides</b>	Reducing agents
<b>Silver</b>	Acetylene, oxalic acid, tartartic acid, ammonium compounds, fulminic acid
<b>Sodium</b>	Carbon tetrachloride, carbon dioxide, water
<b>Sodium nitrate</b>	Ammonium nitrate and other ammonium salts
<b>Sodium peroxide</b>	Ethyl or methyl alcohol, glacial acetic acid, acetic anhydride, benzaldehyde, carbon disulfide, glycerin, ethylene glycol, ethyl acetate, methyl acetate, furfural
<b>Sulfides</b>	Acids
<b>Sulfuric acid</b>	Potassium chlorate, potassium perchlorate, potassium permanganate (similar compounds of light metals, such as sodium, lithium)
<b>Tellurides</b>	Reducing agents



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## 9. REFERENCES:

- a. *Source: Introduction to Safety in the Chemical Laboratory, Academic Press.*

## 10. REVISION HISTORY:

<i>Version</i>	<i>Effective Date</i>	<i>Changes Made</i>
1	10/13/2009	Original
2	03/18/2016	Updated the template and chemical compatibility table