

SAFE HANDLING & STORAGE OF HAZARDOUS MATERIALS

Prepared by the Environmental Health and Safety Office (617-432-2762)

OUTLINE OF TOPICS

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I. ACIDS

- Store acids on low shelves, or in acid cabinets.
- **Segregate oxidizing acids from organic acids as well as flammable or combustible materials (SEE LISTS BELOW).**
- Use bottle carriers for transporting acid bottles.
- Have spill control materials available which will absorb and neutralize an acid spill.

STRONG OXIDIZING ACIDS

Nitric acid
Sulfuric acid
Chromic acid
Perchloric acid
Hydrobromic acid

ORGANIC ACIDS

Acetic acid
Acetic anhydride
Phenol
Trichloroacetic acid
Trifluoroacetic acid

OTHER COMMON ACIDS

Hydrochloric acid
Phosphoric acid
Formic acid
Maleic acid
Phosphotungstic acid

II. BASES (CAUSTICS)

- Store bases on low shelves, or in designated caustics cabinets.
- Segregate bases from acids.
- Have spill control materials available which will absorb and neutralize a base spill.

COMMON BASES

Ammonium hydroxide	Calcium hydroxide
Potassium hydroxide	Bicarbonate salts (potassium bicarbonate, sodium bicarbonate, etc.)
Sodium hydroxide	Carbonate salts (calcium carbonate, sodium carbonate, etc.)

III. FLAMMABLES

- Store volumes greater than one gallon (four liters) in approved safety cans.
- Store in flammable storage cabinets.
- Keep away from heat and ignition sources (burners, heat-producing equipment, sunny windows, etc.).
- Keep firefighting equipment such as extinguishers accessible and unobstructed.
- Have flammable spill materials available. Activated charcoal absorbent is recommended.
- If flammables must be kept cold, use only a lab-safe refrigerator or freezer (electrical components are mounted on the outside), or keep flammables on ice for as long as they are needed cold.
- Never store flammables in cold rooms. Most cold rooms are unsprinklered, and all have recirculating air, which can allow dangerous levels of ignitable fumes to build up.

FLAMMABLE SOLIDS

Benzoyl peroxide	Picric acid
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FLAMMABLE GASES

Acetylene	Ethane	Hydrogen sulfide
Ammonia	Ethylene oxide	Methane
Butane	Formaldehyde	Propane
Carbon monoxide	Hydrogen	Propylene

FLAMMABLE LIQUIDS

Acetaldehyde	Furans	Naphtha solvents
Acetone	Gasoline	Octane
Acetyl chloride	Hexane	Piperidine
Alcohols	Hydrazine	Propanol
Benzene	Isopentane	Pyridine
Butanol	Isopropyl ether	Sigmatocote
p-dioxane	Methanol	Styrene
Ethanol	Methyl acrylate	TEMED
Ethyl acetate	2-Methylbutane	Tetrahydrofuran
Ethylamine	Methyl butyl ketone	Toluene
Ethyl benzene	Methyl ethyl ketone	Turpentine
Ethyl ether	Methyl methacrylate	Vinyl acetate
Ethyl formate	Morpholine	Xylene

IV. OXIDIZERS

- Store in a cool, dry place.
- Keep away from flammable and combustible materials.
- Keep away from reducing agents, such as zinc, alkaline metals, and formic acid.
- Dispose of as hazardous waste.

OXIDIZING LIQUIDS

Bromine	Hydrogen peroxide	Perchloric acid
Chromic acid	Nitric acid	Sulfuric acid

OXIDIZING SOLIDS

Ammonium dichromate	Iodates, salts of	Potassium permanganate
Ammonium perchlorate	Iodine	Potassium persulfate
Ammonium persulfate	Magnesium perchlorate	Silver nitrate
Benzoyl peroxide	Manganese dioxide	Sodium chlorite
Calcium hypochlorite	Nitrates, salts of	Sodium dichromate
Chlorates, salts of	Periodic acid	Sodium nitrite
Chromium trioxide	Peroxides, salts of	Sodium perborate
Ferric nitrate	Potassium dichromate	

OXIDIZING GASES

Chlorine	Nitrogen dioxide	Ozone
Chlorine dioxide	Nitrogen oxide	
Fluorine	Oxygen	

V. WATER REACTIVE CHEMICALS

(React strongly with water, yielding flammable or toxic gases or other hazardous condition).

- Store in a cool, dry place.
- Do not store on shelves over sinks or water baths, or near any other sources of moisture.
- In case of fire, keep water away.
- Dispose of as hazardous waste.

SOLIDS

Aluminum chloride, anhydrous	Magnesium	Phosphorus pentasulfide
Ferrous sulfide	Maleic anhydride	Potassium*
Lithium*	Phosphorus	Sodium*
Lithium aluminum hydride	Phosphorus pentachloride	Sodium borohydride

* Lithium, potassium, and sodium should be stored under kerosene.

LIQUIDS

Acetyl chloride	Sigmacote	Sulfuryl chloride
Chlorosulfonic acid	Silicon tetrachloride	Thionyl chloride
Hydrofluoric acid	Stannic chloride	Titanium tetrachloride
Phosphoryl trichloride	Sulfur chloride	Triethylaluminum

VI. PYROPHORIC CHEMICALS

(Ignite spontaneously upon contact with air)

Boron	Diborane	Manganese*
Cadmium*	Dichloroborane	Nickel*
Calcium*	2-Furaldehyde	Phosphorus*
Chromium*	Iron*	Titanium*
Cobalt*	Lead*	Zinc*

* Finely divided metals form a pyrophoric hazard

VII. PEROXIDE FORMING CHEMICALS

(Chemicals that, over time, can autooxidize to form explosive levels of peroxides)

- Store in airtight containers in a dark, cool, and dry place.
- Label containers with date received, date opened, and date of recommended disposal.
- Dispose of peroxide forming chemicals on or before their expiration date. If no expiration date is listed, contact Environmental Health and Safety at 617-432-2762 for assistance.
- Peroxide inhibitors, often added to these chemicals, may not be sufficient to control peroxide formation once a container has been opened.
- Test periodically for the presence of peroxides. Test strip kits are available from Lab Safety Supply; contact Environmental Health and Safety at 617-432-2762 for ordering information.
- Do not attempt to open containers that are very old, visibly crystallized, or cracked.
- Dispose of as hazardous waste.

If testing for peroxides is not done, do not keep chemicals for longer than the following times.

3 Months:

Isopropyl ether
Potassium metal

12 Months:

Cumene
Cyclohexene

12 Months:

Ethyl ether
Tetrahydrofuran
1,4-Dioxane (p-Dioxane)
Acetal
Methyl butyl dimethyl ether
Vinyl ethers

12 Months:

Diacetylen
Dicyclopentadiene
Butadiene
Vinyl acetate
Vinyl chloride
Vinyl pyridine

VIII. TOXIC CHEMICALS

(Chemicals that are dangerous or extremely dangerous to life and health when inhaled, ingested, or absorbed through skin contact)

- Identify storage areas with signage.
- Take proper precautions to avoid exposure.
- Dispose of as hazardous waste.

SOLIDS

Arsenic compounds	Fluorides, salts of	Phosphorus pentasulfide
Barium compounds	Iodine	Picric acid
Beryllium compounds	Lead compounds	Potassium
Cadmium compounds	Mercury compounds	Silver nitrate
Calcium oxide	Naphthalene	Sodium
Chromates, salts of	Osmium tetroxide	Sodium azide
Cyanides, salts of	Phenol	Sodium hydroxide
Diaminobezidine	Phosphorus pentachloride	Sodium hypochlorite

LIQUIDS

Acetonitrile	p-Dioxane	Methylene chloride
Benzene	Ethylene glycol	Nitric acid
Bromine	Formaldehyde	Perchloric acid
Carbon tetrachloride	Formic acid	Phenol
Chloroform	Hydrazine	Phosphorus trichloride
Chromic acid	Hydrofluoric acid	Pyridine
Dichloromethane	Mercury	Sulfuric acid

GASES

Carbon monoxide	Fluorine	Hydrogen sulfide
Chlorine	Formaldehyde	Nitrogen dioxide
Cyanogen	Hydrogen bromide	Ozone
Ethylene oxide	Hydrogen chloride	Sulfur dioxide

IX. CARCINOGENS

(Chemicals proven or suspected to cause cancer in humans)

- Label all containers 'Carcinogen' or 'Cancer Suspect Agent'.
- Take proper precautions to avoid exposures.
- Dispose of as hazardous waste.

Acrylonitrile

Chloroform

Formaldehyde

Antimony compounds

Chromates, salts of

Hydrazine

Arsenic compounds

Diaminobenzidine

b-naphthylamine

Benzene

Dimethyl sulfate

Nickel carbonyl

Beryllium compounds

p-Dioxane

Vinyl chloride

Cadmium compounds

Ethylene dibromide

X. TERATOGENS

(Chemicals known or suspected to cause reproductive harm).

- Label all containers 'Teratogen' or 'Reproductive Toxin'.
- Take proper precautions to avoid exposures.
- Dispose of as hazardous waste.

Aniline

Carbon tetrachloride

Phosphorus

Benzene

Chloroform

Radioactive substances

Carbon disulfide

Lead

Toluene

Carbon monoxide

Mercury

Turpentine