



**DEPARTMENT OF CHEMISTRY**  
**University of Kashmir, Srinagar**

**CHEMICAL  
ETHICS**





# CHEMICAL ETHICS

## PURPOSE:

Proper storage is needed to minimize the hazards associated with accidentally mixing incompatible chemicals. Due to the diverse individual properties of chemicals that may be located in a chemical use area, proper storage may be complicated. This SOP provides general safety procedures for chemical storage. Specific instructions on chemical storage may be obtained from the MSDS, container label, or by contacting OES.

## SCOPE:

The intent of this guideline is to provide information on the safe storage of chemicals and afford protection from potential health and physical hazards associated with accidentally mixing incompatible chemicals.

## RESPONSIBILITIES:

Only trained and qualified personnel shall be allowed to handle hazardous materials. Supervisors are responsible for ensuring that personnel are trained to handle chemicals and that all chemical are store in a safe manner. The chemical incompatibilities discussed below are by no means exhaustive. As a result, it is important for laboratory personnel to thoroughly research the properties of the chemicals they are using. Material Safety Data Sheets (MSDSs) have sections on chemical incompatibility. The container's label should also provide storage guidelines

## DEFINITIONS:

Pyrophoric Substance - Materials which will react with the air to ignite when exposed, e.g., white phosphorus.

Oxidizing Agent – Reactive material that oxidizes another substance and is reduced.

Acid – Corrosive material that that produces H<sup>+</sup> (aq) ions in aqueous solution. Strong acids ionize completely or almost completely in dilute aqueous solution.

Weak acids ionize only slightly.

Base – Corrosive material that produces OH (aq) ions in aqueous solution.

Strong bases are soluble in water and are completely dissociated. Weak bases ionize only slightly.

Flammable - A liquid as defined by NFPD and DOT as having a flash point below 37.8°C (100°F).

## **REFERENCES:**

- “Manufacturing Chemists' Association, Guide for Safety in the Chemical Laboratory”, pp. 215- 217, Van Nostrand Reinhold, 2nd Edition
- "Safe Chemical Storage: A Pound of Prevention is Worth a Ton of Trouble" by David Pipitone and Donald Hedberg, Journal of Chemical Education, Volume 59, Number 5, May 1982
- "Fire Protection Guide on Hazardous Materials," NFPA, 1978

## **POLICIES, PRACTICES, AND PROCEDURES:**

### **1. General Safety:**

- Generally, it is prudent to avoid working alone in a laboratory. Do not undertake experiments known to be hazardous when working alone.
- Know the materials you are working with (e.g. chemical, biological, radioactive): Refer to the written laboratory protocols and review the Safety Data Sheets (SDS) for chemicals. Consider the toxicity of materials, the health and safety hazards of each procedure, the knowledge and experience of laboratory personnel, and the safety equipment that is available.
- Know the location of safety equipment and emergency procedures in your area.
- Always wear appropriate clothing including long pants, closed toed shoes (no skin showing), and personal protective equipment, (e.g. safety glasses, lab coats, gloves) in the laboratory

- Remove personal protective equipment and wash areas of exposed skin before leaving the laboratory.
- Know the properties of the chemicals used.



In general, chemicals should be separated according to the following categories:

- Solvents, which include flammable/combustible liquids and halogenated hydrocarbons (e.g., acetone, benzene, ethers, alcohols) Note: Store glacial acetic acid as a flammable liquid
- Inorganic mineral acids (e.g., nitric, sulfuric, hydrochloric, and perchloric acids).
- Bases (e.g., sodium hydroxide, ammonium hydroxide)
- Oxidizers
- Poisons
- Explosives or unstable reactives, such as picric acid. Store separately outdoors in flammable storage cabinets. An inventory of all chemicals must be maintained. Inventories must include the full chemical name, location of storage, and associated hazard (e.g. corrosive or flammable
- Inventories must be updated annually and signed by the person performing the update. Chemicals purchased throughout the year must be added to the inventory as soon as they are brought into the work area. Post chemical inventories inside the room with a hazard summary posting on the door for emergency response purposes.
- Ensure that all containers are in good condition, properly capped, and labeled. If you are using short hand names or acronyms on any solutions, reagents, or aliquots of chemicals
- Store all hazardous liquid chemicals in drip trays that are chemically resistant. Photo trays provide good containment and are widely used at the Lab. Install Plexiglas lips or use equivalent means to prevent materials from falling off storage shelves.
- Avoid storing chemicals on countertops or in fume hoods except for those being currently used.
- Avoid storing chemicals above eye level. Select low shelves or cabinets for heavy containers.
- Never store chemicals or any other item closer than 18" to the ceiling. Storing an

item close to the ceiling will impede the effectiveness of automatic fire suppression systems.

- Do not store chemicals on the floor. Chemical containers could present a tripping hazard or could be knocked over causing a spill.
- Label all containers (squeeze bottles and Nalgene bottles) to which hazardous materials are transferred with the identity of the substance and its hazards. Be aware that squeeze bottles and Nalgene bottles have varying resistances to different chemicals.
- Use flammable storage cabinets to store flammable liquids.
- Refrigerators used for storing chemicals, samples or media must be labeled with words to the effect as follows: “Caution – Do Not Store Food or Beverages in This Refrigerator”. Refrigerators used for food storage in or near work areas (shops and labs) must be labeled with words to the effect as: “Notice – Food May Be Stored In this Refrigerator”. Labels may be fabricated by users provided they are legible and securely affixed to the refrigerator.
- Refrigerators and freezers for storing flammable liquids (including ethanol) must be designed, constructed and approved for that purpose.

## **2. STORAGE ACCORDING TO HAZARD CLASSES**

The following guidelines are provided for the safe storage of hazardous materials in accordance with their hazard classes:

- Acids; segregate acids from reactive metals such as sodium, potassium, magnesium.
- Segregate oxidizing acids from organic acids, flammable and combustible materials.
- Segregate acids from chemicals which could generate toxic or flammable gases upon contact, such as sodium cyanide, iron sulfide, calcium carbide
- Segregate acids from bases.
- Bases; Segregate bases from acids, metals, explosives, organic peroxides and easily ignitable materials.
- Solvents (Flammable and Halogenated Solvents)

- Store in approved safety cans or cabinets.
- Segregate from oxidizing acids and oxidizers.
- Keep away from any source of ignition: heat, sparks, or open flames.
- Oxidizers; Store in a cool, dry place.
- Keep away from combustible and flammable materials.
- Keep away from reducing agents such as zinc, alkali metals, and formic acid.
- Cyanides; Segregate from acids and oxidizers.
- Light Sensitive Chemicals
- Store in amber bottles in a cool, dry, dark place.
- Peroxide Forming Chemicals
- Store in airtight containers in a dark, cool, and dry place.
- Label containers with receiving, opening, and disposal dates.
- Periodically test for the presence of peroxides.
- Toxic Chemicals; store according to the nature of the chemical, using appropriate security where necessary.

### **3. Handling Glassware**

- Glass breakage is a common cause of injuries in laboratories. Only glass in good condition will be used. Discard or send for repair all broken, chipped, starred or badly scratched glassware in marked “broken glass” containers only.
- Hand protection should be used when picking up broken glass.

### **4. Eye and Face Washes:**

- The best treatment for chemical splashes of the eye and face is immediate flushing with copious amounts of water for 15 minutes.
- Eye and Face Washes are equipped with a stay-open ball valve. All plumbed eye and face washes should be flushed by laboratory personnel on a weekly basis allowing the water to flow for 3 minutes, to remove stagnant water from the pipes.
- Bottle eyewashes shall be checked for an expiration date and replaced as needed per the lab staff.





5. **Fire Extinguishers:** Fire extinguishers should be strategically placed in or just outside laboratories depending on the hazards.



7. **First Aid Kits:** First aid kits should be available in each laboratory. At a minimum, the kit should contain: Disposable gloves, Band-Aids, Gauze Bandage, Gauze Pads and Ice Packs.

### 8. Laboratory Safety Information:

- SDS, emergency procedures, safety manuals, and other references should be readily available for all laboratory personnel.
- Sharp containers should be sealed, labeled and disposed off by calling Facilities Management.

- Glass-only boxes used for the disposal of broken glass, when full, should be properly sealed and disposed off by Facilities Management once the lab has put in a Facilities Work Order and replace the box with a new one immediately.

**9. Laboratory Coats and Gloves:**

Laboratory coats should be used when performing laboratory work. Depending on the type of work, additional personal protective equipment, such as gloves and aprons may be necessary. Coats, aprons, and gloves will be replaced periodically, removed before leaving the laboratory.

**10. REVIEWS AND REVISIONS:**

The following incompatibility matrix and table contains examples of incompatible chemicals:

	Acids, Inorganic	Acids, Oxidizing	Acids, Organic	Alkalis (Bases)	Oxidizers	Poisons, inorganic	Poisons, organic	Water reactives	Organic solvents
Acids, Inorganic			X	X		X	X	X	X
Acids, Oxidizing			X	X		X	X	X	X

Acids, Organic	X	X		X	X	X	X	X	
Alkalis (Bases)	X	X	X				X	X	X
Oxidizers			X				X	X	X
Poisons, inorganic	X	X	X				X	X	X
Poisons, organic	X	X	X	X	X	X			
Water reactives	X	X	X	X	X	X			
Organic solvents	X	X		X	X	X			



CHEMICAL	KEEP OUT OF CONTACT WITH
Acetic Acid	Chromic acid, nitric acid, hydroxyl compounds, ethylene glycol, perchloric acid, peroxides, permanganates
Acetone	Concentrated nitric and sulfuric acid mixtures, and strong bases
Acetylene	Chlorine, bromine, copper, fluorine, silver, mercury
Alkali Metals	Water, carbon tetrachloride or other chlorinated hydrocarbons, carbon dioxide, the halogens
Ammonia, anhydrous	Mercury, chlorine, calcium hypochlorite, iodine, bromine, hydrofluoric acid
Ammonium Nitrate	Acids, metal powders, flammable liquids, chlorates, nitrites, sulfur, finely divided organic or combustible materials
Aniline	Nitric acid, hydrogen peroxide
Arsenic materials	Any reducing agent
Azides	Acids
Bromine	Same as chlorine
Calcium Oxide	Water
Carbon (activated).	Calcium hypochlorite, all oxidizing agents
Carbon tetrachloride	Sodium