CHEMICAL SAFETY

Introduction

- Wide range of chemicals are used in research laboratories of the Institute, each with its own inherent hazards.

- An understanding of the potential hazards and precautions required in handling of chemicals is of outmost importance in preventing exposure to chemicals and mishaps.

Routes of entry

The main routes of entry of the chemicals into the human body are:

- Inhalation into lungs.
- Absorption through skin membrane/cuts in the skin.
- Ingestion via mouth into the gastrointestinal system.

Corrosives

- Typical examples are sulfuric acid, nitric acid, potassium hydroxide (caustic potash), sodium hydroxide (caustic soda), bromine and phenol.

- Corrosive substances causes destructive burns on the tissue by chemical action at the site of contact.

- Corrosive effect can also occur in the respiratory tract in case of inhalation and in the gastrointestinal tract in case of ingestion.

Oxidisers

- Typical examples include hydrogen peroxide, nitric acid, perchloric acid , sulphuric acid, chlorates, chromates, nitrates, peroxides, permanganates and picrates .

- Oxidisers are chemicals which decompose readily under certain conditions to yield oxygen.
- They can cause a fire to burn violently.
- Oxidisers must not be stored with flammables.

Flammables

- Flammable substances are those that readily catch fire and burn in air.
- The vapours released from a flammable liquid are a common fire hazard in a laboratory.
- The degree of hazard associated with a flammable liquid depends on its flash point, flammability limit and ignition temperature.

Potentially explosive chemicals

- Chemicals when subjected to heat, impact, or friction, undergoes rapid chemical change, evolving large volumes of gases which cause sudden increase in pressure.

- Heat, light, mechanical shock and certain catalysts can initiate explosive reactions.

- Shock sensitive substances include acetylides, azides, nitrogen triiodide, organic nitrates, nitro compounds, perchlorate salts and organic peroxides.

Potentially explosive chemicals

- Perchloric acid, if allowed to dry on wood or other combustibles, will explode and cause a fire on impact or friction.

- Picric acid and picrates are detonated by heat and impact.

- Ethers that have aged and dried to crystals are extremely unstable and potentially explosive.

Toxic chemicals

- Toxic chemicals produce injurious or lethal effects upon contact with body cells due to their chemical properties.
- The toxic effects depend upon the extent of exposure and the inherent toxicity of a chemical.
- The extent of exposure is determined by the dose, duration and frequency of exposure and the route of exposure.

Toxic chemicals

- Toxic effects of a chemical may occur after a single (acute) exposure or long term repeated (chronic) exposure.

- Examples of acute toxins are sodium-cyanide, sodium azide and dimethyl mercury.

- Benzene is an example of a chronic toxin which can cause damage after repeated or long term exposure.

Types of toxins - target organ/tissue - examples

- Neurotoxins (nervous system)- mercury (metallic, inorganic and organic), xylene, carbon disulphide, n-hexane, trichloroethylene.
- Hematotoxins (blood)-carbon monoxide, nitrates aromatic amine compounds.
- Hepatotoxins (liver)- chloroform, dinitrobenzene
- Nephrotoxins (kidney)- cadmium, mercury, carbon tetrachloride
- Dermatotoxins (skin)- organic solvents

Pyrophoric chemicals

- The rapid oxidation of a pyrophoric chemical by oxygen or moisture in air causes the compound to ignite spontaneously.

Example: butyl lithium.

Water reactive chemicals

- These chemicals react violently when they come in contact with moisture or water.

- Examples include lithium, sodium, potassium, aluminium bromide, calcium oxide, sulfur trioxide and phosphorus pentachloride.

Ordering of chemicals

- Always order the smallest possible quantity of chemical. This reduces hazards and chemical waste.

- Understand the hazardous properties of the chemical that is to be purchased.

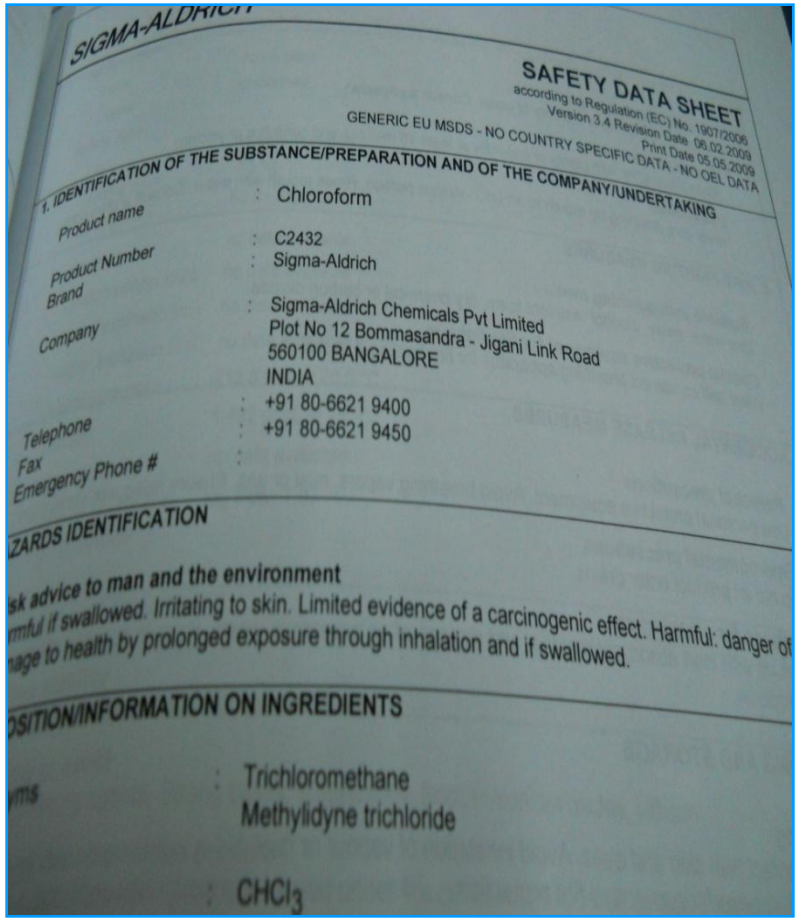
- Where possible, purchase a less hazardous chemical.

Receipt of chemicals

- Received packages must be checked to ensure that the containers are in good condition.
- Details of new chemicals must be entered in the laboratory inventory and stored in a designated area.
- The date of receipt and date of first usage must be recorded on the bottles of peroxide forming chemicals.

Receipt of chemicals

- Ensure that the Material Safety Data Sheet(MSDS) is obtained with the chemical and is readily available for reference.



SIGMA-ALDRICH

SAFETY DATA SHEET
according to Regulation (EC) No. 1907/2006
Version 3.4 Revision Date 06.02.2009
Print Date 05.05.2009
GENERIC EU MSDS - NO COUNTRY SPECIFIC DATA - NO OEL DATA

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

Product name : Chloroform

Product Number : C2432
Brand : Sigma-Aldrich

Company : Sigma-Aldrich Chemicals Pvt Limited
Plot No 12 Bommasandra - Jigani Link Road
560100 BANGALORE
INDIA

Telephone : +91 80-6621 9400
Fax : +91 80-6621 9450
Emergency Phone # :

ZARDS IDENTIFICATION

sk advice to man and the environment
rmful if swallowed. Irritating to skin. Limited evidence of a carcinogenic effect. Harmful: danger of
nage to health by prolonged exposure through inhalation and if swallowed.

OSITION/INFORMATION ON INGREDIENTS

yms : Trichloromethane
Methylidyne trichloride

: $CHCl_3$

Storage of chemicals

- Bulk stocks must be stored in a separate building.
- A spill or fire involving bulk containers will be difficult to tackle when compared with that involving smaller bottles.
- Chemicals must not be placed indiscriminately in the storage shelf. They must be grouped based on their compatibility.

Storage of chemicals

- Separate chemicals into compatible groups and store alphabetically within compatible groups.

Storage of chemicals

- In the event of an accidental breakage or seismic activity, incompatible chemicals that are stored in close proximity can mix to start a fire, hazardous fumes or explosions.

Storage of chemicals

The following chemical groups must be separated by storing them in different cabinets/shelves or by providing secondary containment (trays).

- Oxidisers, including peroxides
- Acids
- Bases
- Flammable materials
- Reproductive toxins
- Carcinogens

Any incompatibles within the above group must be stored separately.

Storage of chemicals

- To prevent accidents caused by overreaching do not store chemicals on shelves higher than 1.5 meter (from floor level).

- Fix the shelf to the wall to prevent its fall.

Storage of chemicals

- Store heavier or larger bottles on lower racks.
- Store flammable chemicals in approved safety cabinets.
- There must be a fixed storage place for each chemical and the same must be returned to that location after each use.

Storage of chemicals

- Toxic or odoriferous chemicals must be stored in a ventilated cabinet.

Storage of chemicals

- Chemicals must not be exposed to heat or direct sunlight.

- Heat and sunlight can degrade chemicals, deteriorate storage containers and labels.

Storage of chemicals

- Chemicals must not be stored at locations where they can be knocked over.

Storage of chemicals

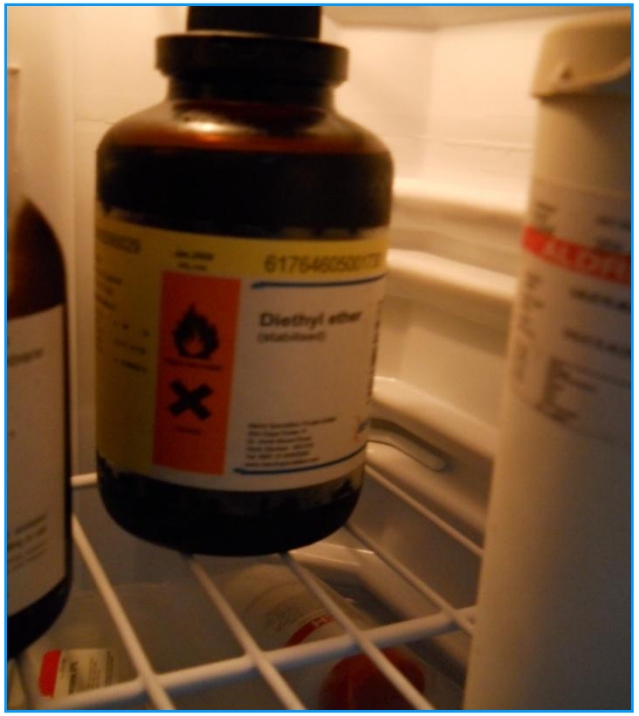
- Rim guards must be fixed on the edge of shelves to prevent bottles from falling.

Storage of chemicals

- Flammable chemicals must not be stored on bench tops.
- After use they must be immediately removed to a safety cabinet.
- Flammable solvents must not be left open in containers or beakers.
- Same must be stored and handled away from sources of ignition and oxidisers.

Storage of chemicals

- Flammable chemicals must not be stored in domestic refrigerators.
- Vapours can leak out from the bottles and form a flammable vapour air mixture .
- The bulb or thermostat can be a source of ignition.
- Flammable chemicals must be stored only in intrinsically safe lab purpose refrigerators.



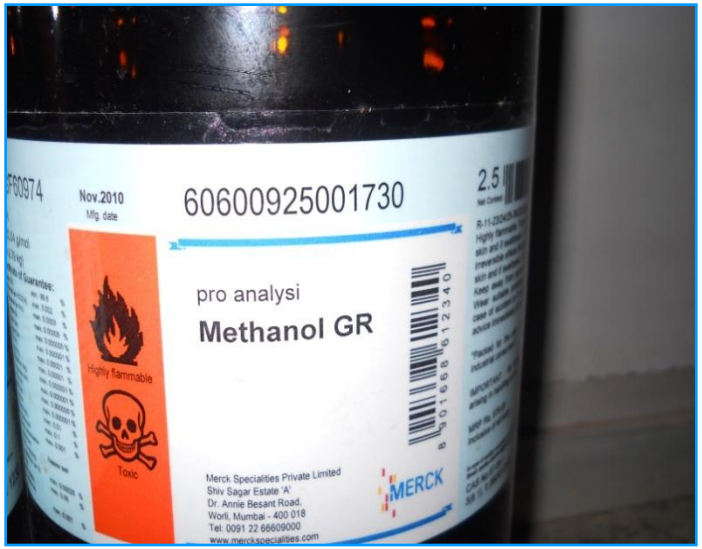
Handling of chemicals

- Bench tops must not be used as storage area to prevent clutter. Keep only chemical bottles that is for immediate use on bench tops.

- All chemical bottles must be tightly closed after use and must not be placed on edge of the bench or shelf from which they can fall.

Handling of chemicals

Chemical formulae or short forms must not be used for labelling chemical bottles.



Labels must include the full name of the chemical, hazard pictogram and a brief description of the hazards and precautions to be taken.

Handling of chemicals

- It will not be possible to identify the chemical in case of a spill or body contact due to inadequate labelling.

- Worn out labels must be immediately replaced by new ones. Unlabelled chemical bottles can create difficulty at the time of disposal of chemical bottle.

Handling of chemicals

Chemicals must not be stored in drinking water bottles.

Handling of chemicals

Transporting chemicals

- Use secondary containment when transporting chemicals.
- When transporting several containers, use carts with attached side rails and trays with provision for spill containment.
- Bottle carriers must be used while moving single container.

Chemical inventory

The inventory of stored chemicals must be examined at least annually.

Annual inventory checks helps in many ways:

- It ensures that chemicals are segregated according to their compatibility.
- Discarding expired chemicals and help to save space.
- Help to quickly locate the chemicals.
- The expiration date of peroxides can be monitored.
- Help to identify bottles with worn out labels or those which are leaking.

Chemical spills

The following equipment must be maintained in laboratories for dealing with chemical spills:

- Chemical spill kits
- Personal protective equipment, e.g., chemical cartridge respirators.
- Scoops and dustpans
- Dry sand

Chemical spills

The following actions must be taken in the event of a chemical spill.

- Evacuate non-essential personnel from the area.
- Ventilate the area by opening the windows.
- If the spilled material is flammable, extinguish all open flames. Do not operate electric switches near the spill.
- Avoid inhaling vapour from spilled material.
- Use personal protective equipment.
- Ensure that there is an exit near by.
- Use spill containment kits to clean up the spill.

Safety precautions

- Do not work alone in the laboratories particularly when performing hazardous procedures.
- Do not perform unauthorised experiments.
- Plan appropriate procedures and the positioning of all equipment before beginning any experiment.

Safety precautions

- Wear appropriate personal protective equipment, a laboratory apron or coat, safety glasses and toe covered footwear at all times in the laboratory.

- Wear suitable gloves when handling chemicals. Inspect all gloves for defects before usage.

Safety precautions

- Know the location of emergency equipment.
- Be aware of the hazards posed by the work of others in the laboratory.
- Make others in the laboratory aware of any specific hazards associated with your work.

Safety precautions

- When heating a test tube or other apparatus, never point it towards yourself or others.
- Be sure that glassware has cooled before touching it.
- Dilute concentrated acids and bases by slowly pouring the acid or base into the water while stirring.
- Keep work area clean and uncluttered. Maintaining good housekeeping helps to prevent accidents.

Safety precautions

- Laboratory equipment must be regularly inspected and serviced as per manufacturer's recommendations.

Safety precautions

- Store coats, bags and other personal items in a designated area, not on bench tops.
- Keep drawers and cabinets closed when not in use.
- Never heat flammable substances with an open flame. Use a water bath.

Emergency measures

- All chemical splashes on the skin must be immediately flushed under running water.

- Contaminated clothing must be removed while flushing the body. Flushing must be continued for at least 15 minutes.

Emergency measures

- Eyes must be immediately flushed with copious amount of water for at least 15 minutes.

- In case of contact with hydrofluoric acid, apply 2.5% calcium gluconate gel on the skin after flushing the affected part with water.

  Refer safety data sheets for more information.

Disposal of chemicals

- Laboratories must maintain labelled carboys/cans for collecting spent chemicals.
- Care must be taken to prevent mixing of incompatible chemicals while transferring spent chemicals.
- There should be at least 2 inch head space above the liquid surface in the chemical container.

THANK YOU