

## OPERATING PROCEDURES FOR ACCESS TO REAGENTS AND USE OF CHEMICALS

### Definitions

#### Chemical agents:

- All chemical elements or compounds, either alone or in their mixtures, in the natural state or obtained, used or disposed, including disposal as waste, by any work activity, whether intentionally produced or not and placed on the market.

#### Hazardous chemical agents:

- Chemical agents classified as dangerous substances pursuant to Legislative Decree 3 February 1997, n. 52, and subsequent amendments, as well as the agents that correspond to the classification criteria as dangerous substances referred to in the aforementioned decree and marked with appropriate iconography;

- Chemical agents classified as dangerous preparations pursuant to Legislative Decree 14 March 2003, n. 65, as amended, as well as agents that meet the classification criteria as dangerous preparations referred to in the aforementioned decree;

- Chemical agents that, although not classifiable as dangerous, according to the previous points, can pose a risk to the safety and health of workers because of their chemical, physical or chemical properties and toxicological properties and the way they are used (ex. cryogenic liquids, welding powders, etc.) or present in the workplace, including chemical agents that have been assigned a limit value for occupational exposure (as per Annex VIII-bis of Legislative Decree 626/94 and subsequent amendments) or for the effects produced on the human organism (e.g. inert gases);

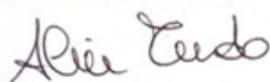
- Substances and preparations produced in research and service activities, the effects of which are not known on human organism, and therefore they ought to be considered potentially dangerous;

- Inorganic and organic chemical waste (e.g. mixtures of chlorinated organic solvents, etc.) containing substances or preparations referred to in the preceding points.

#### Risks related to the presence and use of dangerous chemical agents

The handling of chemical agents in university laboratories is connected to the following main activities:

- synthesis, purification, neutralization of organic and inorganic chemicals;
- preparation and titration of solutions;
- analysis of organic and inorganic chemicals by means of instrumental techniques;
- analysis in the medical and biological fields;



- cleaning and degreasing of materials using solvents;
- conservation of biological findings;
- surgical operations;
- animal experimentation;
- welding operations;
- woodworking operations;
- fixing and photographic development;
- transport, transfer, storage (including those relating to waste and chemical waste) operations;
- experimentation with the use of laser equipment, nuclear magnetic resonance and other research and teaching activities in physical-engineering laboratories that use reagents and chemical products;

The risks deriving from their manipulation are:

1) accidental type:

- explosion and fire hazards (flammable, explosive, oxidizing substances and preparations);
- risks of accidental contact, ingestion, inhalation (irritating, corrosive, cryogenic substances and preparations, etc.);

2) hygienic/environmental types:

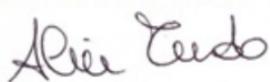
- acute or prolonged exposure to harmful and / or toxic substances and preparations taken by the body through skin contact, ingestion or inhalation.

## ENVIRONMENT AND SAFETY AREA

The use of chemical agents is reserved only for those who have received adequate information and training on the correct procedures to be observed.

### Storage

- In the laboratory it is allowed to keep chemical agents in quantities strictly necessary for experiments, inside closed cabinets, preferably in safety.
- Using open shelves should be avoided.



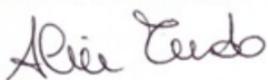
- Stocks must be stored in separate rooms, better if external, adequately compartmented, equipped with suitable fire-fighting devices and adequate ventilation (windows, forced ventilation systems); on different floors, storage premises must be separated from laboratories.
- **Cabinets** must be located distant from corridors, work areas, access roads to laboratories and in general to the premises, from emergency exits, open flames and heat sources (Bunsen burner, stoves, etc.) and must not impede to reach emergency devices (fire extinguishers, first aid box, eyewash stations, etc.). In particular, the suction cabinet must be positioned in such a way that it is possible to convey the air flow in expulsion towards the outside.
- The chemical storage cabinet must contain shelves in fire-proof and acid-resistant material, preferably safety (aspirated/fire-proof cabinets) for particular product categories (acids, bases, flammable and/or toxic substances), equipped with doors. Besides, it must also be equipped with:
  - shelves with raised outer edge to prevent the containers from slipping and contain any leaks or spills; alternatively, trays of suitable material for storing bottles and bottles could be used; collection tank at the base of the stack of shelves;
  - indication of the dangers of the products, by means of appropriate safety signs;
  - particular characteristics of resistance to fire, in case it is a fire-resistant cabinet.

On each cabinet must also be affixed a sheet containing the following information:

- a list of products with relative indications of danger and updating dates;
- the references on where to find the relevant safety data sheets;
- the name and telephone number of the activity/laboratory manager.

Inside the cabinets, the products must be arranged in such a way that:

- corrosive, caustics and irritants must be below the level of the eyes;
- in the lower shelves place the largest containers and the most dangerous substances;
- containers must neither be stacked one on top of the other nor overload the shelf too much;
- containers must display the appropriate label indicating at least the chemical name of the substance or preparation, the class and the hazard symbol;
- comply with the Safety Data Sheet are (sections Handling and Storage);
- chemical mutual incompatibilities must be complied;
- solids must be separated from the liquids;
- protect chemicals from direct sunlight and other sources of heat.



Some substances need special precautions:

- flammable liquids must be stored in fire cabinets for the exclusive use; those that need low temperatures must be kept in refrigeration units, i.e. without internal electrical contacts.

## ENVIRONMENT AND SAFETY AREA

- Highly toxic agents must be stored separately in cabinets that are preferably vacuumed and locked;

- for products that are particularly reactive and subject to a reduction in their chemical stability over time or in contact with air (e.g. organic peroxides, perchloric acid, etc.) the date of purchase and opening must be indicated on the label.

## Handling

The use of chemical agents requires attention and compliance with some basic rules:

- always carefully read the **label** on the container, which provides the first indications on the hazard and on the precautions to be taken (hazard symbol, risk phrases R and safety advice S); these indications are supplemented by those contained in the **Safety Data Sheet**, which must always be consulted before using a dangerous chemical agent for the first time and whenever the hazard characteristics are not known;

- consider dangerous a product whose physical-chemical and/or toxicological properties are not known;

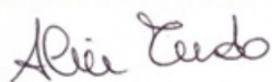
- do not carry out any type of operation if you are not sure of the consequential effects; in case of uncertainty, always refer to the person in charge of the activities;

- do not leave the reactions in progress unattended unless the devices used are specifically qualified to work safely in the absence of operators. If it is necessary to leave a long-lasting reaction under a hood, display a sign written and signed by the Responsible of the activities: the type of reaction, the dangerous reagents present, the reaction time (start/duration/end);

- prepare suitable safety measures for particularly dangerous reactions (e.g. fugitive reactions), isolating them if necessary in areas specifically dedicated and protected;

- do not replace one product with another in an experiment or a routine operation without the authorization of the Responsible of the activities: each substance has its own physical, chemical and toxicological characteristics;

- use the Personal Protective Equipment (indicated in the Safety Data Sheet of the chemicals) suggested by the activity manager (see also specific chapter);



- work under a chemical hood if necessary;
- do not smell a product to identify its nature;
- never mouth-pipette, but instead, use rubber bulbs.

## Transport and transfer of liquid chemical agents

- Do not transfer solvent from containers to bottles in the laboratory; the transfer must be carried out in an appropriate room, separate from the laboratory, and by personnel authorized by the Director or by the person in charge of the activities;
- electrically connect the metal tanks containing flammable liquids to the ground during the transfer operations;
- use plastic buckets with handles to transport liquids contained in bottles and jars; use always the trolley to transport heavy loads;
- do not carry incompatible chemical products (e.g. combustive materials and flammable liquids) in the same bucket or trolley at the same time.

## Labeling and Safety Data Sheets

The label of a substance or a preparation allows to immediately and synthetically identify the main chemical-physical and toxicological risks.

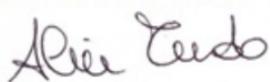
On the labels there are the following information:

- a) the **hazard symbols**, black on an orange background;
- b) the **risk phrases** (R phrases) that refer to the nature of the risk;
- c) the **precautionary statements** (S phrases) that provide summary information on how to operate safely.

## ENVIRONMENT AND SAFETY AREA

The information on the label refers only to the intended use, in fact there are no information on the storage, disposal or management of the emergency.

The cards must accompany (Legislative Decree 52/97 and s.m.i.) dangerous products on the market and are composed of 16 standardized entries, written in the language of the country of employment; they contain more detailed information with respect to the label, including information about the management of the emergency in addition to the intended use.



## General rules:

- Do not store flammable substances in the cabinet for any reason;
- Always consult the reagent manager before storing a new chemical in the cabinet; the new chemical will subsequently be included in the appropriate reagent list.
- If a chemical is out of stock, notify the reagent manager and arrange to order the item.
- Use Personal Protective Equipment before handling chemical reagents.
- Make sure you have properly closed the cabinet after use.

