



Servicio General de Apoyo
a la Investigación - SAI

Universidad Zaragoza

Servicio de Medidas Físicas

RISKS, HAZARDS AND ACTIONS IN THE LABORATORIES OF THE PHYSICAL MEASUREMENTS SERVICE

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The work carried out in the laboratory faces a number of threats that require the awareness of safety precautions. At minimum, the users are kindly requested to comply with the following security procedures.

In case of any accident or injury the user should contact the service staff using the communication links described in the web page. In case of emergency the user must phone to 659031655 and to 841112.

The user is kindly requested to be informed about security policies in the laboratories of the University of Zaragoza. Information can be found at the University Safety Unit web page. In particular, it is recommended to read the following document

<http://uprl.unizar.es/seguridad/pdfs/seglaborUZ.pdf>

I. Hazards and risks

Hazards in the laboratories of the Physical Measurements Service are described below. The user should be aware of their location and avoid any situation that may induce an accident or a dangerous situation. In any case, it is not allowed smoking, eating and drinking in the laboratory.

GENERAL

- In case of instrumentation failure, contact the Service staff. Never attempt to fix the problem by yourself.
- Keep the laboratory in order and tidy, in particular any escape route. Do not leave objects that somebody may trip on.
- The user is responsible for the right use of the laboratory as well as for the right handling and managing of his/her samples and tools.
- Activities involving the use of laboratory space, materials or instrumentation without the knowledge and approval of the service staff is not allowed. Do not use any instrumentation unless you are trained by the Service staff.
- The inclusion in the laboratory of a heating source that may promote fire, like heaters, solders, etc..., is not allowed.
- Make sure you know the building emergency procedures. Locate the fire alarm and the safety exits.
- In case of air-conditioning system failure please contact the laboratory staff. Overheating of the laboratory room may produce instrumentation failure.

SAMPLE HANDLING

The user is responsible for the correct use and preparation of his/her samples. He/she is the person that better knows any special treatment the samples may require concerning safety precautions. In any case, the user, at a minimum, should follow the procedures described below. When the user finishes the preparation of the experiment, the work areas should be left clean and tidy.

- Before using any chemical read its label carefully.
- Use volatile and flammable compounds only in a fume hood. It is recommended the use of safety glasses, especially in case of wearing contact lenses. Volatile agents should always be left properly closed.
- In case of managing any toxic and/or noxious agent (alcohol, acetone, toluene...) it is recommended to wear the proper protective gloves. Do not taste or smell any chemicals.
- Flammable products (alcohol, acetone, toluene...) should not be left close to heating sources.

- Any product or sample prepared that may involve any risk must be properly labeled and stored in a safe place. Waste, stains and hazardous waste must be removed as soon as possible. The service staff must be informed of the existence of that product or sample in the laboratory.
- Dispose of all chemical waste properly. Any paper soaked with chemicals should not be thrown to the paper bin. Notify the service staff for its proper disposal.
- Consider the use of the laboratory coat, since it protects from the spill of chemicals and cryogenic liquids.
- The user will be careful with the sharp edges and tips of sample preparation tools, such as stilettos and punches. In case of broken glass do not handle with your bare hands; report to the service staff for its proper disposal. In case of injuries the laboratory is equipped with an emergency kit.
- Please, do not dispose cutting or stabbing products in the bins. Contact the laboratory staff for its proper disposal.
- Whenever handling biological samples, though not infectious or toxic, but especially when they are unknown, adequate health and safety measures should be considered.

DURING THE MEASUREMENT PROCESS

The user is responsible of the preparation, programming, execution and monitoring of the measurement. Do not leave an on-going experiment unattended for long periods of time, especially in weekends and holidays.

- Dewar pressurization. In case of large evaporation, as in a magnet quench, the dewar will slightly pressurize and the user may hear a small hiss from the valve connected to the recovery system. In case of an excessive evaporation, the dewar may pressurize up to blow the valve connected to the recovery system and/or even the security valve. In this case the user should exit the laboratory immediately and close the door behind. Then, raise the alarm. Although Helium and Nitrogen are not considered toxic gasses, they may cause asphyxiation so the user evacuation should be immediate. The user will never attempt to fix the valve in its place. The user is kindly requested to check the measurement sequence in order to avoid any command that may promote an excessive evaporation.
- Risk of exposure to magnetic fields. The laboratory instruments are delimited by a line of 5 Gauss (yellow lines) that must not be crossed when applying large magnetic fields by people carrying cardiac pacemakers, ferromagnetic implants and/or implanted electronic devices. Users should be aware that they may be exposed to large magnetic fields when they stay over the magnet bore. Also, it is recommended avoiding the risks caused by metal objects suddenly attracted to magnets with fields greater than 30 Gauss.
- Risks of long-term exposure to low frequency noise. Vacuum pumps produce low frequency noise that may induce, when exposed for a long time, hearing loss. Users are recommended to remain in the laboratory just the time to prepare their experiment, avoiding staying there longer than necessary.
- Risks of burnt with cryogenic liquids. The instrumentation maintenance requires the use of cryogenic liquids. The user must not handle them. Also, he/she should avoid be working in the laboratory during their manipulation by the service staff (for example during transfers, cryocleanings, ...).

II. Hazardous Products in the laboratories

Physical Measurement Service laboratories are provided with the following hazardous products involving the risks detailed below. The user will detect its location and avoid any action that could lead to an accident or a dangerous situation, taking into account the risks associated with such products.

CHEMICAL PRODUCTS

- Ethanol: Highly flammable. It reacts violently in combination with oxidizing agents promoting fire and explosion. The mixtures vapor and air are explosive. Its smell can be detected at certain concentrations. Inhalation of vapor may cause coughing, fatigue, drowsiness and headache. Causes moderate skin irritation and respiratory tract irritation. Contact with the eyes can cause irritation, burning and pain.
- Acetone: Highly flammable. It reacts violently in combination with oxidizing agents promoting fire and explosion. The mixtures vapor and air are explosive. Leaving close to a heat source may cause rise in pressure with risk of bursting. Its smell can be detected at certain concentrations. Inhalation of vapor may cause intoxication including drowsiness, coughing, fatigue, disorientation, headache and central nervous system depression. Repeated exposure may cause skin dryness and irritation. Vapor may irritate the membranes of nose, throat and lungs. Contact with the eyes can cause irritation, burning and pain.
- Toluene: Highly flammable. It reacts violently in combination with oxidizing agents promoting fire and explosion. The mixtures vapor and air are explosive. Its smell can be detected at certain concentrations. Inhalation of vapor may cause wheezing, dizziness, headache, nausea and unconsciousness. Causes moderate skin irritation. The major health threat of ingestion occurs from the danger of aspiration (breathing). Avoid vapor exposure of pregnant or women in lactation period as well as of people susceptible of blood diseases and/or malnutrition. Contact with the eyes can cause irritation, burning and pain. It is not listed as a carcinogen or potential carcinogen.
- Oil (vacuum pumps): Highly flammable. It reacts violently in combination with oxidizing agents promoting fire and explosion. The mixtures vapor and air are explosive. The major health threat of ingestion occurs from the danger of breathing of the gas exhaust of the vacuum pumps. Inhalation of vapor may cause dizziness and headache. Causes moderate skin irritation. Contact with the eyes can cause irritation.

COMPRESSED GASSES

- Argon supply. No flammable. Not known significant or critical toxicity. It can cause rapid suffocation when concentrations are sufficient to reduce oxygen levels which may induce unconsciousness. Its presence is hard to detect since it is odorless and colorless. The vapor is heavier than air and can accumulate in confined spaces, particularly at ground level.

- Helium supply and gas cylinders. Not known significant or critical toxicity. It can cause rapid suffocation when concentrations are sufficient to reduce oxygen levels which may induce consciousness. Its presence is hard to detect since it is odorless and colorless. No flammable. Upon exposure to intense heat or flame cylinder may vent rapidly and/or rupture violently
- Nitrogen supply. No flammable. Not known significant effects or critical toxicity. It can cause rapid suffocation when concentrations are sufficient to reduce oxygen levels which may induce consciousness. Its presence is hard to detect since it is odorless and colorless. The vapor is heavier than air and can accumulate in confined spaces, particularly at ground level.

CRYOGENIC LIQUIDS

In general, they may cause cryogenic burns. No odor warning properties. No flammable. Danger of explosion upon exposure to intense heat or flame.

Overpressure can be generated by excessive pressure in the transference or accumulation of ice on the safety valves, that could cause instrument dewar breakage and / or transfer dewar breakage. Overpressure rupture poses a risk for persons located in the vicinity. The user should not obstruct such safety valves and should avoid staying in the laboratory during transfers.

- Liquid Nitrogen. PPMS systems are equipped with a liquid Nitrogen jacket. In addition, the Helium 3 system cryocleaning requires the use of a small vessel containing liquid Nitrogen that in a collision could tip and pour the liquid. The user should try to stay away from the container.
- Liquid Helium. The PPMS and MPMS systems are equipped with liquid Helium dewar.

ELECTRICAL HAZARDS

- The laboratory is equipped with electrical instrumentation that may produce electrical shocks such as power transformers, extension cords, plugs and sockets. The user should avoid its handling.
- The user must avoid manipulation of the instruments hardware and wiring. In any case the user will never try to open the instrument and proceed to repair any fault.
- The user will inform the service staff of any spoil detected in the extension, plugs or sockets, to proceed to repair them. In no case the user will try to fix them.
- In case of power outage the laboratory is provided with a minimum coil system that prevents electrical set when the power returns. In case of power outage the user will contact the service staff to proceed to its rearmament.

III. Immediate actions

The following guidelines are provided as immediate actions in case of certain incidents. In any case, you should always contact the service staff (659 031 655) and University emergency service (extension 841112).

CHEMICALS EXPOSURE

- Chemicals inhalation: move affected person to fresh air; rest, artificial respiration if necessary; require medical assistance.
- Chemical splash in skin: wash with soap and water; require medical assistance
- Chemical splash in eyes: immediately flush with running water for at least some minutes (remove the contact lenses if possible); require medical assistance.

COMPRESSED GASSES AND CRYOGENIC LIQUIDS LEAKAGE

- The user should exit the laboratory immediately and close the door behind.
- Then, raise the alarm.
- Never attempt to fix the problem by yourself.

THERMAL BURNS BY CRYOGENIC LIQUIDS

- First:
 - Clean with running water for at least some minutes.
 - Cover the burned area with sterile dressing.
- Do not apply any ointment, grease or disinfectant in the area affected by the burn.
- No drinks or food supply.
- Stay at least one person with the injured one.
- Get medical aid.

ELECTRIC SHOCK

- Immediately cut power device causing electrocution. Do not approach the victim before.
- Remove the injured person once we have cut the power.
- If necessary practice cardio respiratory reanimation (provided by qualified personnel).

FIRE EMERGENCY

- The user should exit the laboratory immediately and close the door behind.
- Then sound the alarm by pressing the button located in the hallway.
- Evacuate the building following the evacuation plans located in the hallways.
- In the case of presence of smoke and gases use a handkerchief or cloth to cover your mouth and nose, walk as low as possible - hot gases rise and breathing becomes more difficult.
- If your clothes set on fire do not run: drop and roll yourself.
- Do not try to put out the fire by yourself and without the support of the Fire Service. If you do not have training, do not try to use the extinguishers to combat fire.