

OPERATING INSTRUCTIONS

This document defines the rules and safety procedures for the access to this laboratory and the usage of equipments here available.

LABORATORY LOCATION: ground floor, room n. MO-17-00-041

RESPONSIBILITY

- R.S.P.P. CNR – Istituto Nanoscienze : Dr. Milena Toselli
- Laboratory Responsible (Preposto): Prof. Andrea Alessandrini

ACCESS RULES

Two categories of people can access the laboratory:

- GUEST
- USER

GUEST is not allowed to operate on the equipments and must always be guided by authorized personnel (**USER**). **GUEST** has to respect the general safety and conduct rules of the Lab as presented in this Manual (pag. 2).

USER may operate on the equipments. **USER** could be a CNR employee, a collaborator with fixed-term contracts, a CNR associated, or a PhD student who has completed the “General Training Course on Prevention and Safety at Work”. In special cases, **USERS** could be requested to complete the training modules about specific hazards (chemical, biological).

USER permission is granted by the Responsible of the Laboratory who evaluates the applicant’s background knowledge and organizes a specific training about the safety procedures and the working methods to adopt with the equipment and/or the substances in the Laboratory.

USERS and **GUESTS** may ask the **Workers Health and Safety Representative (RLS)**, Dr. Andrea Bertoni, for assistance in case they perceive any hazard-related issue not properly managed by the Laboratory Responsible.

GENERAL SAFETY AND CONDUCT RULES

USERS and *GUESTS* must comply with the following general rules of prevention and security. Please note that non-observance of safety regulations involves, in addition to the penalties of law, taking disciplinary action against the defaulters.

IT IS IMPORTANT

- To memorize the location of access and exit ways
- To check the safety signs
- To locate the first aid box and the placement of individual (DPI) and collective (DPC) safety devices
- To locate the containers for waste disposal
- To promptly inform the Responsible of the Laboratory of any irregular situation in the operation of the instruments
- To collaborate with the Responsible of the Laboratory and with other users, in order to maintain the efficiency of the security system

IT IS MANDATORY

- To carefully read the machine handbook and to strictly follow the given specific rules.
- Before using any chemicals, to acquire information about their characteristics by way of safety data sheets, risk phrases and safety advice, and to follow instructions for their handling, storage and disposal.
- To keep electrical equipments as far away as possible from sources of moisture and/or flammable solvent vapors
- To always use protection devices (DPI and DPC) as indicated by the procedures. Keep them carefully, do not damage or remove them
- To dispose of all processing waste in dedicated containers
- To observe the existing prevention and safety laboratory regulations, and to closely follow the provisions issued by the Responsible
- In case of alarm, to leave the laboratory according to the evacuation procedures envisaged in case of emergency

IT IS FORBIDDEN

- To work alone in the lab, especially beyond the standard working hours
- To take and preserve food and drink inside the laboratory
- To use electrical equipment not compliant with CE regulation
- To carry out operations for which one has not been authorized and/or trained by the Responsible of the laboratory

GENERAL RULES AND BEHAVIOR IN THE LABORATORY

High pressure bottles:

Always use the appropriate regulator on a cylinder. If a regulator will not fit a cylinder's valve, replace the cylinder, not the regulator. Do not attempt to adapt or modify a regulator to fit a cylinder it was not designed for. Regulators are designed to fit only specific cylinder valves to avoid improper use.

Inspect regulators, pressure relief devices, valves, cylinder connections, and hose lines frequently for damage.

Close the main cylinder valve whenever the cylinder is not in use.

Remove regulators from unused cylinders and always put the safety cap in place to protect the valve.

Always secure cylinders, whether empty or full, to prevent them from falling over and damaging the valve (or falling on your foot). Secure cylinders by firmly chaining or strapping them to a wall, lab bench, or other fixed support.

To use the pressure cylinder:

- make sure that the gas pressure regulator is well mounted and closed
- make sure that the gas line is connected to the instrument
- open the gas faucet and regulate the exit pressure using the regulator
- close the pressure regulator and the gas faucet after use

At the end of the experiment or at the end of a working day high pressure cylinders must be disconnected from the instrument and immediately placed into the external cabinet.

To transport a cylinder, put on the safety cap and strap the cylinder to a hand truck in an upright position. Never roll a cylinder.

Chemical procedure

Chemical procedures for sample preparation and/or cleaning process using solvent (acetone, methanol etc.) are strictly forbidden in room *n. MO-17-00-041*. All these operations must be performed in Chemical Laboratory (Ground floor, Room *n. MO-17-00-074*)

Cryogenic Hazard

Always use caution when working with cryogenic coolants.

Use temperature resistant gloves and a face shield during transfer of cryogenic coolants.

Make sure that there is good ventilation. Open a door and/or a window.

Do not pour cold liquid onto the edge of a glass Dewar flask when filling because the flask may break and implode.

Laboratory “*nanobiolab*”

Personal Protective Equipment (PPE) (Dispositivi di Protezione Individuale DPI)

The most important thing to remember about protective clothing is that it only protects you if you wear it.

Material Safety Data Sheets or other references should be consulted for information on the type of protective clothing required for the particular work you are performing.

Vacuum Pumps

Mechanical vacuum pumps used in laboratories pose many hazards. There are mechanical hazards associated with the moving parts. There are chemical hazards of contaminating the pump oil with volatile substances and subsequently releasing them into the lab. There are also fire hazards when pumps malfunction or overheat and ignite nearby flammable or combustible materials.

Follow these guidelines for safe pump operation:

Do not place pumps in an enclosed, unventilated cabinet allowing heat and exhaust to build up.

Do not operate pumps near containers of flammable chemicals, flammable chemical wastes, or combustible materials such as paper or cardboard.

Always close the valve between the vacuum vessel and the mechanical pump before shutting off the pump to avoid sucking vacuum oil into the system.

With **oil rotary pumps** many vapors condense in the pump oil. Solvents in the oil degrade its performance (and eventually ruin the pump), create a chemical hazard when the oil is changed, and are emitted in an oil mist vented from the system. Other vapors pass directly into the exhaust stream. To avoid these problems:

Trap evaporated materials with a cold trap before they reach the pump. Depending on the material that is to be trapped, this can be a filtration flask either at room temperature or placed in an ice bath. For more volatile solvents more sophisticated options exist (e.g. dry ice trap).

Vent the pump exhaust properly.

Electrical Hazard

Properly ground all electrical equipment.

If sparks are noticed while plugging or unplugging equipment or if the power cord feels hot, do not use the equipment until it can be serviced by an electrician.

Do not run electrical cords along the floor where they will be a tripping hazard and be subject to wear. If a cord must be run along the floor, protect it with a cord cover.

Do not plug too many items into a single outlet. Cords that enable you to plug more than one item in at a time should not be used.

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Multi-plug strips can be used if they are protected with a circuit breaker. Do not overuse or daisy-chain in a series.

Do not use extension cords for permanent wiring. If you must use extension cords throughout the lab, then it is time to have additional outlets installed.

RULES FOR THE PECULIAR USAGE OF INSTRUMENTS IN THE LABORATORY

While handling chemicals:

- switch on chemical hood aspirator;
- always operate under chemical hood;
- always wear protecting gloves;
- always wear protecting goggles;
- always wear with coats.

List of instrumentation and switch on/off procedures

- Metal Thermal evaporator

Switch on procedure:

- 1) Switch on chiller and open inlet and outlet valves.
- 2) Switch on main power line.
- 3) Set-up working parameters in the control panel (see instruction manual)
- 4) Switch on pumping system and open the valve on the rotary vacuum pump.

Switch off procedure:

- 5) Switch off pumping system and close the valve on the rotary vacuum pump.
- 6) Wait for the turbomolecular pump to come to a complete stop.
- 7) Switch off main power line
- 8) Switch off chiller and close inlet and outlet valves.

Note1: the vacuum chamber has to be always left at rest under static vacuum.

Note2: instruction manual is located in the first drawer below the evaporator.

- Chemical aspiration hood

Switch on procedure:

- 1) Switch on the lateral main power switch
- 2) Switch on light
- 3) Set the maximum aspiration rate whenever you open the hood.

Switch off procedure

- 1) Switch off the altera main power directly

Note1: This aspiration hood is intended for simple, non dangerous operations and for temporary sample storage. Any other more complex or longer operation has to be performed in the departmental aspiration hood.

Note2: Keep the transparent plastic shield always closed when in stand-by operation.

- -80 °C refrigerator

Note1: Always wear cryogenic gloves when open the refrigerator.

Note2: Pay attention to the acoustic alarm. When ringing, close the lid asap.

- Liquid N2 refill procedure for single photon MCT IR detector

- 1) Unlock the lid of the liquid N2 reservoir
- 2) Use the provided plastic funnel
- 3) Pour liquid nitrogen in the reservoir till it is full.

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4) *Wait 10 minutes.*

5) *Refill again the reservoir.*

Note1: Always wear cryogenic gloves for handling cryogenic liquids.

Note2: The instruction manual is located cabinet below the FTIR spectrometer

PROTECTION DEVICES IN THE LABORATORY

DPI:

- Goggles;*
- rubber gloves;*
- cryogenic gloves;*
- white coats;*
- dust masks;*
- gas mask.*

DPC:

Chemical hood

EVACUATION PROCEDURES IN THE EVENT OF AN EMERGENCY

In case of emergency and warning, users and/or guests attending the laboratories must respect building evacuation procedure and in particular the following rules:

1. Proceed in an orderly way in order to leave the building by following the shortest route indicated by relevant signs, and gather at the meeting point
2. Do not use elevators
3. Do not perform any operation for which you have not been previously trained.
4. Do not reenter the building until you are told to do so by the Director or Safety coordinator.