Safety and Usage rules of the Albanova Nanolab

This document details the usage rules and guidelines for the Albanova Nanolab facility. You are required to read this document and sign the declaration (last page) that you have read and understood these rules and our usage policy. It is not only important that you follow these rules, but also understand why things are done the way described below. **Safety is greatly enhanced when you understand what dangers are present, always think about what you are doing and prevent the accident before it can happen**.

This document attempts to explain the rules and the reasoning behind them. If anything is unclear, do not hesitate to ask the technical staff. On our technical website

`http://www.nanophys.kth.se/nanolab/index.html`

you can find information regarding the tools and various systems (the clean water system, dishwasher etc.) in the lab. This document as well as our usage policy and fee structure can also be found on the technical website.

In order to book and log the tools in the lab you have to register to the LIMS web-based booking system. This system is shared between the Albanova Nanolab, KTH Electrum lab, Chalmers MC2, Lund University Lund Nano Lab, and Uppsala Ångström lab. Apply for membership at:

`http://lims.electrumlab.se/`

and click on “Not a member? Apply for membership here...” on the left hand side.

Staff

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User training

Safety

In the entrance immediately to the left, is a wall mounted rack with safety material. Here you can find gas masks with filters (in case of gas leak or large spill), absorbing granulate material for large spills (chemizorb), paper copies of all risk assessments and relevant material safety datasheets.

Next to the rack is the alarm central for the gas sensors. In case of a gas leak, sirens and blinking red lights will go off in all affected rooms.

Past the shoe-barrier, above the sample working area, is a wall mounted first aid kit containing band aid, compresses, bandages, etc. This kit can be removed from the wall mount and taken into the lab in an emergency. Next to the kit is a bottle of diphoterine which can be used as first aid treatment of chemical burns on the skin or eyes.

Fire extinguishers are present in all rooms except the yellow room.

An emergency shower and eyewash station is situated to the left of the entrance to the process lab.

Ventilation

The ventilation in the lab is designed to keep the lab environment particle-free and to remove dangerous chemical fumes. It is important that you understand how it works, and how to make best use of it.

Fume hood

The fume hood in the process lab (corner to the right of the sink) has the highest exhaust capability (max 350 l/min flow). Always use this hood when working with toxic and/or strongly corrosive liquids and gases.

When using the hood, keep the sash as low as possible. When finished, shut the sash completely. Reducing the opening greatly reduces the air flow out of the room and allows the room to be kept closer to the proper over pressure (see below).

Work in the fume hood if it is not critical that you have very clean air. The clean air benches (see below) do not have as good exhaust as the fume hood.

Always clean up your beakers, chemical bottles, equipment, etc. when you are finished. **THE FUME HOOD IS NOT A STORAGE SPACE FOR CHEMICALS!**

Clean air benches

The clean air benches recirculate 70% of the air, and exhaust the remaining 30%. The HEPA filters in the top remove particles and a laminar flow of clean air is continuously flowing over the work space. The benches are designed to have an air barrier at the front edge of the table to keep particles from entering the work space. Work well inside the bench and do not block the perforated part of the bench as this will block the air barrier allowing particles into the work area.

In the process lab, the first two clean benches in the row of three as well as the bench in the yellow room, have exhaust ports at the top (clear plastic boxes with a red flap) to extract fumes. When using the bench, make sure that the exhaust is working by

checking that the strips of paper are being sucked up, into the exhaust duct. This will only work when the fan in the bench is running at half speed. Therefore, **only use half speed when working in the clean air benches.**

The last bench in the row of three in the process lab, the bench in the EBL room, the bench in the deposition lab, and the bench in the AFM room are not connected to the exhaust and should not be used for work with chemicals. **If you are working with chemicals only use clean benches with exhausts. Look above the bench, do you see the exhaust box and duct? If not, do not use this bench.**

The exhaust for the benches do not have the same level of air flow as the fume hood, 125 l/min compared to 350 l/min, and are therefor inherently less safe. **Always check that the strips of paper are being sucked into the duct (out of the room) to verify that the exhaust is working before you start working in the clean air benches.**

Slight over-pressure in all labs

The lab is kept under slight over-pressure to minimize the amount of particles getting in through doors and windows. Keep the doors to the service rooms, entrance, and corridors closed. Check that the over-pressure is OK by verifying that the circular vents between service rooms and main labs are tilted towards the service areas.

Chemicals

The lab has many users, with many different processes and chemicals. It is very important that you know how to properly handle the chemicals that you use, and follow the general safety guidelines to avoid accidents with your chemicals.

Material Safety Data Sheets for all chemicals can be found in web-based information system KLARA: https://secure.port.se/alphaquest/app_kth/pcmain.cfm

Click the “Chemical database” (“Produktregister”) button in the upper left corner to search for MSDS. Accessing the MSDS does not require a login.

Users are expected to be aware of potential chemical hazards associated with their work in the lab and what protective equipment is required for safe handling.

Always store chemicals in the ventilated cabinets in the process lab. There are three cabinets at the entrance to the process lab used for solvents/organics storage, acid storage, and base storage respectively.

The Nanolab supplies some standard chemicals and resists. Notify the staff if these supplies are diminishing.

Dispose of used chemicals in the appropriate waste bottles. Always work in the fume hood or a ventilated clean air bench when disposing chemicals. The allowed mixture of chemicals in a waste bottle is listed on the bottle. Do not dump chemicals in a waste bottle if you are not sure they belong there. Do not fill the waste bottles all the way up to the rim. The waste bottles are stored in the appropriate cabinet (i.e. solvent waste in solvent cabinet etc.), return them to their proper place once you are done.

To introduce a new chemical to the lab, you must always notify the staff and produce a safety data sheet for the new chemical and wait for approval before the chemical is brought in. **You are never allowed to bring any potentially hazardous chemical in the Nanolab without prior approval of the staff.**

Always work in the fume hood or a ventilated clean air bench when pouring

chemicals into beakers or the waste bottles.

Always wear protective gloves when handling chemicals. Make sure that the gloves give sufficient protection against the chemical. Some chemicals require more protection than the standard, thin clean room gloves provide. Always check the chemical compatibility of the gloves before handling chemicals. Compatibility charts can be found near the glove storage in the process lab, and inside the solvent cabinet.

Never leave an unmarked bottle with liquid unattended – not even water! Properly label all bottles with contents, your name, and date. Use the label printers in the lab for this purpose.

If you need to leave the room for a short time, while your samples are in an unmarked chemical bath, leave a note with the date, time, contents, your name, phone number, and the time when you will be back to finish your process.

Food and beverages are not allowed in the lab.

Gas alarm system

There are toxic, corrosive, and flammable gases used in some machines in the lab. Gas detectors are present at each tool and pump where the gases are used and the detectors are connected to an automatic alarm system with sirens and blinking lights in case of a leak. If the alarm starts, immediately evacuate the lab through the nearest exit (you do not need to use the main entrance) and notify the staff.

Electricity and high voltage

Electric shock can occur from mains voltage (230 V or 400 V). If you discover any broken or frayed cabling, report it to the staff.

Many systems have high power (3 kW) and/or high voltage (10 kV) power supplies. All such systems are connected to safety ground. If you discover any arcing, report it to the staff immediately.

Fire hazards

Solvents (acetone, isopropanol, alcohols etc.) are easy to ignite, do not generate sparks near open beakers and/or space where fumes can accumulate.

The hotplates are potential fire hazards because of their heat generation. Do not put beakers with solvents on these without a water bath. Never heat a solvent close to its boiling point (about 80 for isopropanol and 50 for acetone).

Fire extinguishers are present in each room except the yellow room.

Electric failure

In case of mains power failure, it becomes pitch black in the labs. The labs do not have windows, and the emergency exit signs are not battery powered but fluorescent that give off some weak light.

It is important to stay calm and wait for your eyes to get adapted to darkness. Avoid panic and rushing to the exit. Once your eyes have adapted and you can see the fluorescent exit signs, carefully go to nearest exit door to get out of the lab (you do not need to use the main entrance). The emergency exit signs are placed on the big double-doors leading out to the main corridors, where there are battery powered

lights.

Do not remain in the lab or try to continue working in the dark. The exhaust is on back-up power and remains on, however if you can try to cover any open beakers before you leave.

Liquid nitrogen

Contact with liquid nitrogen or cold gas can cause frost-bite on the skin and eyes. The reaction on the skin is similar to that caused by burns. Permanent damage to the eyes can result from splashes of liquid or contact with cold gaseous nitrogen. When liquid nitrogen evaporates, the nitrogen content in the air increases and there is a risk of oxygen deficiency which can cause suffocation. **There are no oxygen level sensors in the lab, if a large spill occurs leave the lab immediately and wait for the nitrogen to evaporate.**

Working off-hours

Try to not work alone in the lab outside office hours (08:00 – 18:00 on weekdays). If you work alone, someone outside of the lab must know where you are and must check on you (either by phone or in person) periodically.

It is forbidden to work with dangerous chemicals outside of office hours.

Cleanliness, Waste and Trash

You are required to clean up after yourself, put used glassware in the dishwasher, dispose of dirty wipes and consumable items. Do not leave things lying around. Put tools back in their proper storage place, not scattered on the benches. Wipe the bench and remove any pieces of tape or paper.

The lab stocks two kinds of clean-room wipes:

“Class 100 cleanroom wipes” are lint free and thus very clean, and are good for handling samples, chips, wafers etc.

“Safecloths” are low lint and thus not as clean, but more absorbent and good for cleaning up spills or non-sensitive tools etc.

If you need to leave the lab with an experiment in progress, neatly place all items on a lab wipe and write your name, date, phone number, a when you will be back to finish your process on the wipe or a post-it note.

Burnable trash can be disposed of in the waste-cans with lids to contain fumes. Do not dispose of hazardous chemical waste in these cans. If a wipe is drenched in solvents, let it dry in the fume hood before you put it in a waste can.

Clean room gloves are not only for your protection, but also to keep your samples and the equipment in the lab clean and free of contaminants present on your skin. **When working with vacuum parts, it is mandatory to wear clean room gloves at all times.** Never touch the vacuum side of a vacuum part with bare hands. Contaminated vacuum parts can be cleaned with isopropanol (NOT acetone) and a lab wipe.

Clothing and clean-room coats

Always wear a clean-room coat, hair net and clean-room antistatic shoes when working in the lab. This keeps the particle count down, and protects your clothes from

spills of chemicals.

Occasional visitors

Bringing unlicensed people to the lab for a tour or similar is allowed. You are responsible for any guests you bring and need to be with them the entire time they are in the lab. If you need to bring multiple guests notify the staff my email in advance.

Usage fees and access rules, summary

There are two tracks for access to the ANL, hour usage according to MyFab rates (track 1 in the Usage Policy and Fees document) and flat rate for academic users (track 2). All details can be found in document “Usage policy and fees” available on the technical website.

Emergency telephone numbers:

Emergency services
112

KTH Emergency
08 790 7700

Swedish Poisons Information Centre (Giftinformationscentralen)
010-456 6700 (non-emergency)
www.giftinformation.apoteket.se

S:t Erik's Eye Hospital (S:t Eriks Ögonsjukhus AB):
Emergency reception phone number: 08-123 230 00
www.sankterik.se

List of contact persons

in case of emergency

Name: _____

Group: _____

Contact person 1: _____

Phone number 1: _____

Contact person 2: _____

Phone number 2: _____

This document is to be filed with the lab staff

Declaration

I have read and understood “Safety and Usage rules of the Albanova Nanolab” as well as the “Usage policy and fees” documents available on the technical website.

I hereby declare that I shall follow the regulations cited in the above material.

Signature:_____Date:_____

Name printed:_____

Department:_____

Supervisor:_____

E-mail:_____

Card number:_____

Mobile phone:_____

Invoice reference:_____

Licence to use the lab granted on -- date:

This document is to be filed with the lab staff