

Safety and Usage rules of the Albanova Nanolab

This is a list of general rules and guidelines for the use of the Albanova Nanolab. You are required to read this and sign that you read and understand these rules and our usage policy. It is not only important that you follow these rules, but also that you understand why things are done the way we describe below. Safety is greatly enhanced when you understand where the dangers are, **think about what you are doing** and in this way prevent the accident before it happens. This document attempts to explain the rules and why they are as they are. If anything is unclear, do not hesitate to ask the lab manager or any of 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 (eg. the clean water system and dishwasher) 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 systems (tools) in the lab you have to be a member of the LIMS web-based booking system. This is a common system to 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...” at the left side, then follow the instructions.

Safety

In the entrance, immediately to the left, there is a wall mounted cabinet with safety material. There are gas masks with filters in case of a leak of corrosive gases (Cl_2 or BCl_3). There is absorbing material in case of spillage of liquid chemicals. There is substance (“Diphoterine”) to help in case of chemical spill on the skin or eyes.

To the right is a wall mounted alarm central for the gas sensors. There will sound an alarm, and there will blink a red alarm light inside the process lab, in case of a gas leak.

Below the alarm central is a wall mounted first aid kit containing band aid, compresses, bandages, etc. This kit can easily be taken away from the wall mount and taken into the lab in an emergency.

Ventilation

The ventilation in the lab is designed to keep the air clean, and to remove dangerous fumes from chemicals. It is very important that you understand how it works, and how best to use it.

Fume hood

The fume hood in the corner to the right of the sink has the best exhaust (max 350 l/min flow). Always work in this hood with toxic, and strongly corrosive chemicals, liquids and gases etc..

When using the hood, keep the front screen as low as possible. When finished, shut the screen 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). If

you leave the screen open overnight, much energy is wasted in the form of warm air unnecessarily vented from the building.

Try to work in the fume hood with solvents if it is not critical that you have very clean air. Clean air benches do not have as good ventilation as the fume hood (see below).

Always remove your beakers, chemical bottles, equipment, when you are finished. The fume hood **IS NOT A STORAGE SPACE!** The only item which remains in the fume hood is the ultrasonic cleaning bath.

Clean air benches

The filtered air benches recirculate 70% of the air, and 30% is exhausted. 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 front edge of table to keep particles from coming in to the work space.

Work well inside and do not put equipment, boxes, clean room wipes etc. on the perforated front part of the table as this will destroy the air barrier at the front that prevents particles from entering the work area.

The first three clean benches in the row of four, have exhaust ports at the top (clear plastic boxes with a red flap) for removing fumes from the work space, out of the room in to air ducts above the benches. The last bench in the row of four, the bench in the EBL room, and the bench in the deposition lab do not have this exhaust function and should not be used for work with chemicals. **If you are using chemicals, only use clean benches with exhaust. Look above the bench. Do you see the exhaust box and duct? If not, do not use this bench with chemicals.**

Fumes from solvents etc. are vented out of the room through the ducts above the clean air benches. When using the bench, make sure that the exhaust in ceiling 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 with solvents etc. in the clean air benches.**

The exhaust for the benches does not have the same level of air flow as for the fume hood. The clean air benches remove air at 125 l/min, where as the fume hood works at 350 l/min. Sometimes the lab exhaust system is remotely shutdown for central service of the Albanova ventilation system. This shutdown should normally be announced in advance, but that is not always the case. **Always check that the strips of paper are being sucked in to the duct (out of the room) to verify that the exhaust is actually working.**

Slight over-pressure in all labs

Keep doors closed to service rooms, entrance room, corridors. This ensures that the lab is kept at a slight overpressure, and a minimum amount of particles enter the labs from outside.

Check that the over-pressure is OK by verifying that the circular vents between service rooms and main labs are tilted slightly open.

Chemicals

The lab has many users, with many different process 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 and other

peoples 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

Use the “Chemical database” (“Produktregister”) button in the upper left corner to search for MSDS. You do not need to be logged in to do this.

There is a link on the desktop to this page on all computers inside the Nanolab.

Users are expected to be aware of potential chemical hazards associated with their work in the lab.

Always store chemicals in the **ventilated** cabinets. There are three cabinets at the entrance to the process lab used for solvents/organics storage, acid storage and base storage respectively. There is a fourth ventilated cabinet beneath the fume hood, it is mainly used for solvent storage.

The Nano-Lab supplies some standard chemicals and resists. Notify the lab manager if these supplies are diminishing.

Dispose of used chemicals in the appropriate waste bottles. 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. If one of the waste bottles is near full, inform the lab-manager, to arrange for replacement. 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.), please return them to their proper place once you are done.

If you introduce a new chemical in the lab, you must always notify the lab manager and produce a safety data sheet for the new chemical. If, in the exceptional case, you need bring a chemical temporarily into the lab, you must notify the lab manager. If you temporarily bring it in to the lab, you must also take it out of the lab and bring it back to the storage from whence it came. Never leave a chemical in the lab that you temporarily brought into the lab. You are never allowed to bring in any potentially hazardous chemical in the Nanolab without prior approval of the lab manager.

Always work in the fume hood when pouring chemicals, solvents etc. between beakers or into the waste bottles.

Always wear protective gloves and eye-wear (goggles) 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 can give. Strong Acids require heavy rubber gloves.

Never, under any circumstances, leave an unmarked bottle with a liquid in it – not even water! Properly label all bottles with contents, your name and date. Use the labeler which is 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 and phone number, and the time when you will be back to finish your process. A simple procedure is to place your dishes on a lab wipe, and write with a pen on the wipe.

Food and beverages are not allowed in the lab.

Toxic gases, alarm system

There are toxic and corrosive gases present in the lab. They are used in the Reactive

Ion Etchers. There are gas detectors and an alarm system with sirens and blinking lights in case of a leak. If the alarm starts, immediately go out of the lab through the nearest exit (you do not need to use the usual entrance) and notify the labmanager.

Electricity and high voltage

Electric shock can occur from mains voltage (230 V or 400 V). Look out for frayed or cracked mains cables and connectors. If you discover anything broken or suspicious, report it to the lab manager.

The vacuum deposition systems have e-guns which work with high voltages (2 kV – 6 kV). They are all very carefully grounded. Nevertheless avoid touching these systems during deposition, sputtering etc.

Fire hazards

All solvents (acetone, iso-propanol, alcohols) are easy to ignite. Do not generate sparks near open beakers and/or space where fumes can accumulate.

The hotplate next to the spinner and the hotplate for lift-off are potential fire hazards because of their heat generation. Do not put beakers with solvents on these without a water bath.

Fire extinguishers are placed at the entrance of the process lab, and at the corridor double door in the evaporation/deposition lab.

Electric failure (completely dark)

If the house electricity fails, it becomes pitch dark in the labs. The labs do not have windows, and labs in Albanova do not have emergency exit signs with battery power. There are fluorescent emergency exit signs that give off some weak light.

It is important to stay calm and wait for your eyes to get adapted to darkness. Avoid panic, rushing to the exit and knocking something over. 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 usual 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 and try to continue working in the dark. The ventilation will be shut off. Try if you can to cover anything smelly before you leave.

Mercury lamp explosion

The mask aligner is equipped with mercury a lamp that need air cooling. If the air cooling is stopped and the automatic switch doesn't turn the lamp off, the mercury bulb can explode. If the bulb explodes, it will fill the lithography area with toxic mercury vapor. This can cause severe neurological damage. **IMMEDIATELY EVACUATE THE LAB FOR AT LEAST 40 MINUTES** (this is the time needed for the mercury vapor to become liquid), and alert the lab manager. Also warn persons in the other labs, via the big corridor-doors. Put up signs on both doors to this yellow lab **NOT** to enter.

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.

When transporting liquid nitrogen do not ride the elevator together with the container. If the elevator stops and nitrogen leaks out in the closed compartment, there is risk of suffocation.

Working off-hours

Try not to work alone in the lab during off-hours (19:00 – 08:00 and on weekends and holidays). If this is not possible, make sure that someone outside the lab knows where you are and at what phone number you are working.

It is forbidden to work with dangerous chemicals alone at off-hours.

Cleanliness, Waste and Trash

You are required to clean up after yourself. Wash your used glassware, either by hand or using the dishwasher, pick up your scraps and throw them away. Do not leave things lying around in an un-orderly fashion. Place your tools neatly in their storage place, not scattered on the bench. Wipe down the bench and remove all pieces of tape and other crap.

There are two kinds of clean-room wipes, one “Class 100 cleanroom wipe” which is very clean, good for handling samples, chips, wafers etc. The other one: “Safecloths”, is also clean (low lint) and good for wiping up chemical spill etc.

If you need to leave the lab with an experiment in progress, neatly place all items on a lab wipe and write on the wipe your name, date, phone number, a when you will be back to finish your process. Preferably use the “Safecloths” type.

There are metal waste-cans with cover to avoid fumes. This is burnable waste which is disposed at the goods reception in a labeled container. Do not dispose of anything dangerous in these waste cans. If a wipe is drenched in solvent or some other chemical, let it dry a while in the fume hood before you put it in a waste can. If a waste can is full (or overfull) it is your responsibility to empty it. Remove the bag, tie it shut with a good solid knot, place a new bag in the can, and take the full bag to the goods reception when you leave.

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 grease, salts, sweat and other junk that is on your fingers. You absolutely must wear clean room gloves when working with vacuum parts. Never touch the vacuum side of a vacuum part with your hands. Use gloves. Clean contaminated vacuum parts with IPA and a lab towel.

If you are standing around, waiting for your process to finish with nothing to do, find something that needs cleaning and clean it. Your status with the management will be greatly enhanced if you clean up messes which you did not cause.

Clothing and clean-room coats

Always wear a clean-room coat, hair net and clean-room antistatic shoes. This keeps the particle count down, and protects your clothes from spills of chemicals.

The UHV lab has turbo pumps which are not pleasant to listen to over long periods of time. Wear head gear to protect your ears.

Occasional visitors

All un-licensed people that you bring in to the lab, even for a short, one-time visits, should be announced in advance to the lab-manager. Sending an e-mail is sufficient for announcement. The e-mail should be sent each time the person enters the lab. An exception to this rule is a one-time visitor to whom you want to give a quick tour of the lab. Any classes or student demonstrations which use the lab should be announced in advance to the lab manager.

Usage fees and access rules, summary

There are two tracks for access to the ANL, hour usage according to MyFab rates (track 1) and flat rate for academic users (track 2). Flat rate (track 2) access implies a long period of frequent usage, a commitment of at least one year, typically four years for a Ph.D. student, two years for a postdoc. All details can be found in document "Usage policy and fees" available on the technical website.

Emergency telephone numbers:

SOS Alarm: 112

KTH Emergency: 08 790 7700

The Poison Information Centre (Giftinformationscentralen):

010-456 6700

www.giftinformation.apoteket.se

S:t Eriks Ögonsjukhus AB (S:t Erik's Eye Hospital):

Emergency reception phone number: 08 6723100, www.sankterik.se

List of contact persons

in case of emergency

Name: _____

Group: _____

Contact person: _____

Phone number: _____

Contact person: _____

Phone number: _____

This document is to be filed at the local administration.

Declaration

I have read and understood “Safety and usage rules for Albanova Nano-Fab-Lab” 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: _____

Office phone: _____

Mobile phone: _____

Invoice adress: _____

Licence to use the lab granted on -- date:

Signature, Anders Liljeborg, Lab Manager:

This document is to be filed at the local administration.