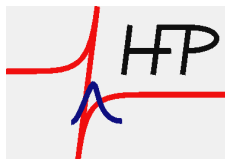


Cleanroom Policy

Version 3.1.1, November 2009



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Cleanroom-Policy

This policy holds for the cleanroom of the institute for semiconductor and solid state physics at the university Linz. A Map of the cleanroom is in the enclosed attachment. It shows the donation of the individual cleanrooms (RR1, RR2, RR3 and RR4) and the service rooms "Grauräume" (G1, G2, G3, G4 und G5) and the flowbox numbers. Also the chemical disposal stations, the emergency exit doors, the stop valves for water, fire-extinguisher and alarm annunciators are marked.

On the internal website <http://brewster.hlphys.uni-linz.ac.at/mediawiki> current and supplemental information for the cleanroom is given.

Entrance restrictions

Only instructed and registered persons (cleanroom users) are allowed to enter the cleanroom by themselves. The Kepler or guest card of the cleanroom users will be activated for the entrance via automatic chip card control. Every cleanroom user must use its own card in front of the card reader at the entrance door to be registered at entrance and may not be let in by other persons without this card registration. Guests may only enter after request and after instruction on proper behavior and in companionship of registered users with a guest overall.

Entering the Cleanroom

- 1) Wearing outdoor shoes is forbidden in the entire clean room area. Jackets and outdoor shoes have to be put off before entering the dressing room, which is only allowed with clean room shoes. When going into the clean room, place your name at the magnet board on the clean room door!
- 2) Between 7 pm and 7 am and on weekends and holidays the cleanroom must not be entered alone, because of safety reasons. During that time a second person must be present. The users have to arrange common working times by themselves.
- 3) The clean rooms are only to be entered with designated clean room garments. Clean room overalls are stored in the ventilated cupboard in the dressing room. Before crossing the bench in the dressing room the clean room garments have to be put on, without touching the floor. Before the overall, a light clean-room cap has to be put on. In RR1 it is obligatory to wear (non-powdered) gloves at all times.
- 4) When entering and exiting the clean room, please wash your hands. It is forbidden to store or consume any food or drink in the clean and dressing room (including chewing gum).
- 5) When entering the clean room the display showing the functional status of the clean room has to be checked. The display lamps for the different areas have the following meaning
 - Red: failure of ventilation or case of fire
 - Green - on: normal operation

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Green - off: stand-by operation

Yellow: clean room conditions do not meet the specifications

Blue: water alarm (water leakage)

In case of red or blue light, inform immediately a responsible person!

When entering the clean rooms, required room lights have to be switched on. In RR2 only the yellow bulb may be used, white light is reserved for service purposes only (in order to see colours appropriately). White light in RR2 will expose the photoresists and make them useless!

- 6) The sliding door between RR3 and RR4 has to be closed (due to different clean room classes and different pressure).

Behaviour and Safety in Clean Rooms:

- 7) When handling liquid nitrogen according safety glasses have to be used. For bottling more than 10 litres of LN₂, the drainpipe leading outdoors must be used.
- 8) Handling toxic and acidly material requires the wearing of safety face sheets and acid-resistant gloves.
- 9) Chemicals are stored in different places (ventilated units) in the clean rooms, see attached plan. Further stock is to be found in the chemicals' cabinet in Service room ('Grauraum') 1. When taking out material from there, the provided list has to be filled in accordingly. Glass bottles should be transported in a safety container, one being in the chemistry laboratory, another one in RR4 next to the transfer hatch. Boxes for chemicals have to be absolutely clean when being brought into the clean room.
- 10) Handling of chemicals must happen in designated flow-boxes. The bottles are never to be left open, except the build up vapor pressure like Piranha etch.
- 11) Special chemicals are only to be used in appointed flow-boxes:
 - HF in FB8, FB1, FB2, and AB4
 - Br in FB10
 - IV-VI-compounds in FB9, AB11
 - Photoresist in FB1, FB3, and AB5
- 12) It is strictly forbidden to dispose chemicals in the sink. Acids in thinned form, solvents and chlorinated hydrocarbonats are to be disposed in the appropriate basin. Chemicals containing Br (Br₂, HBr, Br₂-Methanol) as well as special chemicals have to be collected in glass respective plastic bottles (hydrofluoric acid HF) and disposed separately.
- 13) Each flow-box must be put on with the main switch in order to provide proper functioning of water, plugs and draining of the disposal basin. After using the flow-box it has to be switched off, the ventilation will continue.
- 14) For normal use de-ionised water (DI-water) pipes are present in all flowboxes. Reverse Osmose water (RO-water) with a lower quality is only present at a few

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points in the cleanroom. Normal tap-water and water from the closed cycle cooling system is present in the wall and floor support stations and in the service rooms and may be used for cooling purposes only.

- 15) The disposal containers in G2, G3, G4 and G5 have to be regularly checked on proof, function and filling level. When a container is filled up, clean room personal has to carry it to the central collection point at the University.
- 16) When handling chemicals, contact with skin and eyes has to be avoided. Vapours are not to be inhaled. Warmth, sparks and open flames must not get in contact with vapours at any time.
- 17) Gloves have to be used when handling quartz-glass ampoules. Evacuated ampoules have to be handled with great care in order to avoid mechanical damages (danger of implosion).
- 18) All installations with high voltage (MBE-, evaporation-, plasma-equipment, laser, SEM) have to be protected with safety constructions according to the Austrian norm. Extensions and repair work are to be done by professionals only. When working on or servicing any high-voltage part, the entire installation has to be cut off from the main power supply. Please note, that electric charge is stored in capacitors, which can release voltage spikes even after disconnecting the installation. Capacitors have to be discharged by short circuiting before reparation or service.
- 19) Cleaning of clean rooms has to be performed by the users themselves.
 1. Weekly one user is disposed for to clean on Monday and on Thursday a part of the cleanroom. For details see the attachment or the internal webpage, respectively.
 2. every three month a „major cleaning task“ will take place which includes wiping of floors and walls in all cleanrooms as well as tidying up cupboards and other places.
- 20) All clean room users are responsible for keeping order as well as strictly following all safety regulations.
- 21) The cleanroom users must support the house service and other persons in cases of alarms and accidents in that they help to remove the problems. This is important, as the house service has no knowledge about the equipment in the cleanroom and is further not trained to behave properly inside the cleanroom. The support for these persons has also to take place, if the cleanroom users are not inside the cleanroom, but are present in the building e.g. in the evening or at weekends. But personal safety has always to be obeyed!
- 22) All cleanroom rules listed in detail in the attachment have to be obeyed, other vice a cleanroom user can be punished from the cleanroom for up to ten days or in the case of repetition also for longer time.

To everybody's attention

The present cleanroom policy has to be accepted and obeyed for working in the cleanroom. The policy has to be confirmed with a signature at the cleanroom personal. In case of questions, the cleanroom personal has to be contacted. With his/hers signature on obligates oneself to contribute and support safety, order and cleanliness. It is also obligatory to participate in the cleanroom meetings.

All problems and accidents have to be report as fast as possible in oral form but also via e-mail notice to all three responsible persons:

Gerhard.Brunthaler@jku.at

Stephan.Braeuer@jku.at

Alma.Halilovic@jku.at

Attachments

In case of emergency

- 1) Fire case:
 - Alarm:
 - Activate fire detector
 - Inform fire department **8-122**
 - Give information: where and what is burning, injured persons?
 - Save:
 - Help injured persons
 - Leave building via emergency exits
 - Warn endangered persons
 - Do not use lifts
 - Close all fire-proof doors
 - Extinguish:
 - Extinguish fire with designated devices (fire extinguisher)

Wait for fire brigade at entrance (keep safe distance) and direct them.
Inform them on special dangers!

- 2) In case of injured persons provide first aid (do not endanger yourself!) and call the ambulance 8-144.
- 3) **First-Aid-Kit:** wardrobe, **RR2 (large kit)**
Fire extinguishers: wardrobe, **RR4**
Fire axe: **RR4 (behind SiGe-MBE) .**
- 4) In case the air condition breaks down, leave clean rooms as fast as possible because of possibly dangerous chemical vapors. It is only permitted to switch off equipment that could cause or take damage.
- 5) **In case of emergency the normal doors (yellow doorknobs) and the emergency exits (red doorknobs) have to be to escape. The emergency exits have to be used only in case of emergency, as using them will start an alarm signal. In RR4 a fire-axe is place at the wall, with which windows may be cracked in order to escape.**

FIRE DEPT.	8-122
POLICE	8-133
AMBULANCE	8-144

Internal university phone:
House service (Hausdienst), Porters: 8231

For all emergency call, the internal prefix 8-... has to be used, in order that the house service is as well informed and can help advising emergency forces.

Important cleanroom rules

If any of the rules is not obeyed the user will be locked out first for up to 10 days, in case of repetition longer.

- It is not allowed to take any food (includes chewing gum) and drinks to the cleanroom (CR) or the wardrobe.
- Every user is responsible to keep his/her overall clean.
- Every user has to wear CR shoes and caps entering the CR.
- It is not allowed to deposit any clothes in wardrobe (pullover, etc.).
- It is not allowed to enter the CR 1 without appropriate use of the air-shower (wait until the red light is turned off).
- It is not allowed to take anything out of other persons equipment boxes
- It is not allowed to leave chemicals without clear declaration
- The users have to obey the orders of the lab technicians (Stephan Bräuer, Ursula Kainz, Alma Halilovic).
- The users have to be instructed by responsible persons before using any equipment.
- The users have to write into the log-books before beginning to work with the equipment. (to see who started a machine, to avoid escape after damage!)
- The users are not allowed to change any general setting in the equipment without documentation and asking responsible persons.
- If a problem with an equipment occurs, the users have to document it in the log-book and report it to the responsible persons in verbal form and by e-mail.
- The users have to ask responsible persons for software installation on any PC.
- Any accident or damage must be reported in verbal form and by e-mail.
- Every clean room user has to do his/her weekly cleaning duty. If the user knows that he will not be able to perform it he has to report this **IN ADVANCE** to Stephan Bräuer to reschedule the duty.
- Every clean room user has to participate in the quarterly major cleaning procedure. If this is not possible for any reasons (to be reported **IN ADVANCE** to Stephan Bräuer) the user has to perform an **ADDITIONAL** weekly cleaning service.
- It is not allowed to use normal paper in CRs 1, 2 and 3. Avoid the usage of normal paper in CR 4 as much as possible. Exception: Manuals (CR1 – CR4) and lab-books (CR4). No cardboard boxes are allowed in the cleanrooms.

Cleaning Duties

Regulierung von Sept. 2009, die aktuellste Versionen ist auf der internen Webseite <http://brewster.hlphys.uni-linz.ac.at/mediawiki> zu finden.

Weekly cleaning duty

It belongs to the duties of the cleanroom users that each week another person has to perform a certain cleaning and controlling of the cleanroom. New users will be instructed by our technicians.

When has the cleaning to be done?

Cleaning and **Checking** has to be performed on **Monday** morning till 12 noon. If Monday is not possible, the user on duty has to inform Stephan Bräuer and Gerhard Brunthaler by e-mail why this is not possible in advance and has to do it on Tuesday (in order that it can be checked!). If this is also not possible, because of being away, the user has to organize a swap with somebody else already in advance.

On Thursday morning a second **Checking** has to be performed!

Perform the cleaning duties as early in the morning as possible as then there is no wet waste paper in flowboxes yet!

Cleaning on Monday:

- wipe the sitting bench ('Übersteigebank') with cleaning-chemicals
- mop floor in the dressing-room (wardrobe -'Schleuse') passage room (i.e. the next small room)
- clean the phone, first-aid kit and fire extinguisher
- mop floor in one more cleanroom as given in the timetable for each person
- clean carpet outside with vacuum cleaner

Duties and Checking on Monday and Thursday:

- empty garbage cans inside the flow boxes if waste paper is dry – report non-paper stuff to responsible persons
- empty garbage cans and place new bags inside - take full bags outside and deposit them in or beside a normal garbage can
- refill glove boxes if empty
- pull off a layer of the dust-catching mat if necessary
- check for other problems in cleanrooms
- report any problem via e-mail to responsible persons
- sign the list outside that you have performed your cleaning duties (but only if you have really done it!)

Quarterly cleaning duty

All users have to participate according to the timely schedules.

Chemical storage

FB 1:	Aceton Methanol Ethanol Flußsäure Remover Spritzen mit Photoresist	AB 6:	
FB 1a:	Aceton –VLSI Methanol – VLSI	AB 7:	Flußsäure Kalilauge Aceton (Spritzenflasche) Methanol (Spritzenflasche) Essigsäure TMAH Galden Perfluorinatelfluid GRC-Complex Precious Metal Ammoniumcer(IV)Nitrat TI-Prime Protek Remover 100 AP-3000
FB 2:	Entwickler AR 300-47 AR 300-49 AR 300-56 MF-319 Remover AR 600-70 1165 Stopper AR 600-60 Verdünner AR 600-01 Photolack AR P 671.04 AR P 631.01 AR P 641.04 AR P 631.04 AR P 610.04 AR P 610.08 AR P 610.03 AR N 7700.08 Microposit EC – Solvent	FB 8:	Flußsäure, gepuff. HF Salzsäure Ammoniaklösung Wasserstoffperoxid Chrom(VI)oxid Antimony
FB 3:	Microposit EC-Solvent Microposit Developer MF-319 Microposit Remover	FB 10:	Trichlorethylen Brom Ethanol Schwefelsäure Bor
AB 4:	Aceton Chlorbenzene Essigsäure Ethanol Flußsäure Methanol Schwefelsäure Trichlorethylen Wasserstoffperoxid Titriplex Blutlaugensalz Ammoniaklösung Salpetersäure	AB11:	Aceton Ba2F2 Ba2Te3 Europium Galium Indium InGa Methanol PbSe PbTe Tellurid Wasserstoffperoxid ortho-Phosphorsäure
AB 5:	Spritzen mit Photolack (S1818, S1813, S1805) Microposit Primer Chrom Etch Adhesion Promoter AP3000 Protective Coating AR-PC-504 BCB3022-46	AB13:	HF 20% Gepuf. HF Zinc Galliumarsenid Schwefel Cadmium Manganese Tellurium Selen Magnesium

Chemistry working room

outside of cleanroom

Aceton	Kaliumdichromat
Ammoniaklösung	Kaliumhydroxid
Ammoniumcer(IV)nitrat	Kaliumiodid
Ammoniumfluorid	Methanol
Brom	Natriumhydroxid
Bromwasserstoffsäure	ortho-Phosphorsäure
Calciumchlorid	2-Propanol
Chloroform	Salpetersäure
Chrom(III)-oxid	Salzsäure rauchend
Dichlormethan	Schwefelsäure
Dimethylsulfoxid	Technisches Petroleum
Eisen(II)-chlorid-Tetrahydrat	Tetrachlorkohlenstoff
Essigsäure	Titriplex III
Ethanol	Toulol
Ethylenglycol	Trichlorethylen
Flußsäure	Wasserstoffperoxid
Iod doppelt sublimiert	Xylol
Isobutylmethylketon	Zinn (II)-chlorid-Dihydrat
Kalilauge	

Service room 2 (Grauraum 2):

Gas cabinet: Argon
Oxygen

Ammoniak
Silan
Nitrous Oxide (Distickstoffmonoxid)

Service room 3:

Refrigerator: Microposit Photoresists S1818, S1813, S1805
AZ 1518
AZ 5218

Service room 4:

Gas cabinet: Schwefelhexafluorid
Tetrafluormethan

Hydrogen
Methan

Flowboxes

For planning and construction of the cleanroom a differentiation and notation of the flowboxes into “Flowboxen” (FB) and “Abzüge” (AB) was performed. As this notation lead to errors and mistakes, the function of the different types of flowboxes should be clarified here.

Flowboxes with laminar air aspiration downward

Flowboxes (FB) are homogeneously exhausted through the perforated working plate so that a largely laminar air flow takes place inside.

Flowboxes with sideward air aspiration

Flowboxes with sideward or backward air aspiration are denoted as „Abzüge“ (AB). No homogeneous or laminar air flow takes place largely above the working plate.

Flowboxes without separate air aspiration

Further there are working areas which do not posses their own air exhaust, the air is blown into the cleanroom. In such “flowboxes” no dangerous chemicals must be used. Such areas exist in cleanroom 1 and in cleanroom 2 (maskaligner).

In every flowbox one of the following descriptions is placed:

Laminar air flow
air exhaustion downward
air is completely disposed

Non-laminar air flow
air exhaustion sideward
air is completely disposed

Non-laminar air flow
air is emitted into cleanroom
do not work with
dangerous vapors!

Phone numbers in Cleanroom

Dressing Room:	9625
Clean Room 1:	9631
Clean Room 2:	9630
Clean Room 3:	9628
Clean Room 4:	9626 (IV-VI MBE), 9629 (AFM), 9635 (SiGe-MBE)
Service room:	9632 (at RR4), 9691 (at RR1)

Cleanroom Plan

