

Cleanroom Safety and Etiquette Regulations



Purpose of this training module

- Familiarization with the cleanroom.
- Familiarization with the working principles of the cleanroom.
- Familiarization with the possible dangers in the cleanroom.
- Familiarization with how to respond to chemical or gas exposures.



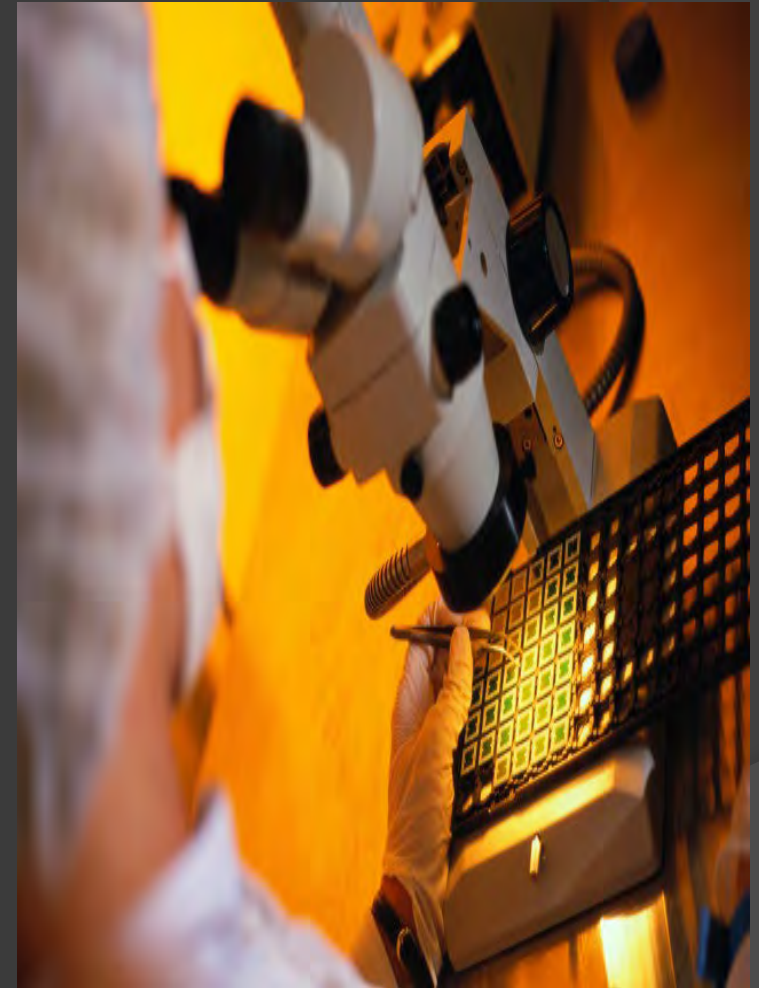
Training fundamentals

- Improperly performed work can lead to personal injury, injury to others, or to workplace and equipment damage.
- These guidelines are intended to familiarize users with the ways to keep the cleanroom in a clean and in an orderly manner which produce a quality product and minimize the sources of contaminations.
- The user is responsible for ensuring his/her own safety.
- Users are expected to have reasonable basic chemical knowledge, common sense, commitment to maintaining personal health, and completely adhere to these guidelines and procedures.



The purpose of the cleanroom

- The ambient outside air in a typical urban environment contains 35,000,000 particles per cubic meter in the size range 0.5 μm and larger in diameter, corresponding to an ISO 9 cleanroom, while an ISO 1 cleanroom allows up to 10 particles of 0.1 μm and up to 2 particles of 0.2 μm .
- Maintaining a high level of cleanliness allows for the obtaining of desired results from machines, processes and products that are sensitive to environmental conditions (particles, humidity, temperature, contamination, etc.)
- High levels of cleanliness are required for the fabrication of certain products, specifically microchips, whose fabrication can be disrupted by even one grain of dust.
- These guidelines will provide for the creation of both a pleasant working environment and a safe one.



Cleanroom class definition

Particle count /m³

ISO 14644-1 Cleanroom Standards

Class	maximum particles/m ³						FED STD 209E equivalent
	>=0.1 µm	>=0.2 µm	>=0.3 µm	>=0.5 µm	>=1 µm	>=5 µm	
ISO 1	10	2					
ISO 2	100	24	10	4			
ISO 3	1,000	237	102	35	8		Class 1
ISO 4	10,000	2,370	1,020	352	83		Class 10
ISO 5	100,000	23,700	10,200	3,520	832	29	Class 100
ISO 6	1,000,000	237,000	102,000	35,200	8,320	293	Class 1,000
ISO 7				352,000	83,200	2,930	Class 10,000
ISO 8				3,520,000	832,000	29,300	Class 100,000
ISO 9				35,200,000	8,320,000	293,000	Room Air

BS 5295 Cleanroom Standards

Class	maximum particles/m ³				
	>=0.5 µm	>=1 µm	>=5 µm	>=10 µm	>=25 µm
Class 1	3,000		0	0	0
Class 2	300,000		2,000	30	
Class 3		1,000,000	20,000	4,000	300
Class 4			20,000	40,000	4,000

Cleanroom Operating Hours

The cleanroom is open to authorized users day and night every day of the week.

Certain equipment and activities are restricted to normal work hours and only when staff is present.

Working after normal working hours requires following a specific work regulation that will be described later on in this guide.



Regulations for after hours, weekends and holidays

Standard working hours are Sunday to Thursday 8:00-18:00.

National regulations state that **a person may not allowed to work alone in a cleanroom.**

When using the cleanroom outside of regular working hours, the user must be accompanied by a buddy.

A buddy is someone:

1. Who has permission to enter the cleanroom.
2. Has passed all the safety training concerning the cleanroom.
3. Can be users from the group or another group.

Under special circumstances if the buddy needs to leave the cleanroom the remaining user can use the **Man Fall Down system.**



The Buddy System



- It is a state Regulation that a person is not allowed to work alone.
- Because users and staff members are present at the cleanroom during the standard working hours, working outside this hours requires a buddy or the use of the Man Fall Down system.
- A buddy is a person who passed the cleanroom safety training and is allowed to enter the cleanroom.
- The purpose of the buddy is to provide assistance in case of emergency or if the user has become incapacitated.
- Specific activities are allowed only in the presence of another authorized user or 'buddy'.

Man fall down detection system

Safety Watch

This system constructed to detect a person in distress. Distress will alert the security and they will arrive.



Work regulations for a man fall down:

1. Inform the security you are starting and ending work at tel. 9106.
2. Wear the watch on your wrist.
3. If you wish to initiate a distress call, press the button. [Image A](#)
4. The watch will **beep** if it identify's you are in distress.
5. If it is a false alarm press "X" on the touch screen. [Image B](#)
6. If it is a true alarm:
 - a. An operator will try to speak to you through the watch.
 - b. A security personnel will be sent to assist you.



The Alarm system

Because the cleanroom contains many hazards special systems have been installed to prevent injury.



The following systems monitor for the dangerous situations:

- Gas alarm system.
- Air evacuation system.
- Fire alarm system.
- Man at distress.
- Man fall down system.

When a dangerous situation is suspected :

1. A loud siren will sound accompanied by a flashing light.
2. If the gas alarm system detects a problem the system will automatically shut down the dangerous gases and stop the processes operating in the machines using these gases.
3. The system automatically alerts the Institute's security services of the dangerous situation.
4. The institute's security services are sent to the location to assist and supervise the situation.



When an alarm is heard you should do the following:

1. Leave the working area as soon as possible and make sure you have not left any equipment operating or left chemicals in a dangerous situation.
2. Silence the alarm by pressing the silence button (the alarm light will continue to flash until the problem is resolved)
3. Make sure all personnel in the clean room leave and that no one is left behind.
4. Leave the clean room through the emergency exits.
5. Leave the cleanroom area.
6. Report the problem to the Security at telephone number 2999.



Distress System

When a cleanroom user is in distress and requires the immediate help of someone inside or outside the cleanroom.

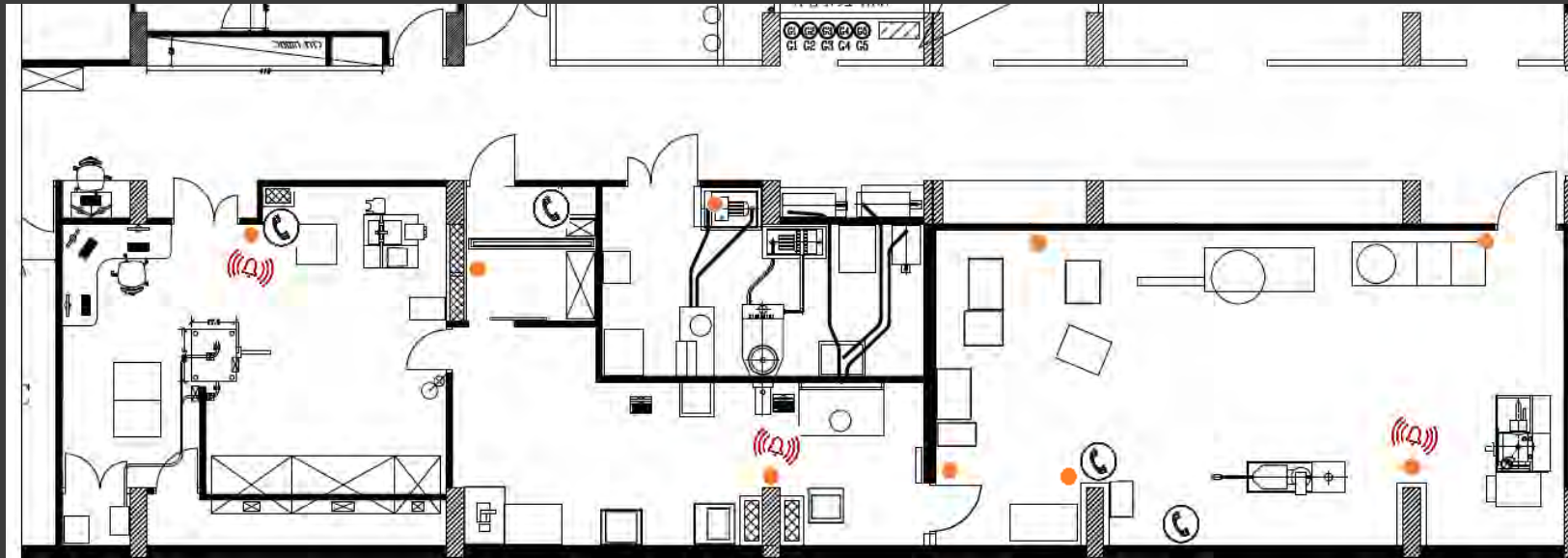
The distress buttons are located in all the cleanrooms.

When the distress button is pushed the following will happen:

1. An alarm will sound and the alarm light will flash.
2. Security will receive a telephone call stating there is a person in distress in the cleanroom.
3. The staff will receive a SMS and will hear the alarm if present nearby.
4. Security, staff and or other users located in the cleanroom will come to assist.



Clean room alarm map

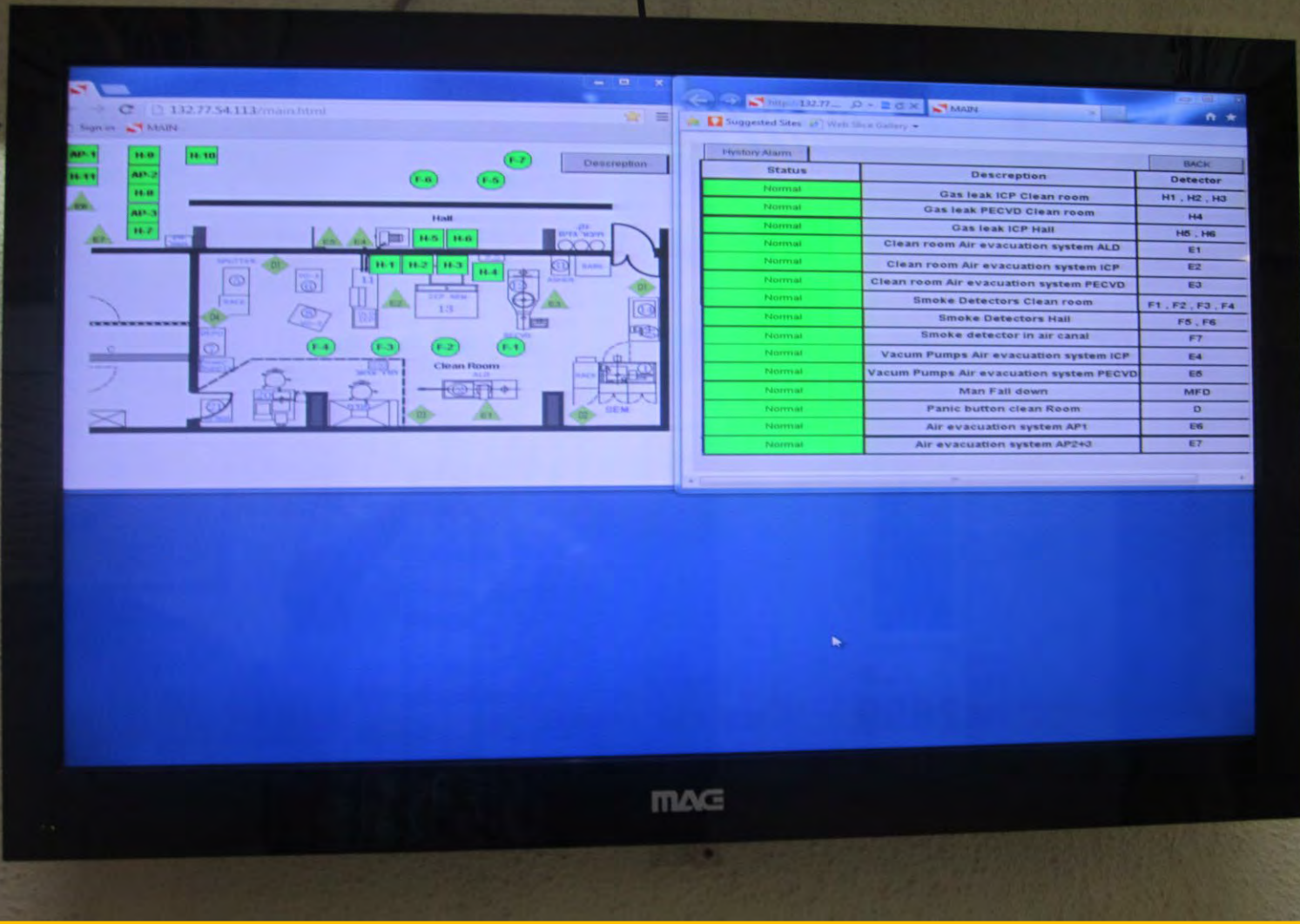


-  Distress button
-  Phone
-  Alarm





Dangerous gas cabinet



Alarm system display



Alarm light and siren In the clean room



Alarm light and siren In the corridor



Man Fall Down control system



Man Fall Down Sensors and Belts



Distress button

The Nano Fabrication Cleanroom

Yellow Room class 1000

- E Beam writer
- Micro writer
- Mask Aligner MA6
- Chemical workstations
- Microscope.
- AFM



The nanofabrication Cleanroom

Plasma Room class 10000

- ICP (SPTS)
- PECVD (Plasma-Therm)
- ICP (Plasma-Therm)
- Plasma Asher
- RTP
- Microfluidic work station
- NIL (Nano imprinting Lithography)



The Nano Fabrication Cleanroom

White Room class 10000

- **Thin film deposition**

- Odem Evaporator
- Yo Evaporator
- Angstrom Evaporator
- ALD
- AJA sputter

- **Characterization**

- Veeco Stylus Profiler
- Zeta Optical Profiler
- Wollem Ellipsometer
- Jeol 7000 Electronic microscope



Cleanroom guidelines and procedures

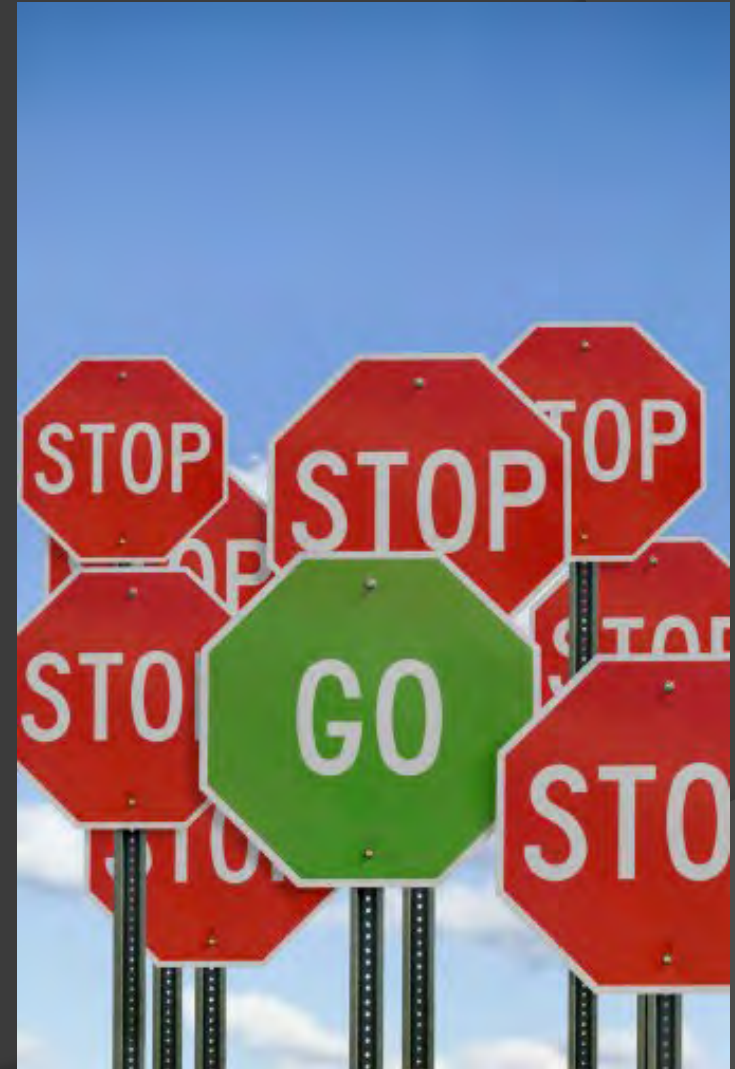
Breakdown of the cleanroom guidelines and procedures:

- Prior to entering
- Equipment
- Entrance
- Behavior
- Accidents and problems
- Exiting



Prior to Entering the Cleanroom

- Confirm that you've registered with the online registration system on the specific equipment or work station you plan to use.
- Wear appropriate clothing:
 - Long pants(full length leg covering) and closed leather or plastic shoes (no sandals).
 - Avoid excessive clothing and fabrics that shed excessive fibers like wool.
- Contact lenses are forbidden.
- Remember, maintaining a high level of cleanliness is not to protect the user from the cleanroom but rather to protect the cleanroom from the user.



Special Circumstances

Pregnancy

Users who are pregnant or planning to be are advised to recheck the MSDS of the materials used for specific indications. Following the standard safety guidelines should prevent exposure and damage to health of the mother and the embryo.

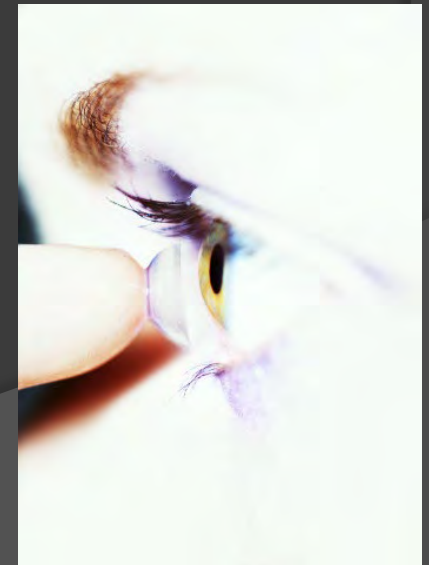
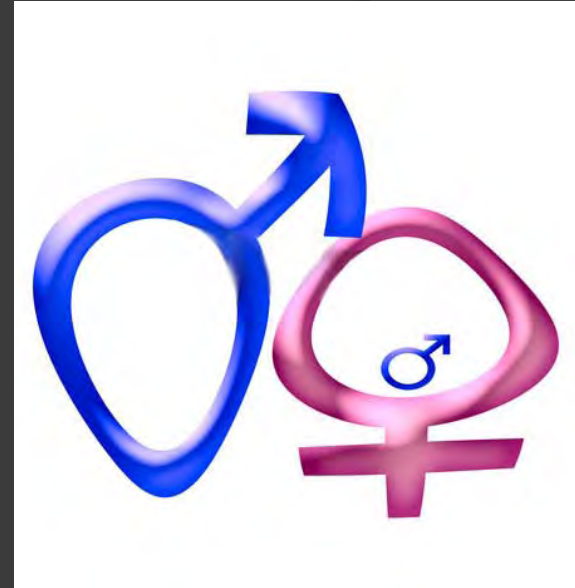
The safety unit guidelines regarding this issue are available at the link: [link](#)

Contact lenses

Contact lenses are **strictly forbidden**.

The presence of contact lenses when chemicals are sprayed in the eyes will worsen the effects. Solvent fumes can diffuse through contact lens and adhere the lens to the cornea. Users who wear contact lenses are responsible for having replacement glasses.

****The Weizmann institute provides optical safety glasses free of charge contact the safety unit.**



Cleanroom Equipment

Permitted items

- Cleanroom notebooks, cleanroom paper, laminated regular paper
- Silicon wafers, tweezers
- Ball point pens
- Items with smooth surfaces that can be cleaned with alcohol
- Flash drives, CDs, and diskettes

Prohibited items

- Regular paper, Styrofoam
- Powders
- Erasers and pencils
- All items that tend to crumble or shed fibers or particles



Computers and printer are located in the cleanroom to view and print recipes. Recipes can be emailed to the user and shared folders can be accessed via the computers.

General behavior guidelines

- No eating and no drinking. Water bottles may be left in the gown room.
- Coveralls, shoe covers, head covers and Safety glasses must be worn at all times while in the cleanroom.
- A face Mask must be worn if facial hair is present. It is also recommended to be used when performing a particle sensitive process.
- Reduce the amount of material that is brought in to the cleanroom.
- All materials brought in and left in the cleanroom must be labelled with the **its contents, expiration date, and user name.**
- Be mindful of keeping your work area as well as the cleanroom in a general clean and neat.



Personal Hygiene

Since the cleanroom is used by a large number of users, it is not possible to provide a personal coverall to all users. Coveralls and over shoes are shared by all users and therefore it is important users maintain personal hygiene's.

- Take care of your personal hygiene.
- Do not smoke before entering. Wait at least 20 min after smoking to enter the cleanroom.
(staff members have their own coverall (light blue coverall))
- Use deodorant to prevent armpit odors left on the coverall.
- Control Dermatitis & Dandruff
- Facial hair must be covered



Cleanroom dress code order

Consideration must be given to the order of dressing so as to reduce to contamination.

1. Shoe covers



5. Overshoes



2. Head cover



6. Glasses



3. Face cover

(incase facial hair is presents)



7. Gloves



4. Coverall



8. Nitrile gloves

(extra pair for chemical works)



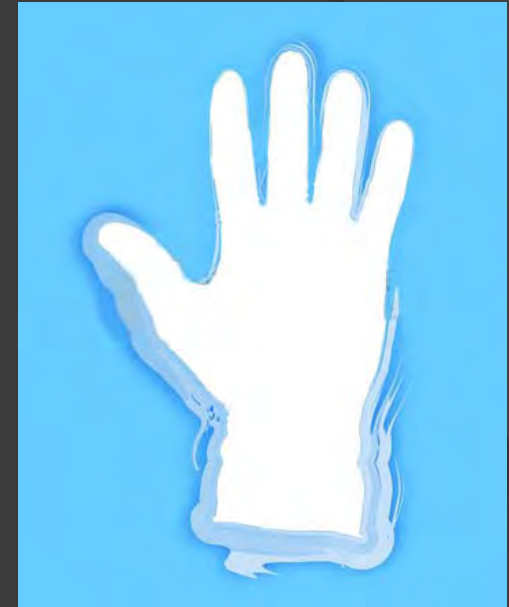
Cleanroom Gloves

Types of gloves

Latex, nitrile, natural rubber.

Purpose of gloves

- To protect the user from contact with harmful chemicals.
- To protect the cleanroom environment from contamination.



Use of gloves

- Latex gloves are to be worn at all times while in the cleanroom.
- Nitrile gloves are to be worn on top of latex gloves when handling lithographic chemicals (solvents, photoresist, etc.)
- Natural rubber gloves must be worn when working with any acids.
- When leaving one room to enter another or to leave cleanroom, wash hands and remove and dispose of nitrile gloves (leaving latex gloves on).
- Put on new nitrile gloves before continuing chemical work.
- Prior to using, check gloves for holes by inflating glove with air or nitrogen. Fold over the end of gloves to catch any liquid that may drip down. After using, wash and dry rubber gloves and return them to their place.

Equipment use

- All users must be **trained** before using any equipment.
- All equipment use should be **scheduled** using scheduling system (internal services).
- If you are unable to use the equipment during the time you scheduled, please **delete** your reservation.
- The user is responsible for **reporting damaged or malfunctioning equipment**.
- The user is responsible for **properly operating and cleaning each piece of equipment used**.
- The user is responsible for leaving the **cleanroom clean and orderly**.



Cleanroom mishaps

- For equipment problems e.g., unexpected equipment performance, breakage, etc. it is imperative to:
 - Place a note on the equipment stating that is non-operational.
 - Inform the cleanroom staff of the situation.

- Do not attempt to fix problems by yourself.

- The equipment in the cleanroom is very expensive and very sensitive. Improper use may lead to expensive and time consuming repairs.

- The Institute cleanrooms are used by professors, students and external users and we understand that accidents can and do happen.

Unintentional accidents become serious problems if the cleanroom staff is not informed.



Dangers in the cleanroom

High and low pressure

Equipment in the cleanroom operates at both high and vacuum pressures. Uncontrolled release of these can cause injury.

Machinery

There are machines in the cleanroom that use motors, pistons, and valves. Improper use or contact can cause injury.



Exiting the cleanroom

- ◉ Clean and organize your work area to leave it how you found it ,or how it should be left.
- ◉ Sign out in the log books or log sheets located near the machine or work station at which you worked.
- ◉ Remove your personal equipment, notebooks, utensils, papers, etc. from public areas.
- ◉ Remove and dispose of nitrile gloves if wearing them.
- ◉ Remove cleanroom suits and shoe covers in the gowning room and put them back where they were found.
Dispose of gloves and disposable booties and head covers in waste bin.



Email updates



The clean room uses two distribution list emails:

1. Nanofabrication_users@weizmann.ac.il - For students.
2. Nanofabrication@weizmann.ac.il - For students and professors.

The emails provide essential information about the cleanroom activities like:

- Updates of expected and unexpected machine availability.
- Updates of changed or new cleanroom regulation.
- Inform users of any information to help them with their work at the nanofabrication center.

Users must read the emails carefully because they contains information vital to their work.

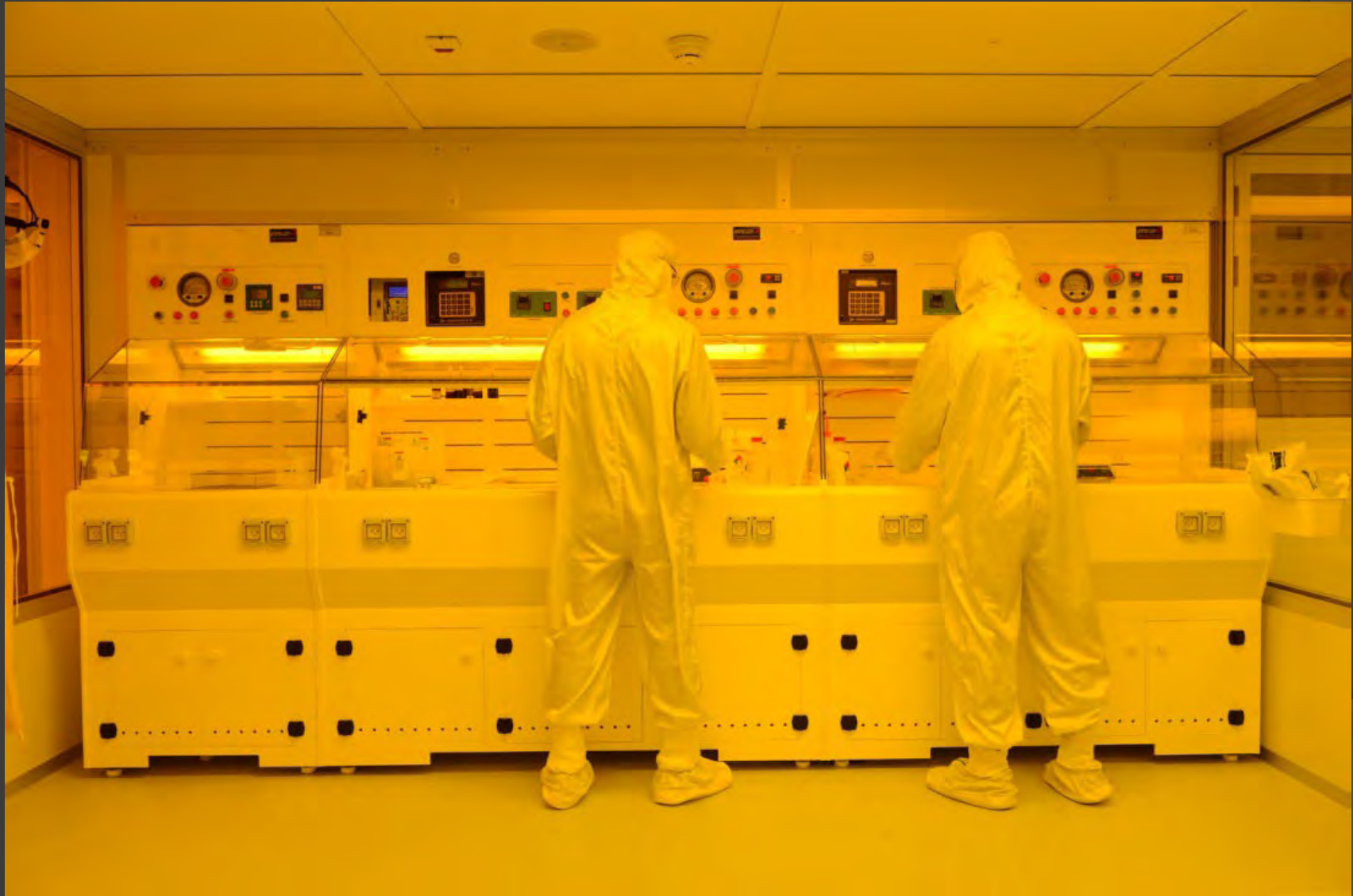
Clean room violation & penalties

The cleanroom serves a large number and variety of users, All users are expected to follow cleanroom etiquette and safety regulations. Link. The following are the penalties for violations: [Link](#).



Clean room Violation & Penalty's			
Violation	Example	Severity	Penalties
Etiquette	Leaving an unorganized a work station, not filling in the log book where required, not cleaning the workstation, not keeping a scheduled equipment booking, brining unsuitable equipment into the cleanroom.	1	Verbal clarification and reminder regarding the correct action that needs to be followed
		2	Suspension for one day, verbal clarification and reminder regarding the correct action that needs to be followed
		3	Two weeks suspension from clean-room activities, email to user +supervisor, update to all users of the incident(without user name).
		4	One-month suspension from clean-room activities, email to user +supervisor, users needs to re-pass safety and etiquette course, all users informed of the incident(without user name).
Safety	Neglecting to use the safety measures as directed (safety glasses, short trousers, sandals shoes insertion of unapproved chemicals)	1	Verbal clarification and reminder regarding the correct action that needs to be followed
		2	Suspension for one day, verbal clarification and reminder regarding the correct action that needs to be followed
		3	Two weeks suspension from clean-room activities, email to user +supervisor, update to all users of the incident (without user name).user needs to re-pass safety and etiquette course.
		4	Two months suspension from clean-room activities, email to user + supervisor, update to all users of the incident(without user name).users needs to re-pass safety and etiquette course.
Unsafe behavior	Behavior in a manner that could harm, the user, other users or the equipment (leaving chemicals outside the chemical work station, mixing solvents and acids, unsafe use of chemicals, neglecting of alarms, not following the after hours work regulations, unsafe use of the equipment)	1	Two weeks suspension from clean-room activities, email to user + supervisor, update to all users of the incident. User needs to re-pass safety and etiquette course.
		2	Two months suspension from clean-room activities, email to user + supervisor, update to all users of the incident(without user name).user needs to re-pass safety and etiquette course.
		3	Permanent suspension, update to all users of the incident (without user name)
Criminal negligence	Deliberate damage to equipment or property.	1	Permanent suspension, update to all users of the incident (without user name)

Fume hoods



Dangers in the fume hood

- Exposure to chemical* vapors.
- Spraying or splashing of chemicals on skin, clothing or in the eyes.
- Chemical leaks from bottles or tanks.
- Contact with contaminated materials (tools, gloves, etc.)
- Improper mixing of chemicals.
- Chemical fires.
- Contact with hot plates.
- Electrical shock.



*Chemicals = acids, bases, solvents, developers, photoresists.

Protective clothing

Solvents/bases

- Safety glasses
- Both latex and nitrile gloves (nitrile on top of latex)

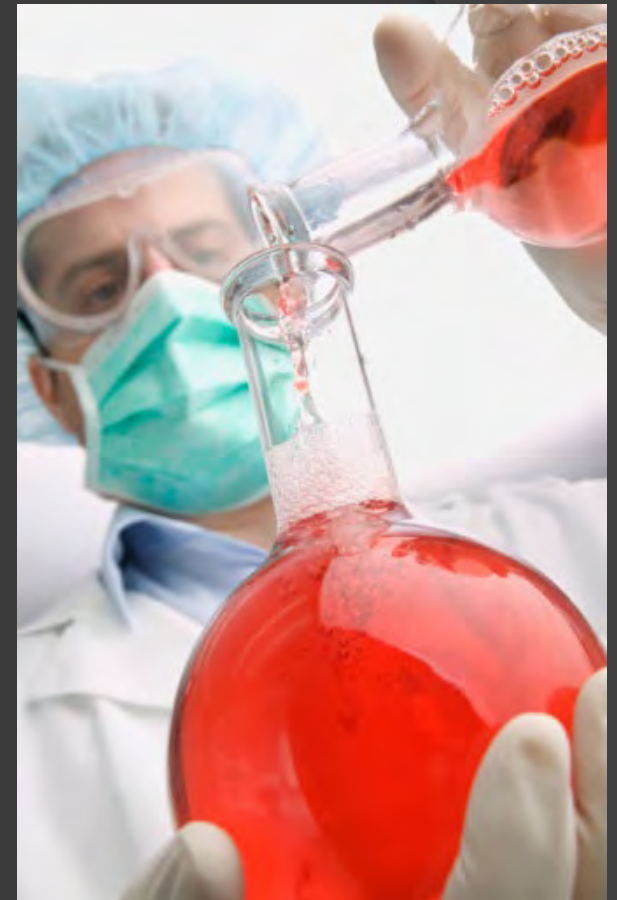
Acids

- Safety glasses
- Latex gloves, rubber gloves, apron and face shield.

Before wearing gloves, check for holes by filling with nitrogen or air and holding the base closed.

Rubber gloves should be folded at the bottom to catch dripping liquids.

Hang up the apron such that the side intended to make contact with chemicals is facing the glass wall.



Basic fume hood rules of behavior

- Familiarize yourself with the chemicals which you will be working with, the dangers they pose, and how to deal with accidental exposure or contact.
- It is a mandatory to read and understand the MSDS for all the chemicals you will be using before you use them.
- It is forbidden to bring chemicals into the cleanroom that have not been authorized by the head of the cleanroom.
- New chemicals that have been authorized must have an MSDS.
- Every liquid must be treated as a dangerous chemical.
- All work with chemicals must be performed within the fume hood and chemicals should be placed at a distance of least 20cm from the bench edge(marked with a red line).
- Work at the fume hood must be performed standing up.
- Do not block the fume hood's air holes including those on the work surface.
- Safety glasses must be worn at all times when working in the fume hood.
- All chemical glassware must be labelled with 1) material inside 2) name while performing work.



Basic fume hood rules of behavior

- When working in the fume hood, it is important to be focused on and occupied with only the task at hand.
- Keep chemicals separate! Do not introduce solvents/bases into the acids fume hood or acids into the solvents/bases fume hood.
- Remove nitrile/rubber gloves before performing tasks not related to fume hood work (i.e. answering the telephone, microscope work, etc.) or before leaving the chemical room.
- Never put your hands, even gloved hands, in chemical baths.
- After completing fume hood work, wipe down the tools and work area with clean wipes wet with DI water.
- Solvent waste must be disposed of in the solvent waste bottle, acid waste **corresponding** in the acid waste bottles.
- Report any incident so that it can be quickly corrected in order to reduce the chance others being injured.



Chemical storage

- Specific places in the cleanroom are designated for chemical storage.
- The areas for chemical storage are below the fume hoods or in specifically labelled closets.
- All chemicals are to be stored in the places specified for them.
- Do not store personal/special chemicals in the fume hoods without permission.
- All chemicals must be labelled with the contents, expiration date, and user name.



PHOTO RESIST USAGE GUIDE

STORAGE

- Bulk amounts of photoresists are stored in the refrigerator at relatively low temperature.
- **Never open the cold bottle with resist right out of the fridge.**
- Prior the opening, the bottle must held at room temperature under the hood overnight.
- **Please, fill the info card and place it under the bottle and leave it inside the hood.**
- Small bottles with pipets for everyday use are stored on the shelf in photolithography hood, one bottle for each type of resist.
- Spare small bottles of some of resists are stored in the drawer under e-beam hood. Please avoid keeping more than one bottle for each resist on the shelf.



Photoresist out of Fridge:

Resist: _____

Date out of fridge: _____

Name: _____

APPLICATION

- **When using resists, avoid leaving drops on the bottleneck.** When dried out, the drops will crystallize and create defects on the pattern.
- Do not use excessive amount of resist.
- **Always protect the spinner from resist.** Use protective ring and wipes or aluminum foil.
- **Clean backside of the sample** from resist residues before placing the sample on the hot plate.
- When your work is finished clean the spinner and the chuck **thoroughly.**

Chemical Identification with PH Paper

- To identify the properties of unidentified chemicals, pH paper or, also called litmus paper can be used.
- Dip the paper in the unidentified chemical and wait about one minute until the color changes.
- Matching the color to the color on the provided chart will yield the pH level.

PH Levels

0 – very acidic

7 – neutral

14 – very basic



*pH is a measure of the acidity or alkalinity of a solution. It is based on the concentration of hydronium ions (H_3O).

Hotplates

While hotplates may look innocent they can be dangerous when used in fume hoods.

The principle danger is from plastic containers placed on the hotplate catching on fire or melting.

Burns can occur if a user touches an operating hotplate.

The rules for working with hotplates:

- You must be present when heating chemicals.
- Set controller to 20°C when work is finished.
- Do not heat solvents with boiling points lower than 130 °F (55 °C).
- It is forbidden to place acetone on the hot plate or heat it.



In case of fire...

Call Security at 2999

- In the event of a small fire that does not pose danger to you, try to extinguish the fire at the source.
- In the event of a fire, an alarm will sound.
- There are fire extinguishers in every room and the extinguishers are suitable for use with chemicals.
- To extinguish a chemical fire, aim the extinguisher above the burning material in order to stop the supply of air.
- If the situation is one that endangers your health or life, leave the area immediately through the emergency doors.



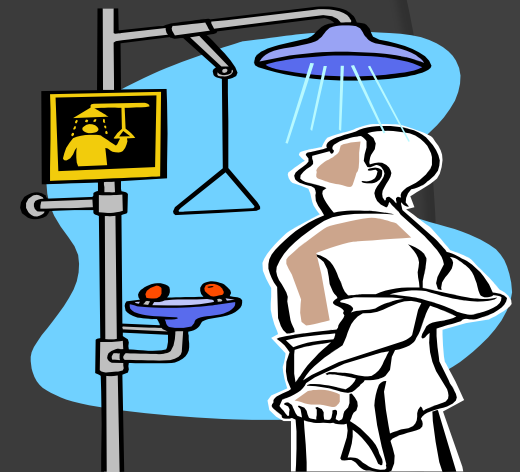
Chemical exposure – Eyes

- Flush with water using the eyewash. Assistance from another cleanroom user is advised.
- Time is critical when flushing chemicals from eyes. Wash for at least 15 minutes.
- keep eyewash pressure low to prevent eye damage.
- Seek medical care as soon as possible!
Take the material MSDS with you.
- Keep others informed of your situation.



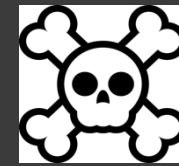
Chemical exposure – Skin

- In the case of chemical exposure or suspected chemical exposure to skin, wash the area immediately for at least 15 minutes at the nearest faucet or eyewash.
- Use the shower for larger exposures.
- If your clothing has been exposed, first remove the clothes, then use the shower.
- Inform those around you or the cleanroom staff of your situation.
- Seek medical care as soon as possible!
- It is important to remember that cleanroom suits, head and shoe covers will not protect you from chemical spills.





Exposure

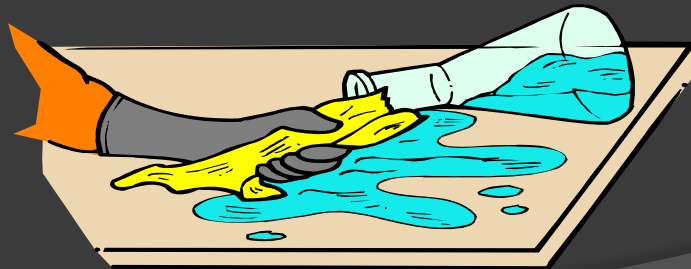


- HF exposure may not cause any obvious sensations yet can be fatal.
- Visible signs of HF exposure may not appear until the next day.
- HF is absorbed through the skin and the muscle until it reacts bone where it will begin reacting with the calcium in the bone.
- Higher concentrations will cause more intense reactions that occur more quickly.
- If not treated immediately, HF exposures may require amputation.
- In the case of HF exposure:
 - 1) Inform those around you and the **staff** of the exposure.
 - 2) Inform security at telephone 2999.
 - 3) Wash the exposed area with water for 15 minutes.
 - 4) Open HF Treatment Kit (also eye flush) and wash area well with calcium solution
 - 5) Apply generous amount of calcium gluconate cream to exposed area.
 - 6) Have a friend inform the hospital of the situation.
 - 7) At the hospital, the doctor may inject a calcium based solution into the affected area.



Chemical accidents and response

- Every chemical accident must be reported to cleanroom heads at all the following numbers:
- At Nano 5175,4974. staff 4514,4971,4970
- In the case of an unidentified liquid spills, you must assume the liquid is dangerous.
- Spills of water, acetone, or IPA can be cleaned with clean wipes.
- Acids spills or large spills should be absorbed by vermiculite.
- After absorbing all liquid with clean wipes, sleeves or granules all materials should be placed in two plastic bags located at the Gown room.



Treating electric shock

Dos

- Switch off the main switch.
- Break the contact between electrical source and patient using a dry non-conductive object like an insulated stick.
- Call for help.
- When previous steps have been completed and if breathing and heartbeat have stopped begin C.P.R .

Don'ts

- Touch the patient directly.
- Alerting from within the high voltage area.



Ammonia (NH₄OH) in cleanroom

Operation procedure.

Background:

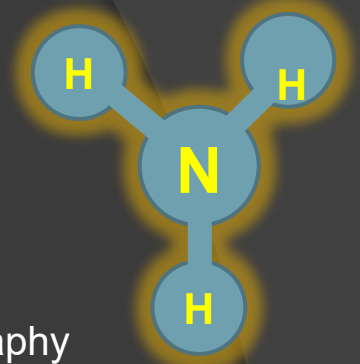
Currently the Perelman building clean room yellow room is equipped with 3 laminar flow hoods dedicated to working with acids, multiple photoresists and PMMA-dedicated.

There is no defined area suitable for work with ammonia.

Nevertheless, use of ammonia is essential to clean Ga arsenide samples prior to lithography processing. The Acid hood area is not suitable for ammonia use due to concern about reactions between ammonia vapors/drops with acids in the hood. On the other hand, the developers in used in the lithography hood are basic water solutions, which should not pose a potential hazard to work with other basic solutions in the lithography hood. The restriction is related to the potential risk of cross contamination and ammonia use and waste solutions storage.

Procedure

- 1) The owner (experimenter) is responsible for bringing a container for ammonia waste to the cleanroom.
- 2) Fresh and used ammonia containers should be evacuated from the Clean Room area by the experimenter once the experiment has concluded.
- 3) The waste container must have a proper chemical waste label.
- 4) The working time should be booked in the "Internal services", no other users are allowed in the Litho hood when working with ammonia.
- 5) Used ammonia must be poured into the ammonia waste container immediately after the end of use.
- 6) All chemical dishes were in contact with ammonia should be rinsed 3 times with water prior to return to the dish rack.



List of common chemicals

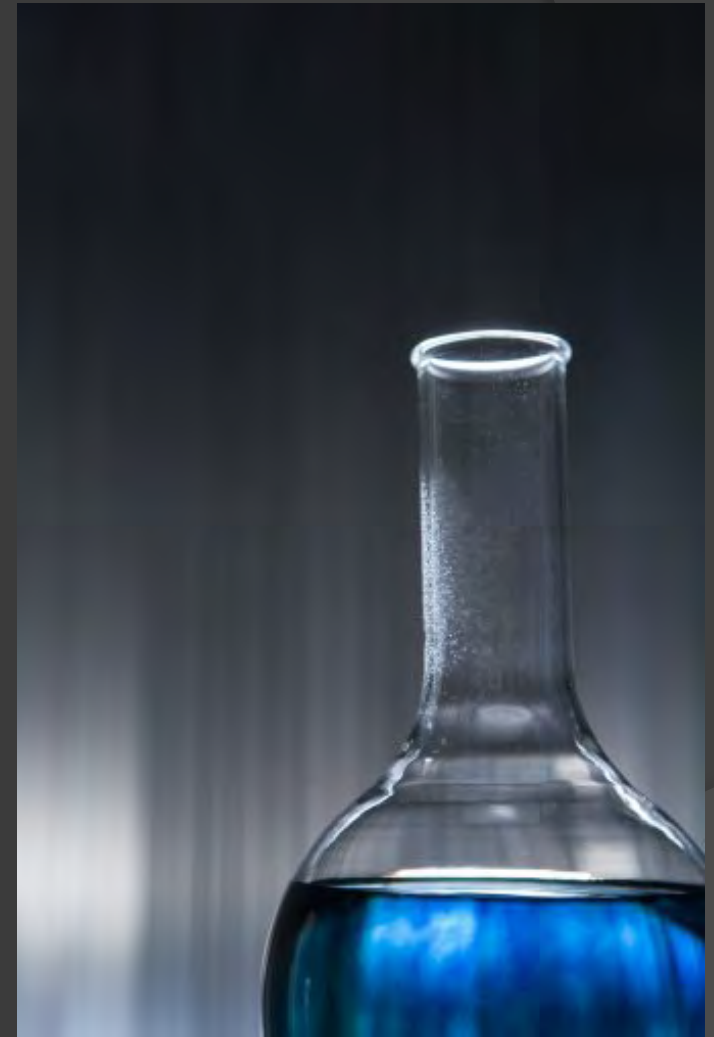
Acids + H₂O₂



Chemical	Danger
HF	May show no signs, reacts with calcium in bones, can be fatal
HCl	Causes severe skin burns
BOE 6:1	Contains HF, see dangers above
Sulfuric Acid	Causes severe skin burns
Ti etch	Flammable
Au etch	Burns skin
Nanostrip	Burns skin, can be explosive
Piranha	Burns skin, can be explosive
H ₂ O ₂	High concentrations can ignite and explode and are corrosive

List of common chemicals – Solvents

Chemical	Danger
NMP	Flammable
IPA	Flammable
Acetone	Flammable
Developer MF-319	Poisonous
Developer MF-726	Poisonous
PM Acetate	Flammable, Poisonous
Microposit Remover	Poisonous



Chemical waste

Acids

The Cleanroom does not have enough space to store waste for all acids.

Acid waste is available for:

- HF
- H₂SO₄ (Sulfuric)
- HCl
- Piranha

For any other acids the user must bring a container to collect the acid waste and dispose of it according to the building regulations.

Solvents

- All solvents should be collected in containers located at the lithography and E-beam workstation.
- Under no circumstances should solvents be poured down the drain.



The NFPA diamond

- The NFPA diamond is designed to give general hazard information for chemicals. Click on the hazards/colors for the specific hazards represented by the numbers.

Red: Fire Hazard

- 0 – Will not burn.
- 1 – Must be preheated for ignition; flashpoint above 200°F (93°C).
- 2 – Must be moderately heated for ignition, flashpoint above 100°F (38°C).
- 3 – Ignition may occur under most ambient conditions, flashpoint below 100°F (38°C).
- 4 – Extremely flammable and will readily disperse through air under standard conditions, flashpoint below 73°F(23°C).

Blue: Health Hazard

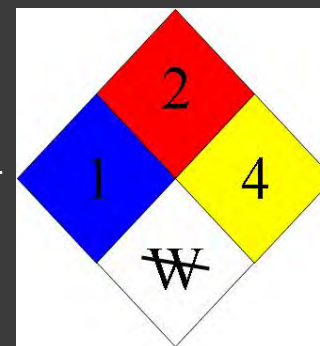
- 0 – Hazard no greater than ordinary material.
- 1 – May cause irritation; minimal residual injury.
- 2 – Intense or prolonged exposure may cause incapacitation; residual injury may occur if not treated.
- 3 – Exposure could cause serious injury even if treated.
- 4 – Exposure may cause death.

Yellow: Reactivity Hazard

- 0 – Stable .
- 1 – May become unstable at elevated temperatures and pressures, may be mildly water reactive.
- 2 – Unstable; may undergo violent decomposition, but will not detonate. May form explosive mixtures with water.
- 3 – Detonates with strong ignition source.
- 4 – Readily detonates.

White: Special Hazard

- OX** Strong Oxidizer.
- W** water reactive.



MSDS

The Material Safety Data Sheet (MSDS) is a form that provides information on chemicals regarding:

- Physical properties.
- Toxicity and health effects.
- Safety, handling and disposal procedures.
- Response to exposure and first aid.
- Reactivity.
- Protective equipment and clothing requirements.
- Spill response.



The data sheet format may differ from form to form. Data sheets often begin with specific materials characteristics (color, smell, boiling point, etc.), toxicity, safety precautions, and first aid response. Data sheets often also include lengthy and specific material descriptions that should be read prior to chemical use.

MSDS



- The MSDS of all materials in the cleanrooms.
- Locations of MSDS notebooks:
 - Gown room
 - Material data sheets can and should be found via internet search prior to working with chemicals.
 - Typical search terms: 'MSDS + *chemical name*'.
 - *Future Nano Center web site.*

MSDS terminology

Pyrophoric

Flammable, will combust spontaneously in contact with air without spark or ignition. An example is silane.

Flash point

The lowest temperature at which a material will form a combustible mixture with air, normally by first producing vapor.

Exothermic reaction

In chemistry, this is a reaction that produces excess heat. In contrast, endothermic reactions absorb heat.



MSDS terminology

- **Acute exposure**
Specifically, a single exposure to a substance.
With regards to toxicity, acute exposure often means a single exposure incident that may result in physical harm or death.
- **Chronic exposure**
Specifically, long term exposure to a substance.
With regards to toxicity, chronic exposure occurs over months or years and build up over time.
The effects may be irreversible and may include genetic mutation
- **Local exposure**
Exposure to a substance that is localized to small area of the body or skin.
- **Systemic exposure**
Exposure to a substance that occurs over the whole body or bodily systems.
Mostly occurs by adsorption, swallowing, or breathing.



MSDS terminology

- **Acute effects**

Specifically, effects that are seen hours or days after exposure to a substance.

- **Chronic effects**

Specifically, long term effects that occur after exposure to a substance.

- **Local effects**

Effects that occur over a small area of the body, typically the area of contact with a substance.

- **Systemic effects**

- Effects that occur over the whole body, or areas of the body other than those that contacted the substance.

- **Allergies and hypersensitivity**

Allergic reactions, or sensitivities, are unexpected and abnormal immunological responses of the body following exposure to certain substance. In general, the response is not associated with disease. Allergic reactions are considered positive immunological responses of a healthy body. Allergic reactions are considered negative when they are 'faults' in the immune system.



MSDS terminology

- **IDLH** – Immediately Dangerous to Life and Health
Often expressed in parts per million (PPM), IDLH is the amount of substance that need be present where any exposure is considered life threatening or resulting in permanent injury.
- **STEL** – Short Term Exposure Limit
The amount of a substance that need be present where exposure for less than 15 minutes or less will not cause physical injury.
- **PEL** – Permissible Exposure Level
The legally allowable amount of exposure to a substance. Normally given in PPM and often time weighted where exposure to higher level are acceptable as long as the average concentration over 8 hours remains lower.
- **LD50 or LD₅₀** - Median Lethal Dose
The abbreviation of 'Lethal Dose, 50%.' Refers to the amount of a substance required to kill 50% of a tested population (humans).
It is generally used as an indicator of a substance's acute toxicity.
Often given as grams or mg or µg of substance per kg of body mass of an individual. This is not the lethal dose for all subjects, some individuals may be killed by much less.



MSDS terminology

- **Carcinogen**
Any substance that promotes or causes cancer.
- **Mutagen**
Any substance that changes in an organism's genetic information (typically DNA).
Many mutations cause cancer, thus many mutagens are also carcinogens.
- **Teratogen**
Any substance that can cause embryonic deformities or as are commonly known as birth defects.



Scheduling

Long Reservation

Date: From hour (HHMM): To hour (HHMM):

CURRENT USER: ASSAFHA OTHER USERS

Enter as another user

Enter as user: Allow past updates

Userid: Account: Supervisor:

Nanofabrication (Microtechnology) (Alex Yoffe: 4970)

Hours: 00:00 - 08:00 08:00 - 20:30 17:00 - 00:00 Work Inf:

Account: UNIT:ASSAFHA

Instrument: All instruments From: 16/06/2014

SEND my calendar a meeting appointment for my reservations

Consulting Needed Send me an email whenever someone cancels

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Instrument	Disp Date	Hours	pilled																			
Photolithography	16/06/2014 Mon	0800 0830 0900 0930 1000 1030 1100 1130 1200 1230 1300 1330 1400 1430 1500 1530 1600 1630 1700 1730 1800 1830 1900 1930 2000 2030																				
Mask Aligner	16/06/2014 Mon	0800 0830 0900 1000 1030 1100 1130 1200 1230 1300 1330 1400 1430 1500 1530 1600 1630 1700 1730 1800 1830 1900 1930 2000 2030																				
Acid workstation	16/06/2014 Mon	0800 0830 0900 1000 1030 1100 1130 1200 1230 1300 1330 1400 1430 1500 1530 1600 1630 1700 1730 1800 1830 1900 1930 2000 2030																				
E-beam lithography workstation	16/06/2014 Mon	0800 0830 0900 1000 1030 1100 1130 1200 1230 1300 1330 1400 1430 1500 1530 1600 1630 1700 1730 1800 1830 1900 1930 2000 2030																				
E-Beam Writer	16/06/2014 Mon	0800 0830 0900 0930 1000 1030 1100 1130 1200 1230 1300 1330 1400 1430 1500 1530 1600 1630 1700 1730 1800 1830 1900 1930 2000 2030																				
Yo Evaporator	16/06/2014 Mon	0800 0830 0900 0930 1000 1030 1100 1130 1200 1230 1300 1330 1400 1430 1500 1530 1600 1630 1700 1730 1800 1830 1900 1930 2000 2030																				
Edwards Evaporator	16/06/2014 Mon	0800 0830 0900 0930 1000 1030 1100 1130 1200 1230 1300 1330 1400 1430 1500 1530 1600 1630 1700 1730 1800 1830 1900 1930 2000 2030																				
Edwards sputter	16/06/2014 Mon	0800 0830 0900 0930 1000 1030 1100 1130 1200 1230 1300 1330 1400 1430 1500 1530 1600 1630 1700 1730 1800 1830 1900 1930 2000 2030																				
AJA Sputter	16/06/2014 Mon	0800 0830 0900 0930 1000 1030 1100 1130 1200 1230 1300 1330 1400 1430 1500 1530 1600 1630 1700 1730 1800 1830 1900 1930 2000 2030																				
ICP	16/06/2014 Mon	0800 0830 0900 0930 1000 1030 1100 1130 1200 1230 1300 1330 1400 1430 1500 1530 1600 1630 1700 1730 1800 1830 1900 1930 2000 2030																				
SLR ICP PT	16/06/2014 Mon	0800 0830 0900 0930 1000 1030 1100 1130 1200 1230 1300 1330 1400 1430 1500 1530 1600 1630 1700 1730 1800 1830 1900 1930 2000 2030																				
PECVD PT	16/06/2014 Mon	0800 0830 0900 0930 1000 1030 1100 1130 1200 1230 1300 1330 1400 1430 1500 1530 1600 1630 1700 1730 1800 1830 1900 1930 2000 2030																				
RTP	16/06/2014 Mon	0800 0830 0900 0930 1000 1030 1100 1130 1200 1230 1300 1330 1400 1430 1500 1530 1600 1630 1700 1730 1800 1830 1900 1930 2000 2030																				
ALD	16/06/2014 Mon	0800 0830 0900 0930 1000 1030 1100 1130 1200 1230 1300 1330 1400 1430 1500 1530 1600 1630 1700 1730 1800 1830 1900 1930 2000 2030																				
Plasma Asher	16/06/2014 Mon	0800 0830 0900 0930 1000 1030 1100 1130 1200 1230 1300 1330 1400 1430 1500 1530 1600 1630 1700 1730 1800 1830 1900 1930 2000 2030																				
Bonder	16/06/2014 Mon	0800 0830 0900 0930 1000 1030 1100 1130 1200 1230 1300 1330 1400 1430 1500 1530 1600 1630 1700 1730 1800 1830 1900 1930 2000 2030																				
SEM	16/06/2014 Mon	0800 0830 0900 0930 1000 1030 1100 1130 1200 1230 1300 1330 1400 1430 1500 1530 1600 1630 1700 1730 1800 1830 1900 1930 2000 2030																				
Dectak profiler	16/06/2014 Mon	0800 0830 0900 0930 1000 1030 1100 1130 1200 1230 1300 1330 1400 1430 1500 1530 1600 1630 1700 1730 1800 1830 1900 1930 2000 2030																				
Ellipsometer	16/06/2014 Mon	0800 0830 0900 0930 1000 1030 1100 1130 1200 1230 1300 1330 1400 1430 1500 1530 1600 1630 1700 1730 1800 1830 1900 1930 2000 2030																				
Scriber	16/06/2014 Mon	0800 0830 0900 0930 1000 1030 1100 1130 1200 1230 1300 1330 1400 1430 1500 1530 1600 1630 1700 1730 1800 1830 1900 1930 2000 2030																				

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- 1) Go to the website: <https://prodis.weizmann.ac.il/pls/htmlldb/f?p=133:399>
- 2) Login.
- 3) Set the date you want to schedule.
- 4) Mark the time for the desired instrument.

Cancelling scheduled work

- It is advised to plan your work and cancel your scheduling as soon as possible so other users will be able to use the instrument.
- As long as you are scheduled on the instrument you will be charged, even if you did not use it.
- cancellation is possible until the start of reservation time.





Please share any ideas you have to improve the cleanroom.



Thanks!

From the cleanroom staff

