

CCNS - Safety Refresher Nov 2018







- The safety refresher are <u>mandatory for ALL</u> <u>users</u>
- Cleanroom access and instrument usage will be denied for users who:
 - 1. Have not attended a safety refresher
 - 2. Have not satisfactorily completed the quiz

Consumables – Substrates and More

Substrates

- * Silicon wafers
- * Pyrex wafers
- * Fused silica wafers
- * Glass slides
- * Photomasks

General

- * Lab wipes
- * Swabs
- * Pipettes
- * Petri dishes







Photo-Resists & chemicals – to be used in CCNS facilities!!!



Consumables - Chemicals



Solvents

- * IPA
- * Acetone
- * NMP
- Ethanol
- Methanol

Developers

- * AZ726
- * AZ400K
- * PGMEA
- * MIBK

Acids

- * Acetic acid
- * Nitric acid
- * Hydrochloric acid
- * Phosphoric acid
- * Hydrofluoric acid
- * BOE
- * Chrome etchant
- * Titanium etchant
- * Nickel etchant
- * Aluminum etchant
- * Gold etchant*

Photoresists

- * AZ1505
- * AZ1518
- * AZ4562
- * AZ5214
- * SU-8 2000.5
- * SU-8 3005
- * SU-8 3050
- * Lor 5A
- * Lor 10B
- * PMGI SF5
- * PMGI SF9*
- * ZEP
- * PMMA
- * ma-N

Preparing for cleanroom work

Familiarity with chemicals and processes

- Read the MSDS
- Perform literature searches
- Consult with staff members
- Have a work plan

Appropriate clothing

- Long, preferably loose fitting, pants
- Closed-toe shoes made of leather or plastic
- No wool or other shedding material
- No contact lenses
- No makeup

Preparing for cleanroom work



Bringing anything in? Is it permitted?

Permitted

- Water bottles (left in the gowning room only)
- * Flash drives, phones, etc.
- * Laminated paper or paper in nylon sleeves
- Tweezers and tools
- * Wafers, other substrates

Not permitted



- * Cardboard
- * Regular paper
- * Pencils, erasers
- Powders
- * Any materials that tend to crumble
- * Not sure? ASK FIRST!

Anything brought into cleanroom <u>must</u> be wiped with ethanol

Gowning in Engineering

Proper order:

- o. Blue shoe covers
- Step on sticky mat
 - 1. Head cover
 - 2. Face mask*
 - 3. Coveralls
 - 4. Booties
 - 5. Gloves
 - 6. Safety Glasses

The order of gowning prevents contamination.







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Gowning in the Nano Center

Proper order:

- o. Blue shoe covers
- Step on sticky mat
 - 1. Head cover
 - 2. Face mask*
 - 3. Coveralls
 - 4. Gloves
 - 5. Safety Glasses

The order of gowning prevents contamination





Gowning in Glove Box Farm, 301

- -

Proper dress:

- 1. Lab coat
- 2. Gloves
- 3. Safety Glasses

Glove box specific:

- 1. Take off rings, bracelets, etc.
- Put cotton gloves on top of latex gloves





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Gloves



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- * Latex always worn
- Nitrile worn on top of latex for lithography and light chemical work
- Tri-polymer or rubber worn on top of nitrile and latex when handling acids



Before leaving a chemicals room or before picking up a phone:

• Wash and dispose of <u>or</u> return outer layer of gloves

Put on new gloves before continuing chemical work





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Types of gloves available

Removing Gloves



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Do not touch your skin with the outer side of the gloves



Gowning for Acid Work



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- 1. Latex gloves
- 2. Nitrile gloves
- 3. Safety glasses
- 4. Apron
- 5. Tri-polymer gloves
- 6. Face shield

Check for holes and acid residues before using the apron and gloves



Removing Tri-Polymer Gloves



- 1. Rinse and dry rubber gloves
- 2. Take off first glove like a lady





- 3. Use 1st glove to take off 2nd glove
- 4. Check for holes and notify MNCF staff



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- * Safety glasses must be worn at <u>ALL</u> times upon entering cleanrooms and other laboratories!
- * The ONLY exception is when using a microscope
- Dark UV protective glasses are found near mask aligners and evaporators





Glasses

Cleanroom hazards









Electricity



Extreme temperatures



UV and laser radiation



High and low pressure



Machinery

Cleanroom hazards

- * Multiuser lab/equipment:
 - Non standard processes
 - * R&D tools
- * Students:
 - * work fast
 - non-experienced

more hazards & down time

Minimizing risks Chemicals

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- * Working alone on benches is forbidden! (New Regulation!!!)
- Read the MSDS
- Keep solvents and acids separate
- AAA: <u>Always Add Acid</u> to water
 (for piranha: add H₂SO₄ to H₂O₂)
- Wear apron, face shield and tri-polymer or rubber gloves when handling acids
- <u>Always</u> work with a cleanroom certified buddy after normal hours (18:00-08:00)

Chemicals

Minimizing risks

- * Keep work area clean and organized
- * Do not block fume hood intake holes
- If you need to leave the chemicals unattended, label the chemicals by: Date, chemical name, your name, your phone number
- * Work at least **15 cm** inside the fume hood
- * Use litmus paper, don't assume its water









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Chemicals

- * <u>Repeatedly</u> check gloves for contamination
- * Remove gloves before opening doors, answering phones
- * Do not use phone while working with chemicals
- Do not place phone or other personal belongings in the fume hood
- Replace gloves before continuing chemical work
- * Do not touch skin with gloved hands



Hotplates

- * You must be present when heating chemicals
- * Never leave the cleanroom with chemicals on a hotplate
- Do not heat solvents with boiling points lower than 60 °C (140°F) e.g. acetone
- * A switched off hotplate might still be hot!
- * Turn it off (or down to room temp) when finished
- Always check that glassware is free of cracks and chips before placing on a hotplate

High and Low Pressure

High pressure sources:

- Load locks and vacuum chambers after venting
- * CPD
- Issue: violent decompression
- Solution:
 - 1. Open lock closure before venting
 - 2. After extracting sample from load lock, pump lock to 10⁻² Torr, stop lock pump and open lock closure before leaving the system

Low pressure sources:

- * Vacuum chambers under vacuum
- **Issue:** pinch points
- Solution: keep hands away from pinch points

Machinery

Sources of pinch points:

- * Loadlocks
- * Vacuum chambers
- * Nanoimprinter

Issue: pinch points

Solution: keep hands away from pinch points



MRC sputter





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Extreme Temperatures

Sources of extreme temperatures:

- * Hotplates
- * Ovens
- * PECVD
- * ALD
- * LN₂

Minimizing risks:

- * Turn hotplates and ovens off after use
- * Use timers when possible
- * Wait until 50°C to open PECVD chamber
- Wear insulating gloves and goggles when dispensing LN₂

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UV radiation

Sources of UV radiation:

- * Mask aligners
- * Evaporators
- * Plasma etchers

Minimizing risks:

- * Use proper glasses when viewing evaporator crucible
- Turn around during exposures
- * Inform users around you of exposure





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Laser radiation

Sources of laser radiation:

- * ELAS femtosecond laser micromachining system
- * Heidelberg DWL-FS66 laser writer

Minimizing risks:

- * Both machines have interlocks that cut off laser if door is open
- * Both machines are class 1 lasers under normal operating conditions
- * Only certified superusers and company technicians are allowed to open the system exposing the optical elements



Call security at x8222 or x5555 03-640





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Chemicals – Eyes

- * Time is critical!
- Flush with water using eyewash for <u>AT LEAST 15 MINUTES</u>
- Inform those around you and the cleanroom staff of your situation
- * Seek medical care as soon as possible!



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Eye wash and showers

Engineering cleanroom



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Eye wash and showers

Nano Center



Portable eyewash



Across from Cleanroom Hallway

Call security at x8222 or X5555



Eye wash and showers

301



Call security at x8222 or X5555

Chemicals – Skin

* Time is critical!

- If your clothing has been exposed, first take off clothes then use shower
- Wash the area immediately for <u>15 MINUTES</u> in the nearest faucet or eyewash
- * For larger exposures, take off clothes and use shower
- Inform those around you and the cleanroom staff of your situation
- * Seek medical care as soon as possible!

Reminder:

The cleanroom suits do <u>NOT</u> protect you from chemical spills





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Chemicals – HF

- Exposure to concentrations <20% may not cause any sensations or feelings initially
- * Visible signs of HF exposure may not appear until the next day
- * Extreme pain may occur without corresponding external signs
- * High concentrations (49%) will cause an immediate, painful response
- * HF will absorb through the skin and muscle until it reaches bone where it will begin react with and decalcify the bone
- * Exposures of 2% of body area can decrease calcium levels in the body effecting heart function to the point of death

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HF treatment kits





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HF treatment kits



HF treatment kit contents:

- Calcium gluconate cream
- Hexafluorine eye rinse
- MSDS
- HF burn management review article

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Chemicals – HF – Skin

* Time is critical!

- Wash the area immediately for <u>15 MINUTES</u> in the nearest faucet or eyewash
- * Apply generous amount of calcium gluconate cream to exposed area, take the cream with you
- * Inform those around you of the exposure
- Have a friend inform the hospital of the situation, go to the hospital with the MSDS and HF burn management review article
- * At the hospital, the doctor may inject calcium gluconate solution into the affected area

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Chemicals – HF - Eyes

- * Time is critical!
- * Immediately rinse with hexafluorine eyewash
- * Continue wash for at least <u>5 MINUTES</u>
- * Inform those around you of the exposure
- Continue to rinse in eye wash until leaving for hospital
- * Have a friend inform the hospital of the situation
- Go to the hospital with the MSDS and HF burn management review article



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Electrical shock

Dos

- * Switch off the main switch
- Break the contact between electrical source and the injured using rescue hook
- * Call for help! Cleanroom staff and security
- If breathing and heartbeat has stopped begin C.P.R (if you are trained)

Don'ts

- * Don't touch the patient directly
- * Don't go near the area if high voltage is suspected







Electrical shock

EMO (emergency off button/switch)







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Defibrillator



Defibrillators can be found throughout every building in the case of sudden cardiac arrest. Once turned on, the defibrillator will instruct you in what to do



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Chemical Spills

- * Always notify MNCF staff
- In case of liquid spills inside the fume hood, clean with wet lab wipe or chemical sleeve
- In the case of small liquid spills outside the fume hood, inform all users and mark the area, put on gas mask and clean with wet lab wipe or chemical sleeve
- * In the case of large spills (>0.5 liters) or **any amount of HF** inform all users and leave immediately without degowning
- * After all liquid has been absorbed, wash the area with water
- Spills in hard to reach places, or HCl, should be absorbed with granules like Chemizorb
- * All materials should be disposed of in two plastic bags (one within the other), and placed in the fume hood.

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Fire

- * In the event of a small fire that does not pose <u>any</u> danger to you, use a fire extinguisher to extinguish the fire at the source
- * There are fire extinguishers in every room and the extinguishers are suitable for use with chemicals
- To extinguish a chemical fire, stand ~3 m away and aim the extinguisher at the top of the fire

If the situation endangers your health or life:

- Do not degown
- Leave the area immediately through the nearest exit



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Alarms

- * Fire
- * Dangerous gases (PECVD Eng; ALD Nano)
- Hood fume suction fault Nano

Tzeva adom – find closest shelter

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Contamination

- * Skin should never touch any surface in the cleanroom
- * Never touch skin with gloved hands
- * Frequently check gloves for contamination
- Dispose of nitrile gloves before leaving chemical rooms or answering phones
- * Handle all chucks, crucibles, etc. with double gloves
- * Throw vacuum grease swabs away after use
- * Don't use carbon tape in evaporator (if you must, clean the sample holder after use!)

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Waste Disposal

- After use, dispose of all chemicals in proper waste bottles
- * Do not close waste bottle with cap before it is full
- Chemicals that are not water soluble (e.g. PGMEA) should be rinsed with IPA followed by water. Repeat rinse
- Empty chemical bottle used for waste should be rinsed fully three times before use



Waste Disposal

 Empty chemical bottles used for waste should be rinsed fully three times before use









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Sharps Waste Disposal

ALL glass, silicon, blades, broken glassware, etc. must be disposed of in orange or red sharps waste receptacles





Do not dispose of **ANY** other garbage in the sharps waste



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- * Always be considerate
- * The cleanroom is a public laboratory
- Leave the work areas as clean or cleaner than you found them

Presentation available at: http://nano.tau.ac.il/mncf/index.php/msds

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* For NANO Building users

- Wait for an email regarding waste disposal date
- * Make a list of your waste chemicals
- * Bring the list and the chemicals



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Thank you for your attention!

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