NanoFab Access Training and Orientation
Cleanroom Access

To enter the cleanroom you need to complete:

- NanoFab New User Form online ([Link](#))
- Turn in a signed NanoFab User Agreement
- General Lab Safety Training or certificate of training administered either at a CUNY School or Columbia University
- Online ASRC NanoFab Safety Training and Quiz
- Cleanroom Orientation walk-thru and checklist sign-off
- Badger account sign-up
- Process specific training (provided by cleanroom staff)
General Rules and Restrictions

• All rules must be observed at all times by all persons qualified to work in the cleanroom
• Remember that not following these rules can result in temporary or permanent loss of cleanroom privileges
• A more comprehensive description can be found in the NanoFab Rules of Conduct and Use document (Link)
Cleanroom Safety

- Only qualified individuals may enter the cleanroom, unless permission has been granted by NanoFab staff.
- All equipment use must be logged in Badger.
- In order to use equipment you must be a certified user.
- Review Material Safety Data Sheets (MSDS) for any chemicals you may use.
- Check any item used (especially clean room gowns and PPE) for contamination or defects before use.
- Bring only essential items into the cleanroom.
- NEVER WORK ALONE!
<table>
<thead>
<tr>
<th>Team Member</th>
<th>Position</th>
<th>Office Phone</th>
<th>Ext (Internal)</th>
<th>Cell Phone</th>
<th>Email</th>
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</thead>
<tbody>
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<td>Public Safety</td>
<td>Public Safety</td>
<td>23000</td>
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Hours of Operation

• **Normal Operation Hours** = 8:00am to 6:00pm weekdays, except CUNY staff holidays

• **After-Hours Operation** = 7:00pm to 8:00am workdays, and all weekend and CUNY staff holiday hours. An up to date list of all CUNY staff holidays can be found at [http://www.cuny.edu/academics/calendars.html](http://www.cuny.edu/academics/calendars.html).

• Remember, you can never work alone!
Buddy System

During After-Hours, a Buddy system rule is in effect at all times inside the cleanroom. The User must ensure there is a willing and qualified second person according to the following guidelines:

1. A Buddy must be a registered cleanroom user and must be located in the cleanroom at the time of duty.
2. The Buddy is allowed to leave the cleanroom, but cannot leave the ASRC and must check on the user every 30 minutes either electronically (phone/text) or in person.
3. At least one of the buddies must have C-14 Laboratory Certificate of Fitness issued to the address 85 St. Nicholas Terrace, New York, NY 10031

Failure to abide by the After-Hours Policy will result in loss of cleanroom access
Emergency Response

In event of fire:
• If the fire is small enough, use the fire extinguisher to put the fire out
• Notify others in the cleanroom and evacuate lab
• Notify cleanroom staff

In event of medical emergency:
• Call 911 if life threatening
• Follow procedures described later in this document specific for each type of event

In event of flooding or utility problem:
• Contact staff
• Shut off water supply if you can identify the source

If there is a non-NanoFab building issue:
• Contact building manager David Salmon at 212-413-3350
Alarm Systems & Exits

Fire Alarm Strobe

**Fire Alarm**: Exit the cleanroom and the building

Gas Detection Alarm

**Blue Alarm** (High detection levels): Exit the cleanroom and building

**Orange Alarm** (Low detection levels or a chemical spill): Exit the cleanroom

**Green Light**: Normal / safe conditions
Evacuation Procedure

• Secure your process
• As you proceed to a exit door ask other lab members to follow
• Exit the building through the nearest exits
• The assembly area for the NanoFab is across St. Nicholas Terrace on the park side of the street
• Remain available to pass on details you have about events that lead to an evacuation
Building Egress from the Cleanroom

Wait for all clear on the park side of St. Nicholas Terrace

Wait for all clear on the park side of St. Nicholas Terrace
Cleanroom Entry

- Cleanroom access is controlled by a dual card / iris reader located to the right of the gowning room entrance.
- Stand approximately 2’ from the box and hold your card to the reader until the system begins its audio cues.
- Align your eyes so that they are visible in the alignment mirror.
- The yellow indicator dot will turn green when you reach a correct position.
- Hold position until access is granted.
Shoe Cleaner and Bootie Butler

Shoe Cleaner: Place your foot and shoe together inside it. Hold the handle to steady yourself, then press the button. You'll feel a slight tug on your shoe from the moving brushes, but it won't damage your shoe.

Bootie Butler: Place shoe in bootie heal first, then toe. Then pull straight back until bootie releases from the butler. Do not pull upwards.
Appropriate Attire

• Full length pants must be worn at all times
• Avoid clothing that is especially fuzzy or tends to produce a lot of lint or static electricity
• No muddy shoes
• No sandals, open toe shoes, hi-heels or bare feet
• Only closed-toed shoes are allowed
Gowning Procedure

• Proper attire requires before entering cleanroom:
  – Safety glasses, bouffant cap, nitrile gloves, shoe covers, gown, boot covers.

• Safety glasses must be worn at all times! Safety
  – Contact lenses discouraged: They can trap abrasive chemicals next to eyes.
Allowed & Prohibited Items

<table>
<thead>
<tr>
<th>Prohibited</th>
<th>Allowed</th>
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</thead>
<tbody>
<tr>
<td>Cardboard and Paper</td>
<td>Plastic</td>
</tr>
<tr>
<td>Pencils</td>
<td>Cleanroom paper and notebooks</td>
</tr>
<tr>
<td>Cloth items</td>
<td>Pens</td>
</tr>
<tr>
<td>Hats and coats</td>
<td>Synthetic fabrics (polyester, nylon)</td>
</tr>
<tr>
<td></td>
<td>Paper items sealed in plastic</td>
</tr>
</tbody>
</table>

- Cleanroom notebooks are required for taking notes in the cleanroom
- Cleanroom paper will be available for all notes
- All approved items that are brought into the cleanroom must be wiped down to remove dust particles and oil
General Lab Practices

• Walk, do not run while in the lab
• Food or drinks are not allowed in the NanoFab
• Cellular phone and/or headphones use is permitted in gowning area or wipe down room only
• Visitors and non-qualified users are allowed only by pre-approval
  – Request permission from cleanroom staff
• Always remove your gloves as you exit the laboratory
• It is recommended lab users wash their hands after leaving the NanoFab
Material Safety Data Sheets

• Also known as MSDS and SDS (Safety Data Sheets)

• You must thoroughly review a chemical’s MSDS before using that chemical.

• Copies of MSDS’s for all chemicals can be found in:
  – The Gowning Room
  – Online (soon to come)
Working with Chemicals

- Special training is required before you are allowed to use chemicals in the cleanroom.
- Know if the chemicals you use must be used in glass or plastic beakers.
- Always wear appropriate protective equipment (PPE).
- Never wear PPE outside of the wet bench area.
- Always stand when working at wet benches.
- Only work with chemicals in their designated areas.
Working with Chemicals

- Assume any liquid is potentially dangerous.
  - Contact staff to dispose of unidentified chemicals
- Only use dedicated tanks/baths as they are designated.
- Uncap only one bottle at a time. Pour chemicals slowly.
- Keep gloves dry and clean.
- When using hot plates, only heat Pyrex beakers.
- Constantly monitor temperature.
Working with Chemicals

• When mixing chemicals:
  – Pour acids into water (exception being Piranha).
  – Do not mix acids and solvents.
  – Do not mix halogenated solvents with non-halogenated solvents.
  – Label all mixtures.

• Do not leave chemicals unattended.

• Do not pour chemicals back into storage bottle.
Working with Chemicals

• Always replace the cap securely.
• Clean up your work area.
• Place empty bottles on the bottom shelf of the chemical cabinet it came from, cross out the chemical name and warning symbols, and label it as empty.
• Make sure all PPE is clean and dry before returning it to storage areas.
Hoods and Carboys

- Always check to make sure exhaust is above .1 inches of water
- Notify staff if below the lower limit

- Pour waste into appropriate carboy chutes
- Chutes are labeled directly above

Nitrogen gun
(blue hose)

Di water gun
(white hose)
Labeling Chemicals in Hoods

When working with chemicals in a hood, use a cleanroom wipe to properly label the contents:

- Chemical Name (no formulas)
- Your Name
- If you plan to be away from the bench for an extended period or time or leave the cleanroom, add the date and process start time.
Working with Chemicals

• All wet chemical work must be performed at a NanoFab sink.

• You **must** wear protective equipment (PPE) when working with any chemicals:
  – Chemically resistant gloves, face shield & apron.
  – Safety glasses must be worn under the face shield at all times
  – It is highly recommended that you make a cuff in the gauntlet gloves

• You must wear chemically-rated gloves, chemical resistant apron and a face shield when working with any chemicals.
  – The only exception to this rule is the chemically resistant gloves are not required when handling small amber bottles of photoresist.
Personal Protective Equipment (PPE)

• For personal protection against chemical spills.
• These are chemical resistant – not chemical proof.
• Always wear when working with chemicals.
• Always inspect Personal Protective Equipment before and after use.
  – Check for holes, stains and other indicators of contamination
• Do not wear PPE outside of the wet bench area
How to Wear PPE

1. Inspect Apron
2. Tie Apron
3. Use 10% IPA in Water on towel to clean Face Shield
4. Put on Face Shield
5. Adjust Face Shield
6. Put on Chemical Resistant Gloves over apron sleeves

Note:
1. Check gloves, apron and face shield for contamination. If not easily cleaned, throw away.

2. Wash gloves

3. Dry Gloves using a towel

4. Remove and Hang Face Shield

5. Remove and Hang Apron
Showers and Eye Wash Stations

There are 3 eye wash / shower stations in the NanoFab

ASRC NANOFABRICATION FACILITY
Chemical Storage

- Common chemicals are supplied by the NanoFab.
  - For use in NanoFab ONLY.
  - Chemicals are stored in lab member accessible labeled cabinets throughout the lab.

- Lists of contents are posted on each chemical storage cabinet
- HF acid has its own storage cabinet
Special Chemicals

- A “Special Chemical” is a proper name for any chemical not supplied by the NanoFab.
- Special Chemicals must be approved prior to bringing them into the NanoFab.

Approval Process:
- Obtain a Material Safety Data Sheet (MSDS)
- Email MSDS to Jacob Trevino and request special chemical review
- Once approved, print out a label with the appropriate information
- Even if previously approved, additional purchases of the same chemical must go through the approval process to maintain up to date chemical inventories
- It is recommended that you complete the approval process prior to ordering chemical
- Special Chemicals may require special hazardous waste disposal methods
Sharps and Biohazard Bins

• All solid waste that has come in contact with photoresist must be discarded in either red sharps or biohazard bins

• Dispose needles, pipettes, razor blades, and other sharp objects in red “sharps” bins.

• Non-contaminated wipes are not to be disposed of in red biohazard bins
Sharps and Other Dangerous Objects

- Dispose broken wafers, needles, razor blades, and other sharp objects in red “SHARPS” bins.
- Mercury thermometers are banned from the lab.
Chemical Exposures (Except HF)

• Have someone call 911 and notify staff
  – The person calling 911 should find the MSDS for the chemical and have it ready for them when they arrive and stay with the exposed person
  – All MSDS are located in the gowning room
• Remove the affected clothing.
• Rinse the exposed areas with water for 15 minutes using a safety shower or eyewash.
• Notify staff after exposure using the posted Emergency Contact Information.
• In an emergency, the deck hoses are usually your closest source of water.
Eye Exposure

If eyes are exposed:

• Flush eyes for at least 15 minutes – NOT LESS!
  – Use an eye-wash
  – Sinks have DI deck guns which can be used followed by an eye wash.

• Contact staff for assistance or call 911.

• Follow up eye exposures with visit to a medical professional.

• Lab members should assist a colleague in the event of an eye exposure!
HF Burns

• HF acts as an anesthetic, you may not feel the burn until damage is already done

• Have someone call 911 and notify staff
  – The person calling 911 should find the MSDS for the chemical and have it ready for them when they arrive and stay with the exposed person
  – All MSDS are located in the gowning room
  – Bring calcium gluconate gel to the ambulance and continue to apply

• Remove affected clothing, flush with cold water for 5 minutes

• Massage calcium gluconate ointment from safety stations onto exposed area

• Notify staff after exposure, using posted Emergency contact information
TMAH Exposure

• TMAH is used in photoresist developer @ ~ 3%
• It is hazardous by ingestion, inhalation, skin exposure or eye contact
• Exposure to concentrations > 15% may cause respiratory or heart failure – a ganglion inhibitor

If exposed:
  – Flush expose area with water for 15 minutes
  – Notify staff after exposure, using posted Emergency contact information
Safety Buddies

• If you see someone who is in distress, you automatically become their safety buddy
• Call 911
• Be sure you are wearing proper protective apparel before helping the victim
• Take MSDS to the ER
First Aid for Other (Minor) Incidents

Chemical Inhalation

- Check area for safety
- Close open containers
- Move victim to safety
- Call 911
- Resuscitate with rescue breathing if necessary

Chemical Ingestion

- Call 911 and notify staff
- Immediately go to ER
First Aid for Other (Minor) Incidents

Thermal Burn
• Immerse burned area in cold water
• Cover with sterile dressing
• Call 911 if severe

Bleeding
• Place clean pad and pressure on the wound
• If excessive get medical attention

Clothing Fire
• Douse victim with safety shower or smother with fire blanket
• CALL 911
Chemical Spills

Simple Spill:
• Does not spread rapidly
• Is not toxic
• Does not endanger people or property (except by direct contact)
• Does not endanger environment outside of building
• Contained entirely in the fume hood

Large Spill:
• Spreads rapidly
• Toxic
• Endangers people or property
• Endangers outside environment
• More than ½ a gallon of liquid
• Any amount of HF
Simple Spill

- Check self for contamination
- Check bench and floor for contamination
- Warn surrounding users of spill and stay near the spill
- Contact cleanroom staff for cleanup
Large Spill

- Check self for contamination
- Alert other cleanroom users to evacuate and press the **EVACUATE** button located next to the gowning room hallway slider
- Notify cleanroom staff
- If it is safe, stay with the spill till staff arrives to transfer any relevant information about the spill
EMO Buttons

• Only push in the event of life threatening emergencies such as visible flames or electrocution
• A process malfunction is not an emergency
• Pressing this button will most likely damage the instrument
Tweezers and Glassware

• It is recommended that users provide their own cleanroom compatible tweezers and glassware
• We cannot guarantee the cleanliness of the community tweezers and glassware
• We can provide storage bins to users who wish to store their items on-site
• NanoFab staff can recommend vendors and specific items that are known to work well with particular processes
Citation Requirement

- User certifies that, where appropriate, acknowledgement will be given to The City University of New York Advanced Science Research Center NanoFabrication Facility in any of User’s publications or presentations that result from work performed with ASRC facilities or staff.
Cleanroom Orientation & Checklist

• You should now complete the Online Quiz.
• You should then attend an in person cleanroom walk-thru
  – You will be shown some of the key safety features of the cleanroom and how to operate the Badger lab management software
  – A checklist will be provided at the session to ensure you are familiar with these key features