

User Name & ID (Print):

PI (subject to change):

User Signature & Date:

Research Focus (subject to change):

User e-mail:

Extreme Hazards	Process Name	User Initials	Qualifier Initials	Date	User Initials	Qualifier Initials	Date	User Initials	Qualifier Initials
	Acetic Acid, Glacial								
	Ammonium Fluoride								
	Ammonium Hydroxide								
	Aqua Regia								
	Buffered Oxide Etch								
	HNA								
	Hydrochloric Acid (HCl)								
	Hydrofluoric Acid (HF)								
	Hydrogen Peroxide								
	Nitric Acid								
	PAN								
	Phosphoric Acid								
	Piranha								
	Potassium Hydroxide								
	RCA1 (Base)								
	RCA2 (Acid)								
SulphoNitric									
Sulphuric Acid									

Chemical Handling and Equipment	Process Name	User Initials	Qualifier Initials	Date	User Initials	Qualifier Initials	Date	User Initials	Qualifier Initials
	Breadth of Hazards								
	Haz Waste Management								
	Labeling Experiments								
	Pouring and Mixing								
	PPE Choice & Cleaning								
	Sharps								
	Work Station Use								
	KOH Bath								
	RCA Bath								
	Sonicators								
	Stir- and Hotplates								

Users: By initialing, you agree that you understand and will follow the SOP.

If you forget any rules it is your responsibility to seek help from the lab staff, who will happily provide further training.

User Name & ID (Print):

Tools	Process Name	User Initials	Qualifier Initials	Date	User Initials	Qualifier Initials	Date	User Initials	Qualifier Initials
	Alcatel DRIE								
	Cannon Aligner								
	CHA E-beam Evaporator								
	CHA Sputterer								
	CPD								
	Dektak 3030 and/or 2A								
	Dicing Saw								
	EVG Aligner								
	FEI NanoSEM								
FirstNano Nanowire CVD									
Karl Suss MA-4									
Lesker Sputter									
Mann PG									
MRL Furnace									
Nanonex									
PlasmaTherm Etcher									
RTP									
Solitec Spinner/Hotplate									
Spin Rinsers									
Technics PECVD									
Technics RIE									
UV Flood									

Common Lesser Hazards	Process Name	User Initials	Qualifier Initials	Date	User Initials	Qualifier Initials	Date	User Initials	Qualifier Initials
	Aqueous Developers								
	Chrome Etch								
	DMSO								
	EBL Developer								
	Halogenated Solvents								
	Monolayer Deposition								
	PR Diluents & Strippers								
	Squirt Bottle Solvents								
	Standard Photoresists								

Users: By initialing, you agree that you understand and will follow the SOP.

If you intend to use any of the listed chemicals, you must answer all of the following Common Procedures:

-----Common Procedures-----

Breadth of Hazards

1. What PPE should you wear if approaching an unknown chemical? Make sure to include everything you would use to protect your body, hands and face beyond your standard cleanroom wear.
2. What are the 3 major possibilities for explosions at NCNC?
3. What makes anesthetic chemicals so dangerous?

Haz Waste Management

1. You can conveniently aspirate almost any **acid** solutions at NCNC. What is an exception? There are many possible answers, but please pick just one.
2. What should you do with nearly empty bottles of chemicals? Should you return the bottle to its cabinet or discard the remaining chemicals and rinse the bottle?
3. If a waste bottle creates toxic fumes, how tightly should you cap it if using a normal cap?

Labeling Experiments

1. In what cases can you use chemical acronyms when labeling an experiment?
2. What should you put on overnight chemical bath labels?
3. Can you write your label on a tekwipe?

Pouring and Mixing

1. When mixing concentrated acids/bases with water, which should you mix into which?
2. When pouring hazardous materials from a bottle while wearing full PPE, why should you keep the base of the bottle over the work bench?
3. Roughly how long must you stir Sulphuric acid and water for the materials to fully mix and finish releasing heat?

PPE Choice and Cleaning

1. For each of the following, should you use a black or a blue glove: Acids, Bases, Oxidizers, Organics?
2. What processes are you allowed to double glove (wear a second pair of white nitriles) for?
3. How can you keep a pair of black butyl/Viton gloves clean when working messily with resist?

Sharps

1. Name any two common sharps at NCNC.
2. Where can you find gauze and bandages for first aid? Name any of the several locations.
3. Name any two of the common signs of infection.

Work Station Use

1. Which NCNC provided chemicals (if any) can attack a wetbench workstation (plenum) top?
2. How can you determine the pH of residues on a wetbench workstation (plenum).
3. What cleanroom device can you use to quickly remove rinse water from cleaning a wetbench workstation (plenum) top?

-----Chemicals and Mixtures-----

Acetic Acid

1. How resistant are NCNC's blue heavy nitrile gloves to concentrated (>40%) Acetic acid? Are they not resistant, splash resistant or emersion resistant?
2. Can you ignite heated Acetic Acid?
3. Should you store a new bottle of Acetic Acid with acids, organics or elsewhere?

Ammonium Fluoride

1. You find a spill that might be Ammonium Fluoride. What would the pH be?
2. What is the easiest way to dispose of Ammonium Fluoride solution that do not contain heavy metals?
3. Will heated Ammonium Fluoride create a vapor hazard? How about room temp?

Ammonium Hydroxide

1. How long will Ammonium Hydroxide residues last in cleanroom conditions? hours, weeks, years?
2. (Part 1) Will heated Ammonium Hydroxide present a vapor hazard? (Part 2) How about room temp?
3. What side effect will occur if your nose tingles from inhaled Ammonia fumes.

Aqua Regia

1. Is Aqua Regia a transient or persistent oxidizer?
2. Why should you mix a new batches of Aqua Regia rather than storing and re-using old ones?
3. Can you use Aqua Regia with Teflon beakers or dishes at NCNC?

BOE

1. You find a spill that might be BOE. What would the pH be?
2. How long do BOE burns take to become apparent? minutes, hours, days?
3. What is the easiest way to dispose of BOE solutions that do not contain heavy metals?

HNA

1. When capping an HNA waste bottle, how do you avoid explosion?
2. What labware can you use with HNA? Polypropylene, Teflon, Pyrex, Aluminum, Stainless?
3. What danger will you face when etching Silicon, especially in hot HNA?

Hydrochloric Acid (HCl)

1. Can you ignite hot HCl?
2. What additional contact hazard should you be cautious of if etching metals in HCl?
3. What is the white mist that erupts from HCl bottles?

Hydrofluoric Acid (HF)

1. Can you smell HF vapors before they reach chronically hazardous levels?
2. Is the poor splash warning-property more likely for diluted (~20%) or concentrated (~49%) HF?
3. Where at NCNC can you use hot baths of HF? Name all the possible locations.

Hydrogen Peroxide

1. Why do Hydrogen Peroxide bottles have special caps? What do they prevent?
2. Why should you never mix solvents (liquid organics) into H₂O₂?
3. When using a waste bottle of Hydrogen Peroxide with a non-venting cap how many “turns from tight” should the cap be?

Nitric Acid

1. What class (or classes) of chemical is Nitric Acid? Acid, Base, Fluoride, Organic, Oxidizer?
2. What and how hazardous is the brown gas that Nitric Acid occasionally emits?
3. Why is it hazardous to mix liquid organics into nitric acid?

PAN

1. When using a waste bottle of PAN with a non-venting cap how many “turns from tight” should the cap be?
2. Where can you dispose of PAN used to etch large amounts of Aluminum?
3. What is the NCNC approved mixing order of PAN? Don't forget the water!

Phosphoric Acid

1. How long will residues of Phosphoric acid persist? Hours, Weeks, Years?
2. Does Phosphoric acid have a vapor hazard at room temperature?
3. How does boiling Phosphoric acid create an especially hazardous vapor and residue?

Piranha

1. Though permitted, what hazards occur when mixing Hydrogen Peroxide into Sulphuric Acid rather than the NCNC recommended vice-versa?
2. Is Piranha a persistent or transient oxidizer?
3. Glycerol (a solvent) is added to many etches to attenuate the etch. Why would it be bad in Piranha?

Potassium Hydroxide

1. What and how hazardous are the bubbles formed when using Potassium Hydroxide as an etchant?
2. Where can you use hot baths of Potassium Hydroxide? Name all the possible locations.
3. Will concentrated (~50%) Potassium Hydroxide fume or leave hazardous residues at room temperature?

RCA1

1. What class (or classes) of chemical are in RCA1? Acid, Base, Fluoride, Organic, Oxidizer?
2. Where in NCNC can you use heated RCA1? Name all the possible locations.
3. What fumes will erupt from a heated RCA1 bath?

RCA2

1. When using a dedicated RCA bath can you add hydrogen peroxide after heating the rest of RCA2?
2. After using RCA2 on mostly clean wafers, can you decant (dump) RCA2 to the neutralizer?
3. What color is RCA2?

SulphoNitric

1. Are the residues created when simmering/boiling SulphoNitric temporary or long-lasting?
2. What is the first sign of a runaway etching in hot SulphoNitric? How should you stop it?
3. What may happen if you mistakenly dispose of SulphoNitric in the waste bottle for Piranha?

Sulphuric Acid

1. How resistant are NCNC's blue heavy nitrile gloves to concentrated (>40%) Sulphuric acid? Are they not resistant, splash resistant or emersion resistant?
2. How long will residues of Sulphuric acid persist? Hours, Weeks, Years?
3. When you first pour Sulphuric acid into water, it doesn't mix or heat up. How long should you stir to mix the two and create heat?