

WET BENCH SOP

Revised May 2020



GENERAL SAFETY RULES

- You must be a certified client to enter the Cleanroom and work at the wet benches.
- You must have received **ACID WET BENCH TRAINING** provided by a cleanroom staff member. You may request this training through FOM.
- You must wear the personal protective equipment (PPE) of chemical resistant smock, face shield and gloves for designated chemicals.
- You must never work alone. Always have a buddy in the cleanroom when working at a bench.
- **DO NOT** work with acids/bases in the solvent hoods. **DO NOT** work with solvents in the acid/base hoods.
- **DO NOT** cross outside the yellow line of the wet bay carrying any new or opened chemical bottles or wear PPE outside this bay unless working under emergency situations or following spill cleanup procedures.
- **DO NOT** dump chemicals from bench tanks. Tanks will be drained by Cleanroom staff members only.
- **DO NOT** fill up a tank unless it is a solvent tank. Acid and Base tanks may only be filled by MNTC staff.
- You are **NOT ALLOWED** to bring new types of chemicals inside the cleanroom without approval. Fill out a chemical request form if you are interested in having a new chemical available in the cleanroom.

WET BENCH BY PURPOSE

Each bench is designed for a specific type of process. An acid bench is dedicated to handle acids and a solvent bench is dedicated to handle solvents, the same protocol is followed for bases and oxidizers. The EDP, KOH, TMAH Benches may have IPA as part of some mixture. Refer to the tables below to learn about the purpose of each wet bench and always make sure you are using the correct chemical on its corresponding work station.

Processing utensils allowed at the Benches:

The following is a list of processing utensils allowed at the chemical wet benches:

- Tweezers
- Wafer boat holders (made of Teflon only)
- Cleanroom wipes
- Quartz and Pyrex Beakers
- Polypropylene beakers
- Wafer containers; keep them away from chemical tanks!
- Chemical and waste bottles (only when in use). Please remember to put bottles back in their corresponding chemical cabinet.

Table 1. Location: Wet Etch Bay

| Bench Name | Chemicals that can be used | Processes allowed at this bench |
|---------------------|---------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|
| Acid Bench | Hydrofluoric Acid Acetic Acid Aluminum Etch Chrome Etch HNA Nitric Acid Sulfuric Acid | Piranha Bath Aluminum Etch Chrome Bath BOE 6:1 Bath |
| KOH/TMAH Etch | KOH TMAH | KOH Bulk Etching TMAH Bulk Etching |
| RCA Clean Hood | Hydrochloric Acid HF 40:1 Ammonium Hydroxide | RCA-1 *NO METALS RCA-2 *NO METALS BOE Bath *NO METALS |
| Solvent Bench | 2 Propanol Acetone NMP Methanol Ethanol | 2-Propanol Clean Acetone Static Bath Methanol Clean LIFT-OFF Hot DI Water Ultrasonic Bath |
| EDP Bench | Gold Etchant Copper Etchant EDP Etching | Gold Etching Copper Etching EDP Etching |
| Electroplating Hood | Gold Electroplate Nickel Electroplate | Electroplating |

Table 2. Location: Lithography Area

| Bench Name | Chemicals that can be used | Processes allowed at this bench |
|------------------------|-----------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| Solvent Bench | 2-Propanol Acetone Methanol Toluene WNRD Xylene NMP Chlorobenzene Pyralin PD Rins | Photoresist Removal Toluene Bath WNRD Pattern Developing Xylene Bath Chlorobenzene Bath Pyralin PD Rinse |
| Developer Bench | MF-319 | MF-319 Pattern Developing |
| Hotplate/Spinner Bench | Positive Resist Negative Resist Adhesion Promoter SU-8 Polyimide | Spinning/Coating |

Table 3. Location: Thermal Bay

| Bench Name | Chemicals that can be used | Processes allowed at this bench |
|---------------------------|---------------------------------------------------------------------|---------------------------------|
| Hot Plate / Spinner Bench | Spin On dopants Adhesion Promoters Spin on Glass Polyimide | Spin On/Coating |

You Must Use a Beaker If:

- Your process will react or contaminate a tank.
- Your process will make the chemical in the bath unusable.
- If the chemical you need does not have an assigned tank.

Additional Rules:

- Use Polypropylene beakers for HF and BOE solutions.
- Use only glass beakers for heated chemical processes.
- Use glass beakers for solvents.
- **DO NOT** use household Pyrex pans or Bowls for **ANY** hotplate or heated process.
- **DO NOT** use polypropylene beakers for **ANY** hotplate or heated process.

CHEMICAL DISPOSAL

NOTE: You Should Never Dispose of Chemicals from a Bench or Tank without prior knowledge from the MNTC Staff.

Disposal in the Cup Sink: Non-Halogenated solvents at a solvent bench. Example: SU-8 Developer, IPA, Methanol, Acetone, WNRD, etc.

Disposal in a designated waste bottle: Aluminum Etch, HNA, Copper Etch, Gold Etch, Silver Etch. Once bottles are filled up leave the bottle in its corresponding chemical cabinet located in the Wet Etch or Photolithography Bay and contact MNTC staff.

CHEMICAL DISPOSAL GUIDE

Empty Bottles: Place all empty bottles at the EDP Bench in the wet etch bay.

Chemical waste which needs to be stored in a waste bottle:

- Potassium Iodide (KI) / Copper Etch
- Gold Etch
- Silver Etch
- Gold Etch
- All electroplating supplies

Chemicals that can be dumped down the sink and/or aspirated:

| | |
|-------------------------------|---------------------------|
| MF-319 | (115 X Base Develop Hood) |
| TMAH | (115 X Base Develop Hood) |
| KOH | (307 Base Hood) |
| TMAH/IPA solution | (307 Base Hood) |
| Hydrochloric Acid (no metals) | (LF8-2 RCA Clean Hood) |
| BOE (no metals) | (LF8-2 RCA Clean Hood) |
| RCA-1,2 Solutions (no metals) | (LF8-2 RCA Clean Hood) |
| Ammonium Hydroxide | (LF8-2 RCA Clean Hood) |
| Piranha Bath | (305 Acid Hood) |
| Acetic Acid | (305 Acid Hood) |
| Nitric Acid | (305 Acid Hood) |
| Sulfuric Acid (305 Acid Hood) | (305 Acid Hood) |

Chemicals that can be dumped in a cup sink:

| | |
|--------------------------|-------------------------------|
| Acetone | (LF8-1A Solvent Develop Hood) |
| Methanol | (LF8-1A Solvent Develop Hood) |
| IPA | (LF8-1A Solvent Develop Hood) |
| Ethanol | (LF8-1A Solvent Develop Hood) |
| Toluene | (LF8-1A Solvent Develop Hood) |
| Xylenes | (LF8-1A Solvent Develop Hood) |
| BTS-220 | (LF8-1A Solvent Develop Hood) |
| WNRD | (LF8-1A Solvent Develop Hood) |
| Pyralin PD Rinse | (LF8-1A Solvent Develop Hood) |
| Non Halogenated Solvents | (301 Solvent Mems) |
| Methanol | (301 Solvent Mems) |
| IPA | (301 Solvent Mems) |
| Ethanol | (301 Solvent Mems) |
| NMP | (301 Solvent Mems) |

Unattended Beaker Processing

If you are leaving a beaker unattended for any time it must be covered and labeled with the chemical contents, dated and initialed.

Wet Bench Inspection When Finished

- Before walking away from a wet bench make sure the following is in order.
- The bench is in a tidy condition and ready for the next user. All components need to be moved to the back of the bench.
- Dispose of all wipes used and do not leave any wipes on the deck of the bench.
- QDR's, Ultrasonic Baths, Timers and other operations need to be finished and silenced.
- Beakers must be left empty and clean.
- Nitrogen and DI water guns must be placed back into their compartments.
- Chemical Resistant Gloves need to be washed and dried with a towel, then placed on a table outside the wet benches.
- Inspect PPE before returning it to the apron/shield hangers. Please, report damage PPE so it can be replaced.

QUICK DUMP RINSE OPERATION (QDR)

START – Press this key activate the process.

STOP/RESET – This key will stop the QDR process if the number of cycles have not finished. Pressing the **STOP/RESET** key again will reset the QDR.

WET BENCH TIMERS

START – Press this key to start the timer.

STOP/RESET – This key will stop the timer. **STOP/RESET** key again will reset the timer.

DIGITAL HOTPLATE / STIRRERS

- Max temperature = 450°C
- Max timer = 99:59:59 hours
- Max stir bar rotation = 1500 RPM

STEP BY STEP OPERATING PROCEDURES:

1. Fill a Pyrex beaker with at least 800 ml of solution and place it on the hot plate. Insert your sample, stirrer bar and cage.
2. Insert the temperature probes into the beaker as shown.
3. Press the **LOW LEVEL LIMIT RESET** button. If the light indicator turns off that means the solution level is sufficient to start the hotplate controller screen.



4. Setting Solution Temperature by Probe:

Once the controller screen is on, press the Probe Temperature Button (shown in image) and use the up and down arrow buttons set a temperature value. Press **ENTER** to start heating up the solution. The value shown on the screen to the right of the probe temperature icon is the actual temperature of the probe in degrees centigrade. The letter **A** indicates the actual temperature of the probe. The letter **T** represents the target temperature. The display will toggle between **A** and **T**.



Setting the Hot Plate Temperature:

Press the Hot Plate Temperature Button (shown in image) and use the up and down arrow buttons to set the hot plate temperature. Press **ENTER**. The value shown on the screen to the right of the probe temperature icon is the actual temperature of the probe in degrees centigrade. The letter **A** indicates the actual temperature of the hot plate and the letter **T** represents the target temperature. The display will toggle between **A** and **T**.



Ramp: NOTE: If a ramp value is to be used, the ramp value must be set before setting a target temperature. Press the ramp button (shown in image). Using the up and down arrows select the desired value, and press **ENTER** (ramp values are always in centigrade per hour).



5. **Stirrer Rotation:** Press the stirrer button (shown in image) and using the up and down arrows to set the desired stirrer speed values (stirrer values are shown in revolutions per minute) then press **ENTER**.



6. **Timer:** Press the timer button (shown in image). The icon and the seconds digits in the display will flash. Press the arrow buttons to set the seconds followed by the timer icon again to set the minutes in a similar manner and hours. If only seconds or minutes are set, continue to press the timer button until it scrolls past hours. Press the timer button again to start the timer. When the timer counts down to zero it will alarm 5 times and start to count up. To stop the timer, press the down arrow.



7. **Auto Off:** When the Auto-off function is activated the heater will be shut off automatically when the timer counts down to zero. Press the Auto Off button (shown in image). The words **AUTO OFF** will appear in the display. To turn off the Auto-off function, simply press the **AUTO OFF** button until the words **AUTO OFF** disappear in the display.



8. **Shutting down:** When you process is finished remove the probes from inside the beaker and rinse them with DI water. **BE CAREFUL NOT TO TOUCH THE BEAKER WHILE THE UNIT IS HOT!** The hot plate will automatically turn off when the nitrogen probe is removed from solution.

9. **Clean up:** Make sure you wait until your beaker has cooled down in order to dispose of the solution). Once you have emptied the contents of the beaker wash it with DI water. Wipe the ceramic surface of the hot plate with DI water and a cleanroom wipe. **DO NOT USE SOLVENTS TO CLEAN THE CERAMIC HOPTPLATE SURFACE. USE ONLY DI WATER.**