

## Wet Bench Standard Operating Procedures

### **Purpose:**

This document provides guidelines for the use of the wet benches in the CSSER cleanroom. Since there are so many different processes that can be done using the wet benches, this document is intended as a set of general instructions, not a step by step manual.

**Your safety is your responsibility!** Some processes require very dangerous chemicals, heat, or unstable mixtures. Know what you are doing before you begin, and perform your processing as safely as possible.

### **Bench/Chemical Compatibility**

USE ONLY THE CORRECT BENCH FOR YOUR PROCESSING!!!! All processing needs to be done at a wet bench that is compatible with the chemicals being used. Use of the wrong bench can be unsafe, and could destroy the bench or the exhaust system, endangering future users. Contact CSSER staff with any questions.

Labels are attached to each bench displaying its type, and some benches may also have a sample list of chemicals allowed at the bench. This is not a complete list, it is a guideline.

### **Examples of Chemical Types:**

#### SOLVENTS

Photoresists  
Isopropyl Alcohol (IPA)  
Acetone  
Microstrip 2001  
SU-8 products

#### BASES

Developers  
AZ 400T  
TMAH

#### ACIDS

Buffered Oxide Etch 20:1 (BOE)  
Sulfuric  
Nitric  
Hydrochloric (HCL)

### **Bench type and location:**

Bench #1 - Acids ONLY (RCA Cleans). This is the only Acid bench with Hot Plates and Ceram glass for hot beakers. Located in RIE bay.

Bench #2 - Acids ONLY (Piranha clean and BOE tanks). Located in main isle next to Furnace bay.

Bench #3 - Bases ONLY (4'). Located on south wall of Photo bay. This bench has a constant temperature bath and only 1 sink.

Bench #4 - Acids ONLY (Hot Phos tank). Located in main isle next to Metals bay.

Bench #5 - Solvents ONLY (Stainless Steel). Located in Photo bay. This bench has a hot plate and 2 sinks.

Bench #6 - Solvents ONLY. Located in Metrology bay.

Bench #7 - Bases ONLY (6'). Located in Photo bay. This bench has 2 sinks, a digital hot plate and Ultra Sonic bath.

Inspect the Wet Bench prior to using it. If there are any droplets of liquid, they should be treated as dangerous chemical and should be cleaned up while wearing the appropriate PPE.

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### **Glassware/Chemical compatibility:**

Although there are too many possibilities to give a complete list, here are some compatibility guidelines:

1. Most importantly, know exactly what you are doing and what you are trying to accomplish in your experiment prior to pouring or mixing any chemicals.
2. **ALWAYS** be aware of the dangers of each chemical you are using and read the MSDS for each chemical prior to your processing.

**NOTE:** MSDS's are available for all chemicals used within the CSSER clean room and its labs. They are located in the following areas:

1. **Master copy:** Located in ERC144
  2. **C/R copy:** Located in ERC146A Chemical waste storage area.
  3. **Labs:** Only the chemicals which are stored and used regularly in these labs have an MSDS located within.
3. Before mixing any chemicals, be aware of the chemical reactions that may occur and the **dangers** that may accompany these reactions.
  4. Understand all of the possible reactions that can occur between chemicals/glassware/samples. This includes not only chemical compatibility but also thermal compatibility. For example:
    - a. **DO NOT** use glass beakers when using HF or any HF mixture, since the acid will attack the glassware. Use only Teflon or plastic beakers with HF.
    - b. **DO NOT** use Teflon when using heated chemicals of any kind. **ALWAYS** use Pyrex glassware when using hot plates and heated chemicals.
  5. **Know** the sequence in which the chemicals must be poured and/or mixed. **NEVER add water to acid. ALWAYS add acid to water (AAA).**
  6. Wash all glassware thoroughly before and after using at the wet benches.

### **Gowning and glove wash**

During all processing at the benches, the appropriate Personal Protective Equipment (PPE) needs to be worn. PPE requirements differ based on the bench type.

1. Acid Benches - Currently, ALL operations at the acid benches require chemical gown, face shield and gloves. This equipment is even necessary if there is no liquid chemical at the bench, since dangerous residue could be present.
2. Base Benches – In general, chemical gown, face shield and chemical gloves are required for all operations at the base benches. However, the PPE requirements can be somewhat relaxed if ALL of the following conditions are met.
  - a. Less than 100 ml of Chemical is at the bench.
  - b. There is no amount of very high Ph (Ph Greater than 12) chemical at the bench.
  - c. There is no chemical heated above 40 C.

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- d. There is a need to remove the PPE in order to perform the process successfully.

If all of these conditions are met, chemical gown, face shield and chemical gloves are only required when pouring, mixing, or disposing of the chemical. Safety glasses and Nitrile gloves can be worn during other processing.

3. Solvent Benches - It is only necessary to wear safety glasses and nitrile gloves at the solvent benches. No additional protective equipment is required for general processing, although it is available if desired.

In addition, PPE requirements may be more stringent than those expressed above if the chemicals used or the process required is especially dangerous. Please contact CSSER staff with specific process questions. **When in doubt, be safe and protect yourself.**

Chemical or Nitrile gloves should be rinsed regularly while working at the benches, using the DI water sprayer, sink, or glove wash. This will not only prevent cross contamination, but will decrease the chance of injury due to chemical exposure.

The glove wash adjacent to Bench #2 can be used to clean chemical residue off gloves at any time while working at the benches, or can be used as a final wash before removing gloves. To use the glove wash:

1. Place gloved hands inside the wash chambers.
2. Rotate hands slowly for approximately 20 seconds.
3. Slowly remove gloves from the chamber, allowing the N2 to blow off any excess water.

### **Dump rinsers and timers**

Process timers are integrated into the headcase of each bench. To use the timers:

1. REMOVE ORANGE CHEMICAL GLOVES. The bench controls should not be touched with chemical gloves, as the chemical residue will destroy the panels.
2. Press "Stop" and "Start" simultaneously to enter program mode.
3. Use the Up and Down arrow keys to change the process time.
4. When Complete, Press the "Stop" key twice to return to run mode.
5. Press "Start" to begin the countdown and "Stop" to reset the timer.

Benches # 1, 2, and 4 also contain dump rinsers. The controls are located in the headcase for each bench. The dump rinser programs are pre set, there is no need to modify them.

To use:

1. REMOVE ORANGE CHEMICAL GLOVES. The bench controls should not be touched with chemical gloves, as the chemical residue will destroy the panels.
2. Press "Start" to begin the countdown and "Stop" TWICE to reset the timer.
3. At any point during the rinse cycle, press "Stop" once to put the cycle in hold mode, if desired. This will leave the cycle in its current step, which can allow for additional rinsing or dumping.

### **Bench Clean Up:**

The benches should be kept as clean as possible at all times.

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1. When working at a wet bench, take note of any droplets on the bench or glassware and wipe them up as soon as possible using the Chem wipes provided. Use the appropriate trash container for chem wipe disposal; red trash cans for the solvent and base benches, and white trash cans for the acid benches.
2. Return chemical bottles to the pass through as soon as possible. Do not leave several bottles to clutter up the bench.
3. Keep toolboxes, sample cases, and everything else that is unnecessary off of the deck of the bench.
4. Rinse all glassware and other equipment (tweezers, thermometers, wafer dippers, etc.) at least three times when switching chemicals or doing final clean up. Return any CSSER equipment to the student cabinet after it is CLEAN and DRY.
5. Remove any cleaned glassware from the bench as soon as possible.

### **Rinsing and Drying samples:**

The simplest way to rinse and dry samples is using the DI water and N<sub>2</sub> guns that are located at each bench. Take care when using the N<sub>2</sub> guns with small samples, as the N<sub>2</sub> pressure can blow the entire sample away.

Once an initial rinse of 4" or 6" wafers is complete, the Spin Rinse/Dryers can be used if desired.

1. Transfer the wafers to the designated blue cassette.
2. Load the cassette into the dryer, with the H-bar toward the back of the dryer.
3. Close the dryer door.
4. Press the Green start button.
5. The tool will rinse and then dry the wafers.
6. When it is finished, Open the door and remove the wafers. Return the blue cassette to the dryer.

### **How, when, Chem bottles, waste, trash, Chem disposal, solvent waste**

#### **Chemical Usage:**

- Check out all chemicals that you will need before entering the cleanroom. Have all necessary waste containers for the disposal of your waste once completed.  
**Never pour chemicals down the drain.**
- Move chemical bottles in the cleanroom using the plastic buckets next to the pass thru. Use appropriate PPE for all chemical moves.
- Return chemicals to the pass through

#### **Max capacity at benches:**

Please be courteous to other users of the clean room. In general, only one user is permitted at each wet bench at a time. When you are finished with your processing, clean up your mess so that others can use the tool. The wet benches that have two sinks can be used by two people at once, as long as there is room for both.

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- Check-out chemicals you will need before entering the cleanroom.
  - If there are any droplets of liquid, make note of it and inform a CSSER staff member. **Always** treat all droplets as if it may be acid. Rinse with DI water and wipe dry before using bench.
  - Be sure to wear appropriate Safety Apparel (PPE) when using Wet Benches.
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