Laurell

Processing Manual

JDP

2019

|  |  |
| --- | --- |
| **TABLE OF CONTENTS** | |
| 1. **Laurell Dual (MRL)**   Making Chemistry   1. 100:1 HF2 2. 10:1 HF2 3. 9:1 BOE (SiO2 Etch) 2 4. 600:1 HF3 5. Si-etch3   Processing   1. All Chemistries3   Dumping Chemistry   1. All Chemistries3 2. **Laurell Spray (1-150)**   Making Chemistry   1. Cu Recess (Alanine formulation)4 2. Cu Seed (Glycine formulation)5 3. Cu Decon (Dilute Sulfuric Peroxide (dSP)) 5 4. Tungsten Etch6 5. Si-etch6 6. Si Hybrid Etch6 7. SC16 8. Citric/dHF6 9. 50:1 BOE6 10. 9:1 BOE7 11. 600:1 HF7 12. 100:1 HF7 13. 10:1 HF7 14. 1:1 HF7 15. aSi Etch   Processing   1. All Chemistries7 2. 300mm Laurell Spray7   Dumping Chemistry   1. All Chemistries8 |  |

Laurell Processes

1. **Laurell Dual (MRL)**

*Note*: If Laurell Dual needs rebooting, hold power button on tablets for five seconds, keep off for 5 seconds and then press power button to turn on again.

Making Chemistry

1. 100:1 HF

* 100:1 HF can be found in the chemical stock room

1. Open drawers on Laurell Dual and remove cap from container
2. Use small containers to place lid onto and remove carboy to hood
3. Pour chemical as is into carboy
4. Place lid onto carboy and replace small container
5. Rinse out small container 3x
   1. If empty bottles, need to 3x rinse in back and dispose of properly
6. Prime line by using recipe for 3 min.
7. 10:1 HF

* 10:1 HF can be found in the chemical stock room

1. Open drawers on Laurell Dual and remove cap from container
2. Use small containers to place lid onto and remove carboy to hood
3. Pour chemical as is into carboy
4. Place lid onto carboy and replace small container
5. Rinse out small container 3x
   1. If empty bottles, need to 3x rinse in back and dispose of properly
6. Prime line by using recipe for 3 min.
7. 9:1 BOE (SiO2 Etch)

* 9:1 BOE can be found in the chemical stock room

1. Open drawers on Laurell Dual and remove cap from container
2. Use small container to place lid onto and remove carboy to hood
3. Pour chemical into beaker first to check for crystals and then into carboy
4. For every bottle of 5:1 used, add 400ml of DI water
5. Shake carboy gently to mix
6. Place lid onto carboy and replace small container
7. Rinse out small container 3x
8. Prime line by recirculating for ~2min (manual switch located to right, switch “A”)
9. Take an etch rate on a thermal oxide monitor
   1. 30s etch
10. Record rate on spreadsheet in GSA
11. 600:1 HF

* Need one bottle of 100:1 HF

1. Remove appropriate container from storage shelf and replace with small container
2. Ratio needs to be 5:1 HF/DI water
   1. If container is empty: 6L DI water to 1.2L 100:1 HF
   2. If partially full: 4L DI water to 800mL of 100:1HF
3. Once added, shake container to mix
4. Replace small container with filled container
5. Rinse out small container and beaker 3x
6. Prime line by using recipe for ~3 min.
7. Take an etch rate on a thermal oxide monitor
   1. 30s etch
   2. Pre- and post- measurement on the F5
      1. BEOL🡪 Thermal Ox 🡪 Polar map, 49 point 🡪 1000+300
8. Record rate on spreadsheet in GSA
9. Si-Etch

* Recipe is listed on chemical supply container
  1. 4.4L nitric, 450mL acetic, 180mL 49% HF

1. Wash out graduated cylinder 3x
2. Measure out nitric acid and carefully add to carboy.
3. Rinse put graduated cylinder before pouring next chemistry
4. Repeat for acetic and 49% HF
5. Once all is added, gently shake carboy to mix

Processing

1. All Chemistries

* Make sure appropriate chemical container has enough to run lot
  1. If not, replace carboy with small container and refill
* Check recipe and edit if needed
* Place wafer in appropriate processor with appropriate side up
* Start run
* If III-V or ASPCM, double check which carboy waste container is selected
  1. Normal rinse/dry can be used if needed on III-V
  2. When 70-80% full, switch waste containers

Dumping Chemistry

1. All Chemistries
2. Replace carboy with small container and place carboy into hood
3. If shutdown, dump chemistry
4. Fill small container with DI water close to the top
5. Pause chemical recipe during “chemical step”
6. When ½ of water is gone, start recirculating for ~ 1 minute
7. Stop recirculation and complete recipe until water is nearly gone
8. Fast forward to next step and un-pause
9. Refill water in container 2x and repeat process until lines are 3x rinsed
10. **Laurell Spray (1-150)**

*Note:* Password for computer is written on notebook in top left drawer. Boot computer and go to Spin Processor program.

Making Chemistry

1. Cu Recess (Alanine formulation)

* 20x Alanine: 30% H2O2: DI (1:2:17)
  1. Instructions on how to make solution are listed in lab
     1. Fill beaker ½ with water and add stir bar
     2. Place on stir plate
     3. Measure out K3PO4 in small plastic beaker and add to water
        1. Clean off scoop
     4. In new plastic beaker, measure out CDTA and then add to water
        1. Clean off scoop
     5. Lastly, measure out alanine and then add to water
     6. Clean off scoop
     7. Let solution mix until clear
  2. Test pH with wand before adding phosphoric acid in small increments
     1. Calibrate pH probe with buffer pH 7 and pH 4 solutions
     2. Rinse off probe in between readings
     3. Once calibrated, read buffer solutions to make sure calibration is correct
     4. Test pH of concentrate and use 5mL pipet to add small increments of phosphoric acid to solution until pH 7.2 is reached
     5. When pH is stable, pour solution into bottle and add water until line is reached. Shake.
     6. Retest pH with buffer solutions to make sure calibration is still good. If not, may need to adjust pH of concentrate again.
        1. If acidic: 12M potassium hydroxide
        2. If basic: Phosphoric acid
* Once 20x concentrate is made, add to 4L container and add water to fill to line
  1. For 3L- 150mL: 300mL: 2550mL
  2. For 4L- 200mL: 400mL: 3400mL
* Shake well
* Replace chemical line with filled bottle

1. Cu Seed (Glycine formulation)

* 20x Glycine: 30% H2O2: DI (1:2:17)
  1. Instructions on how to make solution are listed in lab
     1. Fill beaker ½ with water and add stir bar
     2. Place on stir plate
     3. Measure out K3PO4 in small plastic beaker and add to water
        1. Clean off scoop
     4. In new plastic beaker, measure out EDTA and then add to water
        1. Clean off scoop
     5. Lastly, measure out glycine and then add to water
     6. Clean off scoop
     7. Let solution mix until clear
  2. Test pH with wand before adding phosphoric acid in small increments
     1. Calibrate pH probe with buffer pH7 and pH 4 solutions
     2. Rinse off probe in between readings
     3. Once calibrated, read buffer solutions to make sure calibration is correct
     4. Test pH of concentrate and use 5mL pipet to add small increments of phosphoric acid to solution until pH 7.25 is reached
     5. When pH is stable, pour solution into bottle and add water until line is reached. Shake.
     6. Retest pH with buffer solutions to make sure calibration is still good. If not, may need to adjust pH of concentrate again.
        1. If acidic: 12M potassium hydroxide
        2. If basic: Phosphoric acid
* Once 20x concentrate is made, add to 4L container and add water to fill to line
  1. For 3L- 150mL: 300mL: 2550mL
  2. For 4L- 200mL: 400mL: 3400mL
* Shake well
* Replace chemical line with filled bottle

1. Cu Decon (Dilute Sulfuric Peroxide (dSP))

* DI: H2O2: H2SO4 (50:7:3)
  1. There is a dedicated bottle for dSP in lab
  2. To make 3L of chemistry:
     1. First, add about 1.5L of water to bottle
     2. Then measure out 150mL of H2SO4 and add
     3. Rinse out graduated cylinder before measuring 350mL of H2O2
     4. Add to bottle
     5. Fill with water until 3L line
     6. Gently shake so thoroughly mixed
     7. Let bottle cool down as it will heat up to ~35℃
     8. Prep line with chemistry before running lot

1. Tungsten Etch

* H2O2:NH4OH (4:1)
* If making 3L
  + 600mL NH4OH and 2400mL H2O2

1. Si-Etch

* 70% HNO3: 100% Acetic Acid: 49% HF (50:5:2)

1. Si Hybrid

* Uses both chemistry canisters
* Chem 1- HF: HNO3: H3PO4: H2SO4: Acetic Acid (1: 12: 2: 1: 3)
* Chem 2- 10:1 HF as supplied
* STREAM nozzle!!! Not Spray!
  + Align so stream hits center of wafer
* There is a specific recipe for this process offering, not default recipe

1. SC1

* DI: H2O2: NH4OH (50:1.5:1)
* If making 3L
  + - 2857mL of DI, 86mL of H2O2, and 57mL of NH4OH (Ammonium Hydroxide)
* If making 4L
  + - 3809ml DI, 115ml H2O2, 76ml NH4OH
* IMPORTANT: Always make fresh.

1. Citric/dHF

* Should say which HF to use
  + E.g. 10:1. 100:1. 600:1, or 2100:1
* Add 34.5mL of 1% citric acid to every 1L of HF
* Shake well

1. 50:1 BOE

* Place manufacturer bottle in canister.

1. 9:1 BOE

* Place manufacturer bottle in canister.

1. 600:1 HF

* DI: 100:1 HF (5:1)
* If 3L
  + 2.5L DI, 0.5L 100:1 HF

1. 100:1 HF

* Place manufacturer bottle in canister.

1. 10:1 HF

* Place manufacturer bottle in canister.

1. 1:1 HF

* DI: 49% HF (1:1)
* If making 3L
  + 1.5L DI and 1.5L 49%HF
* If making 4L
  + 2L DI and 2L 49% HF
* “Do what you oughta, add acid to wata”

Processing

1. All Chemistries

* Load chemistry in appropriate canister
* Place dummy wafer on chuck
* Start recipe on controller unit
  + Standard recipe : 200mm 1-chem.spn
  + For Chem1 & Chem2 : Rath 200mm (2+1)
* When chemical step is reached (Step 2), pause until the chem line is filled with the chemistry with no air bubbles
* When filled, resume recipe
* Take dummy wafer out when recipe finishes
* On computer, edit recipe so parameters match run sheet
  + i.e. chemical dispense step (Step 2)
* Press the blue and red arrow circle button to transfer recipe from PC to Spin Processor controller unit
  + New box will pop up
  + Select “etch” from PC program and then press arrow that goes from PC program to Spin Processor program (i.e. top one)
    - Both should turn green
  + Press “OK”
  + Recipe successfully transferred when Spin Processor controller unit blinks 4 times
  + If unsure if successfully transferred, press blue and red arrow button and display message should say “The current notebook matches the Spin Processor”
* Begin processing lot
  + Report: Chemistry, Time, Side

1. 300mm Laurell Spray

* Lift 1-150 Laurell hood with chain
* Pop up center button and loosen two screws with Allen wrench
* Lift up and replace with 300mm chuck
* Tighten screws and place center button
* Recipes listed in 300mm wafer folder
  + Use big wand to lift
* Continue processing like normal
* Replace with 200mm chuck when done

*Note*: Back DI should always be on during Step 2

Dumping Chemistry

1. All Chemistries

* When done with lots, open chemical container carefully and replace chemical with beaker of DI water
* Run recipe and pause at “chemical” step to rinse line out
  1. Resume recipe when line is cleared.
* Clean up area when done by putting chemistry away and rinsing off area
* Before leaving, make sure plastic nut around chem 1 line is tightened
  + Located behind dome, left most line