

University of Minnesota Nano Fabrication Center

Standard Operating Procedure

Equipment Name: Deep Trench Etcher

Coral Name: deeptrench

Revision Number: 6

Model: SLR -770

Revisionist: S. Miller

Location: Bay 3

Date: 5/30/07

1 Description

The deep trench etcher etches vertical trenches in silicon wafers.

2 Safety

a Watch fingers around the Loadlock lid when pumping down the system.

3 Restrictions/Requirements

a Must be a qualified user on deep trench etcher.

b Etcher is for SILICON etching ONLY. **Do NOT etch anything else except silicon.**

c The deep trench etcher is for 4 inch wafers. Pieces can be run only if bonded to a 4 inch wafer.

d Wafer must not have any chips or nicks on it. Backside of wafer must be clean and flat 5 mm from the wafers edge.

e **Do not leave the Etcher for more than 30 minutes at a time during a run.** The users **MUST** check the status of the recipe at least once every 15 minutes to verify there are no alarms. This is not a requirement if running a clean.

f Masking Materials Allowed:

Oxide - thermal or PECVD

Positive photoresist (S1800 series, SPR 220 series, AZ resists)

Futurrex Resist (NO SU8)

Nitride (LPCVD or PECVD)

Other: Staff approval required.

g Masking Materials NOT allowed:

Absolutely NO METAL masks are allowed.

No SU8 masks are allowed.

All metal or SU8 on the side of the wafer to be etched **MUST** be covered with enough photoresist to last throughout the length of the etch.

h A wafer needs to be loaded for all runs. If running clean or warmup use one of the dummy wafers located by the machine.

i If doing a through the wafer etch, the wafer being etched needs to be bonded to another wafer prior to breaking through the silicon. This will protect the chuck. A thick oxide or other film deposited on the back on the wafer can be used instead of bonding as long as the film does not etch through as well. See staff if you have any questions.

j Fill out the log sheet with each use.

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k Enable/Disable with each use in CORAL.

4 Required Facilities

- a Compressed air 80-90 psi
- b Process water
- c Nitrogen gas
- d Electrical 208/240 VAC
- e House Exhaust

5 Definitions

6 Setup

- a Choose Recipe to Run:
 - i **warmup.bch** : It will run for approximately 20 minutes then unload automatically. A warm up batch needs to be run if the system has not been used in at least 4 hours. This will condition the process chamber prior to etching.
 - ii **bosch.bch** : This is the standard silicon etch recipe.
 - iii **clean.bch** : It will run for approximately 60 minutes then unload automatically. This runs an oxygen clean on the system. It should be run after the system has been vented or has been heavily used. Staff will typically run this recipe as needed.
 - iv **Other recipes**: Other recipes with different parameters can be run with staff approval. Remember: The DRIE only etches silicon.

7 Operating Instructions

- a Enable the Deep Trench Etcher in CORAL. Fill out the log sheet.
- b If the screen saver is on when you first approach the system, touch any button on the keyboard or move the mouse to activate the system.
- c The Operator Login window should now be in the middle of the screen. In the Operator box enter **nfc** and press TAB. In the Password box enter **1234** and click the mouse on the OK button. (Use the top left mouse button, this is the only one used in the operation) or press Enter on the keyboard.
- d The System Monitor window will now appear on the screen. Move the Mouse to the Process pull down and click on it. Select Batch and click on it. The Batch Editor window will now appear.
- e Move the Mouse to the File pulldown on the Batch Editor window and click on it. Select Load and click on it. The Load Batch File window will come up.
- f Select the batch you want to run (see recipe list) and click on it. Move the Mouse to the OK button and click on it or press Enter on the keyboard to load the program.
- g Move the Mouse to the File pull down on the Batch Editor Window and click on it. Select Exit and click on it. The batch loaded should now appear in the Batch box on the System Monitor window.

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- h Move the Mouse to the Utilities pull down. Select Loadlock and click on it then select Vent and click on it to vent the system. It will take a couple of minutes to vent the Loadlock. The left chamber will turn from white to red. The Pressure indicator will change from reading VACUUM to ATMOSPHERE when the system is vented. The Loadlock lid will pop up when it reaches atmosphere.
- i Load wafer unto the robot arm making sure the flat is aligned with the flat on the arm.
- j Press the Ready button on the bottom of the System Monitor window. When the system has met all initial parameter requirements the entire Ready button will turn yellow. Once the system is in the Ready mode, click on the Run button to start the recipe while slightly pressing down on the Loadlock lid. The system will pump the Loadlock down, move the wafer to the process chamber, run the process, move the wafer back to the Loadlock and vent it so the wafer can be unloaded.
- k The etch will actually begin in step 4 which is approximately 2'5" from the time the run is started. **The etch is stopped by pressing the *ABORT* button at the bottom of the screen during step 6.** All processing needs to be stopped in step 6. The plasma will stop after that step has completed. A window will come up asking whether or not to *abort the process. Press YES*. The process is now terminated. Another window will come up asking whether or not to *abort the batch. Press NO*. The chamber will pumpdown and move the wafer to the Loadlock, then vent the Loadlock.
- l If no other wafers are going to be run, pump the loadlock down by moving the Mouse to the Utilities pull down and clicking on it. Select Loadlock and click on it then select Pump and click on it. It will take a couple of minutes to pump down the Loadlock. The left chamber window will change from a red color to a white color.
- m After the Loadlock is pumped down push the Standby button. The button will turn yellow when the system is in Standby. Move the Mouse to the Utilities pull down and click on it. Select Log Out and click on it to log out of the system.
- n Complete the Log sheet. Disable out of the deep trench etcher in CORAL.

8 Problems/Troubleshooting

- a Helium out of compliance:
 - i Silence the alarm by clicking on the Alarm Silence button.
 - ii Abort the process. Using a flashlight, look the window for the following:
 - * **wafer is still on the chuck:** Do not abort the Batch. Click on No to let the machine unload normally.
 - * **Wafer is NOT on the chuck:** Click on YES to abort the Batch to leave the wafer in the process chamber. Contact a Staff member to let them know the machine is down and why. Note in the logbook that a wafer is stuck in the chamber.