

DRIE Operating Procedure

1. DRIE Processing Rules:

- a. The system must be cleaned with an O₂ plasma to keep the chamber clean. The chamber must have a 30 minute O₂ plasma clean before every group of **silicon etch** wafers run on a single day.
- b. The chamber must be seasoned before each **silicon etch** (group of wafers) using the same recipe that will be used to etch samples. If a single short etch (<10 min) is planned, season 15 minutes, otherwise, season for 30 minutes. Seasoning is only required once a day for a particular etch recipe.
- c. No seasoning is needed for **silicon dioxide or quartz** etches. **Silicon dioxide or quartz** etch requires an O₂ plasma clean before each run of 30 minutes. After 30 minutes of silicon dioxide or quartz etch, the sample must be removed and another O₂ plasma clean must be done using a dummy wafer before the sample is finished. The sample can then be reloaded after the cleaning procedure.

2. Important things

- a. Do not change any parameters on the system software or attempt to do anything with the system hardware. This has caused many problems at other user facilities. This tool has many parts, valves, software, connections, etc. that can be damaged and are difficult to troubleshoot. Service on the tool from the vendor is limited and system downtime can be long because of this.
- b. **User privileges will be revoked for anyone changing any of the system presets or using any features of the tool other than those outlined in this document.**
- c. All parameters of recipes added or changed must be sent to the Cleanroom Manager via email with a description of why the changes are being made. Put your initials in the recipe name for any changed recipe: e.g. "TES High Rate Oxide Etch"
- d. The cleanroom manager must be provided the system password used by each individual.
- e. Make sure you logout after each use of the tool. Do not leave the tool unattended while samples are being run.
- f. Process Engineer Privileges are limited to only a few users. The only additional privilege for process engineers is in the recipe creation screen. All other screens are off limits. **No one** (no exceptions) is allowed to change or do anything in any other screens other than the user screens listed above and the recipe creation screen. Unfortunately, this is not controllable in the software, so it is important

to adhere to this restriction. Changes to or use of the other screens can cause problems for other users or can compromise the operation of the system.

3. Log into the DRIE computer. Note the login time needed for billing.
4. Access Menu screens summary (and shortcuts in parentheses):

System Plan View: Shows the overall system schematics

Functions:

Process Edition (F2): Shows the process steps and recipes available

Go Process (F3): Use this to choose the process you want to run

Alarms (F5): This will enable you to look at the alarms generated

Any alarms generated must be cleared by a Process Engineer

Maintenance:

Pumping (F9): Use this to start the pumping sequence for the chamber and/or load lock.

Maintenance Times (Sh+F1): Shows maintenance items

Configuration: Languages (Sh+F3): Changes the language—do not change

Help: About (Sh+F7)

Users Guide (Sh+F8) Manuals

Logout:

5. If the sample needs to be loaded, go to the Pumping Screen (F9) and vent the load lock. Note that the load lock vent must be stopped manually (click on the Vent load lock a second time to stop the vent) since the nitrogen does not turn off automatically after venting. Do in a timely manner to prevent a timeout error.

Note that the wafer on the screen must be in the load lock position. There are no sensors in the load lock or chamber to “tell” the system where the sample is. The wafer location is indicated by the user, and is not sensed by the system.

6. Place the wafer or wafer sample carrier onto the sample holder in the load lock. Be careful in placing the wafer—the wafer flat must be in the slot cutout. The DRIE will not

run without a wafer in the chamber. Any test, chamber clean or conditioning runs must be done with a wafer in the chamber.

7. Confirm that the chamber position is in the Home/Transfer position. If the sample holder (SH) is not in the Home/Transfer position, the sample cannot be loaded.
8. Pump down the load lock before attempting to open the sample door. When the pressure reaches $<5E-1$ mb, the chamber door can be opened. Do this in a timely manner just before or as the valve closes to the load lock pump. If you wait too long to open the chamber door and the pump valve closes, the load lock pressure rises quickly and the load lock will need to be pumped down again.
9. Transfer the wafer into the process chamber by extending the transfer arm into the process chamber. When transferring the wafer, note that the loading mechanism needs to be lowered at the end of the transfer point to actually place the wafer onto the sample holder inside the process chamber.
10. After placing the wafer inside the chamber, lower the mechanism and pull out the transfer arm. Close the chamber door when finished. Note that the door clicks into place. Never force open the chamber door. Difficulty in opening the door is an indicator that there is some problem with the system—call the Cleanroom Manager for help.
11. The software does not automatically detect the wafer position. To indicate that the wafer is not in the chamber, click on the “Transfer Wafer Init” box and click the wafer position as now being in the chamber. The screen should reflect transfer of the wafer from the load lock to the chamber.
12. The chamber pressure should be $<5E-6$ mb to begin processing.
13. Go to the Process Edition screen (F2) and choose the process you want to run. The Process recipes (Process Library) are listed on the right hand side of the screen. The recipes are made up of individual steps that show up on the list just to the left of the Process Library. Details regarding these individual steps can be found in the Step Library on the left hand side.
14. If there is a process recipe change you want to make, you must have Process Engineer privileges. See the end of this document for details of changing these. **Any Process Library and Step Library entries must be named with the initials of the individual that created them. This is very important for tracking use of the tool.**

15. To begin processing go to "Functions" then "Go Process (F3)." Note that the wafer position can also be indicated on this screen. Choose the desired process from the menu. Choose data logging so all processes are documented.
16. The process control screen will appear. The substrate will go to its process position and the process recipe begins to run automatically.
17. If there is a problem or any errors, stop the process or go to the next steps to finish out the process and call a Process Engineer (Cleanroom Manager) for help.
18. When finished processing, pump the load lock until the pressure reads <5E-1mb and again open the chamber door in a timely manner as soon as the pressure is reached (as or before the pump valve closes).
19. Transfer the wafer to the load lock by extending the arm into the chamber and lifting the arm before pulling out the sample. Close the chamber door and make sure it "clicks" into place.
20. Show that the wafer is now in the load lock.
21. Vent the load lock, again stopping it manually.
22. Remove the sample and close the chamber door.
23. Logout after finished.
24. Log usage in the CHANL login screen in the cleanroom computer.

Process Engineer Recipe Creation: