

PERKIN-ELMER SPUTTERING SYSTEM OPERATING PROCEDURE

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PERKIN-ELMER SPUTTERING SYSTEM OPERATING PROCEDURE

The Perkin-Elmer is currently configured for DC magnetron sputtering with RF substrate bias.

A. QUICK CHECK

1. Check that MODE switch on the sputter head is set to SPUTTER ETCH.
2. Check that temperature on the cryo pump temperature monitor is ~13K.
3. Check that keyswitch on the *Pump Down Controller* is in **AUTO**.
4. Check that keyswitch on the *Magnetron Drive* is in **PROG**.
5. Check that all 3 water flow switches are working. The wheels on these switches should be spinning at an appreciable rate due to cooling water flow.
 - a) **RF Coil** flow switch may be viewed from the back of the machine (wheel is spinning & LED on switch is lighted up)
 - b) **RF Generator & Vertical Etch Tube** flow switch may be viewed from the front of the machine
 - c) **Target & Substrate Holder** flow switch may be viewed from the front of the machine

B. CHAMBER VENT: -

1. Check the readout on the **EXTERNAL GAUGE** (with filament **ON**) to verify that chamber is under pressure.
2. Turn gauge controller to **ST1**.
3. Hold down **VENT** button while pressing **START**. Needle on analog dial gauge moves to **ATM** when chamber is vented.
4. Press **OUTPUT OFF** to silence “vent” alarm if needed.
5. Press **HOIST UP** to open up the chamber.

C. WAFER LOAD and PUMP-DOWN: -

1. Load wafers into chamber.
2. Press **HOIST DOWN** to close the chamber.
3. Hold down **PUMP** button while pressing **START**. At 200mT (on analog dial gauge) the high vacuum valve closes.
4. When reading on **ST1** reaches ~02, switch to **EXTERNAL GAUGE** and turn filament **ON**.
5. The system should pump down to $\sim 3 \times 10^{-6}$ T in approximately 1 hour.
6. When base pressure is achieved, turn the gauge controller to **ST1** and adjust the zero if required.
7. Turn on table rotation if desired.

D. WAFER PROCESSING

The system can be set-up to carry out one of the following procedures or any combination of these procedures as desired.

I. HEATING

1. Check that the shutter is in the **HEAT** position.
2. Select **HEAT/ETCH** on the target selector.
3. Press the **OUTPUT OFF** button to silence the alarm if needed.
4. Turn **ON** the heater power supply.
5. Adjust heater current as needed.
6. Open the paddle shutter with the **HEATER SHUTTER** knob located on the right side of the sputter head.
7. After desired heating period, close the paddle shutter.
8. Turn down the heater current and switch **OFF** the heater power supply.

II. WAFER ETCHING

1. Ensure that gas **MODE** on the Digital Gauge Controller is set for **ARGON-AUTO** (not AIR).
2. Hold down **GAS** button while pressing **START** to open gas leak valve.
3. Switch **OPEN** the argon toggle valve on the sputter head.
4. Adjust argon needle valve to achieve required sputtering pressure (~2mT for etch - ST1 reads 2)
5. Check that the shutter is in the **CLOSED** position.
6. Select **HEAT/ETCH** on the **TARGET SELECTOR**.
7. Press the **OUTPUT OFF** button to silence the alarm if needed.
8. Switch on the RF power generator (switch at back of unit).
9. Press the **LOCAL** and **FWD PWR** buttons on the RF generator.
10. Set the RF power level with the **MODIFY** knob.
11. Press **START** to turn on RF power.
12. Check that the Servo Controller switch is in **MANUAL**.
13. Tune for minimum reflected power using the **LOAD** and **TUNE** switches on the sputter head (reflected power varies with table rotation).
14. Press **STOP** button to shut off RF power.
15. Close the argon toggle valve on the sputter head.
16. Hold down the **PUMP** button while pressing **START** to close the gas leak valve.
17. Turn off table rotation.
18. To vent chamber, go to **Chamber Vent**.

III. METAL DEPOSITION

Make Sure you Open Shutter to a Target other than the one you are going to Pre-Sputter with. This will insure that the hole of the shutter will not be under your sputter target when you are only pre-sputtering your target. Then close shutter and move target select to your desired pre-sputter target.

1. Ensure that gas **MODE** on the Digital Gauge Controller is set for **ARGON-AUTO** (not AIR).
2. Hold down **GAS** button while pressing **START** to open gas leak valve.
3. Switch **OPEN** the argon toggle valve on the sputter head.
4. Adjust argon needle valve to achieve required sputtering pressure (~12mT for dep. - ST1 reads 12)
5. Check that the shutter position switch is **CLOSED**.
6. Select target material with the target selector switch.
7. Press the **OUTPUT OFF** button if the light is flashing or to silence the alarm.
8. Hold down **LEVEL** button and adjust the **MODIFY** knob to set the DC current level.
9. Press **OUTPUT ON** to turn on DC power.
10. After pre-sputtering, switch the shutter to **OPEN**.
11. Deposit target material for the required amount of time.
12. For biased deposition, turn on the RF generator at any time (see **Steps 8 –13 under Wafer Etching**).
13. When process is completed, **CLOSE** the shutter.
14. Press **STOP** button to shut off RF power if necessary.
15. Press **OUTPUT OFF** to switch off DC power supply.
16. Close the argon toggle valve on the sputter head.
17. Hold down the **PUMP** button while pressing **START** to shut off argon gas flow.
18. Turn off table rotation.
19. **To vent chamber, go to Chamber Vent.**

D.

CRYO PUMP REGEN PROCEDURE

1. Ensure that mechanical pump is **ON**.
2. Ensure that key-switch on the *Pump Down Controller* is in **AUTO**.
3. Set toggle switch on *Regen Controller* to **NORMAL**.
4. Reset cycle time to **0** if necessary.
5. Start the regen process by hitting **CYCLE START**.
6. '**CYCLE ON**' light comes on and regen cycle begins.
7. After vent cycle (as indicated by cycle time knob), manually open the **FORELINE VALVE** at the back of the machine.
8. After the roughing period ends (at the beginning of cool down), manually close the **FORELINE VALVE**.
9. Set toggle switch on *Regen Controller* to **HOLD** and switch digital gauge control to **ST 2**. Make sure that the vacuum pressure is **50 mTorr** or less as displayed by **ST2**. If you were not able to reach this base pressure check for leaks in systems, mechanical pump operation, & nitrogen purge, Go to step 4 and repeat procedure.
10. Check that the pressure change in the pump (Outgasing) is \leq **10mTorr per minute** as read by **ST2**.
11. If pressure change is larger than this, repeat the regen cycle otherwise set toggle switch back to **NORMAL** and continue with cool down.
12. At the end of the cycle, the temperature on the cryopump monitor should read $\sim 12\text{K}$.