

E-beam

STANDARD OPERATING PROCEDURE

CORAL

Name: *e-beam*

Model

Number: --

Location: TRL

What it does: evaporative deposition system

Introduction: This system deposits metal using an electron beam which gives the purest metal possible. There are three planetaries in the system that will accommodate fourteen wafers per planetary for a total of forty two wafers per process. It should be noted that the crucible s used in the deposition of material be filled to the proper level. The system is capable of depositing four layers of metal on a substrate without breaking vacuum, and is also capable of co-deposition of metal alloy (2 materials at the same time). It is extremely important that the electron beam be centered on the hearth to avoid damage to the hearth, the crucible and avoid contamination of the material.

There are 2 electron beam evaporators in the MTL. One is located in the TRL (Technology Research Laboratory) and the other is in the ICL (Integrated Circuits Laboratory). The e-beam in the ICL is used strictly for silicon devices processing. The e-beam in the TRL is used for a wide variety of metals, such as gold, tin, silver, etc. This e-beam must not be used if your wafer requires further processing in equipment or laboratories that is dedicated to silicon processing. If you need metal that is compatible to silicon device work then you must use the e-beam in the ICL. Once you use the e-beam in the TRL you cannot bring your wafers back into the ICL for any other process steps.

Safety: This system is designed with a full array of electrical interlocks, that should at no time be defeated or overridden. The power supply is capable of supplying ten thousand watts of power to the electron guns. There is a shorting bar located in the lower part of the system and is to be used whenever the lower portion of the system is opened. This shorting bar can be used to safely discharge components to ground, however you should not enter this area of the system unless you are fully trained on the repair of the systems electronics.

Procedure: Login to CORAL and engage machine.

Start Up:

- a. Turn on cooling waters to the hearth and power supply. Cooling water is located in the back of the system. Turn on the main supply so the valve handles are parallel to the pipe. Turn the bypass off valve handle perpendicular to the pipe.
- b. Turn on the power supply and verify the gun filament current is reading correctly, approximately 0.3 amps.
- c. Check crystal health, parameter 36 on the process controller. The crystal health should read greater than 85%, if it does not change crystal.

Chamber Venting:

- a. Turn on system vent toggle switch.
- b. Press the stop pump push button.
- c. System will start venting and will be at atmospheric pressure in approximately 6 minutes.

Sample Loading:

- a. Lock the planetary removal tool into place. Remove the planetary locking bolt and remove the planetary from the system. Place the planetary on a flat clean surface. (CAUTION: Do

- not attempt to load wafers into the planetary while it is in the system.)
- b. Remove a sufficient number of dummy wafers and replace them with the wafer to be metalized. Be sure that the clip spring is positioned in such a way that it points directly toward the center of the wafer.
 - c. Inspect the crucible to insure that it contains enough material for your deposition. Material level in the crucible must be at one half to three quarters of the volume of the crucible.
 - d. Remove the shutter from the system and inspect the underside to insure that there is no flaking. Loose flake can contaminate the deposition material.
 - e. If flakes are present, clean and place the shutter back into the system.
 - f. Open the shutter and place the crucible with the deposition material into the hearth pocket.
 - g. Close the shutter.
 - h. Place the planetary back into the system Using the planetary tool and lock the planetary securely into place with the locking bolt. Remove the planetary tool.

System Pump Down:

- a. Turn off the system vent toggle switch.
- b. Press the start pump push button.
- c. Pump system to 2 E-6 or lower before depositing metal Note: The system should pump to approximately 5 E-7 in 30 to 45 minutes

Deposition:

- a. Select the proper deposition process and film number. Process number and film number are set for the same values Example: Process 1 Film 1, refer to the process note book.
- b. During pump down check all process parameters to insure they are correct.
- c. Start planetary rotation. The two rotation toggle switches should be positioned as follows: Forward direction and local.
- d. Turn on the main switch to the power supply.
- e. Turn on the PC turn key switch.
- f. Turn on the high voltage push bottom switch and hold it in place until both relays latch into place.
- g. Turn on filament push button. Be sure that you have selected the proper E-gun. Gun #1 Turret hearth (4 pocket hearth). Gun #2 Single pocket hearth.
- h. Press the reset push button on the process controller.
- i. Press start process push button.
Note: If multi layers of metal are required, let the crucible material cool for a minimum of one minute before rotating the torrent hearth.

Sample Unloading:

- a. Deposition complete start timing the 20 minute cool down cycle.
- b. Turn off the filament and the high voltage at the power supply controller. Leave the main circuit breaker on so the power supply will cool for the same time period as the samples(20 minutes).
- c. After the samples and power supply has cooled for the required 20 minutes, turn off the PC turn key switch and the main switch for the power supply.
- d. Press the stop pump push button
- e. Switch the vent toggle switch to vent
- f. After system reaches atmospheric pressure remove samples as describer in Sample Loading steps a),b),c).
- g. Remove the planetary/planetaries as described in Sample Loading step a).

- h. Open shutter and remove crucible material from the hearth. and place it in its proper storage container, and place it back into the dry box. Lock the dry box.
- i. Remove the shutter and inspect the underside for flaking and clean if needed. Replace shutter and return it to the close position.
- j. Remove the wafers from the planetary and replace them with dummy wafers.
- k. Place planetary/planetaries back into the system and lock them into position with the locking bolts.
- l. Turn off the cooling water. Open the bypass valve (parallel to the pipe). Turn off the supply and return valves perpendicular to the pipe.
- m. Return the system to high vacuum status as follows:
 - a. Turn off vent toggle switch
 - b. Close chamber
 - c. Press start pump push button
- n. Disengage the machine in CORAL.

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