

GENERAL PROCESS AND OPERATION SPECIFICATION

PDS 2010 Labcoter2 Parylene Deposition System

I. SCOPE

- a. The purpose of this document is to describe requirements and basic operating instructions for the Parylene Deposition System that coats thin conductive layers of gold on non-conductive SEM samples.

II. SAFETY

- a. Be sure that you are trained and signed off to use this equipment.
- b. If you are unsure about any procedure or indication while operating this equipment be sure to contact a staff member or trainer for assistance.
- c. If you encounter any issue, please notify or email the staff.

III. APPLICABLE DOCUMENTS, MATERIALS AND REQUIREMENTS

- a. Process Information (thickness vs runtime and uniformity).

IV. OPERATION

1. Preparation:

- a. Check the cold trap probe and clean with 2% MicroSoap mixture and wipes if dirty.
- b. Place probe into cold trap.
- c. Turn on mechanical chiller.
 - i. Allow the chiller to run for 30 minutes prior to pump down.
- d. Press Process Start button.
- e. Switch Furnace Heater selector to Enable.
 - i. Heat up will take more than 45 minutes.

2. Ready sample and close the chamber:

- a. Leave the furnace to heat up while you weigh out dimer material into aluminum foil boat.
 - i. Use the boat reference to create a new aluminum boat. The cylinder you create will need to be slightly smaller than your reference to fit in the furnace.
 - ii. Use the boat reference to create a new aluminum boat. The cylinder you create will need to be slightly smaller than your reference to fit in the furnace.
 - iii. You must use at least 0.5 g, or the tool will not be able to determine when it finishes evaporating.
- b. Place the aluminum boat with dimer into the vaporizer port.
- c. Remove chamber lid and place it to the side.
 - i. The lid is heavy so please be careful when moving it.
- d. Lift out the turntable surface by holding the center attachment fixture.
- e. Fix samples onto the turntable using Kapton tape.
- f. Load the turntable back into the chamber by holding the center attachment.
- g. Place the chamber lid back on top.

3. Run process:

- a. Switch vacuum selector to vacuum.
 - i. Center and hold the cold trap probe during pump down start.
- b. Switch vaporizer selector to Enable.
 - i. The turn table will begin to rotate.
- c. Wait for automated process to begin.
 - i. Vaporizer starts when furnace temperature is reached.
 - ii. Vaporizer temperature then rises to meet target pressure setpoint.
 1. Record base pressure at vaporizer temperature ~100 C.
 2. Adjust set point to base pressure + 15 T.
 - iii. After pressure decreases due to evaporation of all dimer, the vaporizer temperature set point will change to about 175 C.
 - iv. After this temperature has been met for a few minutes, the system will turn furnace, vaporizer, and detector off which will allow the temperature to decrease.
- d. When finished, the tool Start button will be blinking green.
 - i. Press the blinking green Start button.

4. Unloading chamber:

- a. Turn off mechanical chiller.
- b. Turn Vacuum selector to Vent.
- c. Switch Furnace, Vaporizer, and Detector to Off.
- d. Remove the chamber lid and place to the side.
- e. Lift the turntable out holding the center fixture.
- f. Retrieve samples.
- g. Return the turntable to the chamber.
- h. Place the chamber lid back on top.
- i. After the chiller has been warming for > 10 minutes, move cold probe to side holder.
 - i. Do not wait for so long that water begins to drip into the cold trap.
- j. Wait for an additional 30 minutes to allow the melting of ice.
- k. Clean the cold probe by using 2% MicroSoap mixture and wipes.
- l. Leave probe clamped inside holder.
- m. Wait for vaporizer temperature to be < 60 C and open the vaporizer load door.
- n. Remove dimer boat and place back with Parylene Coater supplies.
- o. Close vaporizer door and ensure everything is switched off.

V. QUALITY

- a. The thickness of deposition is based on the amount of dimer placed into the tool. Please allow the tool to automatically turn off when it registers that all dimer has been evaporated. The evaporation rate is unknown and stopping the tool early can affect the thickness.

VI. SIGNATURES AND REVISION HISTORY

- a. Author of this document: Mitchell Roselius
- b. Author Title or Role: Student Technician
- c. Date: 2/8/2021
- d. Revision: Original Issue

Approvals:

Technical Manager Signature: _____ *Sandra G Malhotra* _____

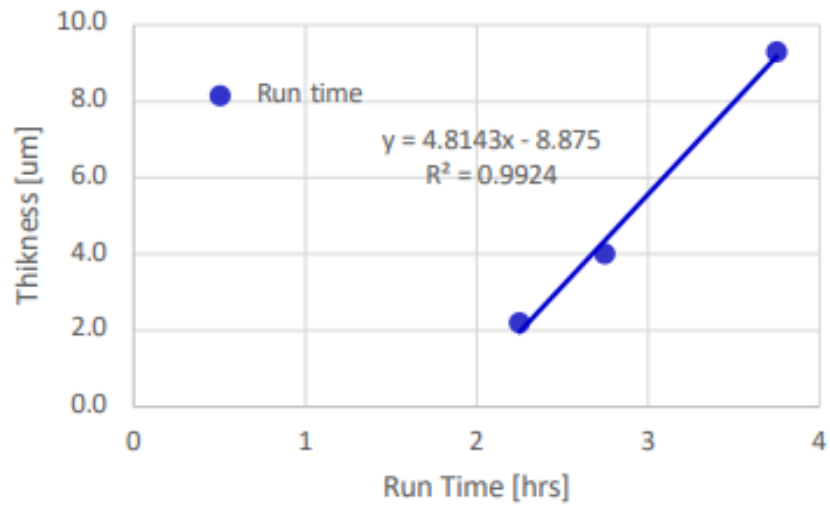
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Revision History:

Revision	Author	Date	Changes
Original Issue	Mitchell Roselius	2/8/2021	
Rev A	R. Carreon	1/11/2022	Re-formatted procedure
Rev B			
Rev C			

APPENDIX A: Process Information

Run time vs. Parylene Thickness [nm]



❖ Uniformity: ~< 3% (4" wafer)

"Dimer C" Wt. [g]	Thk Dektak * [um]	Unif % on 4" Si wafer (9 pts)*
2.0	2.2	1.9
5.0	3.97	2.6
10.0	9.3	2.4

* Zhiyu Yan, Sep. 2020

Appendix B: Computer Control Sequence (Process Start/Stop button) (Taken from manual)

4.4 Computer Control Sequence

After pressing the PROCESS START/STOP button, The computer will automatically control the deposition process in the following sequence:

1. Chamber gauge and furnace heaters come on and heat up to set point value.
 - a. Vaporizer is disabled.
 - b. Vaporizer temperature fault monitor is enabled.
 - c. Rotation (if installed) comes on.
2. When the chamber pressure is below Base Pressure (indicated by the flashing output ALM light on the vacuum controller) and the furnace and chamber gauge temperatures are in limits (indicated by the ALM light on both controllers not flashing), the vaporizer is enabled and begins to ramp up.
3. When the vaporizer exceeds 90°C, coating begins.
4. If a temperature fault is detected, a fault shutdown will be initiated:
 - a. The Red Alarm light will begin to flash.
 - b. An audio alarm will sound (this can be silenced by depressing the Alarm pushbutton).
 - c. The 5-minute fault alarm timer will initiate. If the fault does not clear before the timer elapses, then a shutdown will initiate as described in the next step.
5. When the coating run has completed, the vaporizer will hold at set point temperature and the chamber will return to base pressure. The 5-minute end-of-run timer begins timing out before initiating a shut down as described in step 6.
6. Shut down occurs when the end-of-run or a fault timer has elapsed. The PROCESS START/STOP (green) light will start to blink. The furnace, gauge tube, vaporizer, and load door heaters will be disabled. If the shutdown was caused by a fault, the red alarm will be turned on. The pump will remain on to secure the process by preserving the vacuum.