4D LABS

Simon Fraser University 8888 University Drive, Burnaby, B.C. V5A 1S6
E info@4dlabs.ca T 778.782.8158 F 778.782.3765 www.4dlabs.ca

PVD 9 – Lesker PVD 75 Deposition System

Standard Operating Procedure

4D LABS Confidential

Revision: 1.0 — Last Updated: July 15/2015, Revised by Chris Balicki

Overview

This document will provide a detailed operation procedure of the PVD 9 System. Formal Training is required for all users prior to using the system.

Revision History

#	Revised by:	Date	Modification
0	Chris Balicki	2015/07/15	Document Initial Release
1			
2			
3			
4			

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General Information

The Lesker PVD 75 Deposition System (PVD 7) is a 2 source thermal evaporation and 1 source sputter deposition system. The system can process samples up to 6” in diameter. Materials approved include: Chromium, Gold, and Silver. Features include substrate cleaning/etching via argon/oxygen plasma and heating up to 400°C.

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Operation

Vent Main Chamber

1. Login.
2. Enter the 'Vacuum' screen.
3. Run the 'Start PC Vent' recipe.
   IMPORTANT: If you need to abort, click on the green portion of the 'Running Recipe' window and click abort.
4. Verify that the turbo pump speed is decreasing.
5. Wait for the recipe to finish. Close the recipe window by clicking 'OK'.

Sample Unloading/Loading

1. Open chamber door.
2. Use the dedicated needle nose pliers for platen removal. Spot the platen from falling.
3. Mount your sample using the clips and ensure your sample is secure.
4. Load the platen with the needle nose pliers, again spotting it from falling. Ensure it is seated correctly such that it is perfectly centered and horizontal in the platen holder.
5. Check the chamber door viewport and ensure there is a transparent piece of mylar film protecting the glass window.
6. Check the sources. If material is low, add 2-3 pellets of material and record the amount added on the log sheet. Sources that will not be used should be covered w/ aluminum foil.
7. Check the crystal sensor using the Sigma SQM-242 software. If sensor life is <55%, replace the crystal. Request assistance from the Nanofabrication Staff if necessary.

Pump Main Chamber

1. Close main chamber door.
2. Run 'Start PC Pump' recipe.
   IMPORTANT: If you need to abort, click on the green portion of the 'Running Recipe' window and click abort.
3. At step ** of the recipe, apply a slight pressure to the chamber door until the VAC switch turns green and the turbo pump turns on.
4. Wait for recipe to finish. Close the recipe window by clicking 'OK'.
5. Wait for the main chamber pressure to reach <2.00E-6 before performing deposition.

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Deposition

Note: For up-to-date source status and operation parameters, please check the log book and the Materials Information sheet posted near the equipment. Deposition should take place at a pressure of <2.0E-6Torr.

Thermal Evaporation Deposition via Manual Control

1. Verify that Sigma SQS-242 and Sigma SQM-242 software is off. If both software are off, proceed to step 2. If not, proceed to step 1a.
    a. If Sigma SQM-242 is on, turn it off.
    b. If Sigma SQS-242 is on, turn it off, and exit (shutdown) the C-Ware software. Restart C-Ware software and run the 'Start PC Pump' recipe.
2. Enter the 'Platen Motion' screen.
3. Click the 'Fwd' button to initiate sample rotation.
4. Enter the 'Deposition' screen.
5. Open the Sigma SQM-242 software.
6. Enter the desired material Density, Tooling Factor, and Z Factor (check Materials Information sheet).
7. Click 'Start'.
8. Turn on the desired source switch.
9. Turn on 'Evap' power supply.
10. Click on Evap ramp rate and enter the value for the corresponding material ramp up (check Materials Information sheet).
11. Click on Evap set point and enter desired set point (check Materials Information sheet / log book).
12. Monitor your thickness and deposition rate in the Sigma Monitor software. Perform predeposition if desired. If rate adjustment is required, repeat steps 10-11, first entering the ramp rate followed by the new set point.
13. When desired deposition rate is reached, click 'Zero Sensor' and open the Substrate shutter.
14. Wait until desired thickness is deposited.
15. Close Substrate shutter.
16. Click on Evap ramp rate and enter the value for the corresponding material ramp down (check Materials Information sheet).
17. Click on Evap set point and enter 0.
18. Wait for set point to reach 0.
19. Turn off 'Evap' power supply.
20. Turn off the Sigma Monitor software.
21. Enter the 'Vacuum' screen.

If finished, the chamber may be vented by activating the 'Start PC Vent' recipe.

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Sputter Deposition via Manual Control

1. Enter the 'Vacuum' screen.
2. Set Turbo Pump Speed SP to 40.
3. Wait for the PC Turbo Speed% to reach <80.
4. Enter the 'Gas' screen.
5. Open the Gas Injection valve.
6. Enter the desired mode for each open MFC.
7. Enter 20mTorr for Capman Pressure SP.
8. Confirm that gas flow is present and that chamber pressure is converging on 20mTorr.
9. Enter the 'Platen Motion' screen.
10. Turn on substrate rotation by pressing the 'FWD' button.
11. Enter the 'Vacuum' screen.
12. Wait for the PC Turbo Speed% to reach 40.
13. Enter the 'Deposition' screen.
14. In the power supply section, row #3 (DC 1kW), enter 50W for Working Power SP.
15. Turn on the source power supply #3 (DC).
16. Confirm that Power is ~50W, Volts is >0V, and Amps is >0A.
17. Once plasma is ignited, take the necessary steps to setup your sputtering conditions – working power, gas composition, and pressure.
    a. Reduce pressure (PC Cap SP) to desired working pressure. Enter gas ratios if desired.
    b. Enter ramp rate (check Materials Information sheet).
    c. Enter new Working Power SP. Wait until SP is reached.
    d. Once SP is met, wait ≥10min to presputter the target.
    e. Open the source shutter and wait 30 seconds.
    f. Confirm that Volts/Amps are stable.
18. When ready, open the substrate shutter to start your timed deposition.

    Simultaneously, the user should start a handheld timer and verify through the viewport that the shutters are open, the platen is rotating, and that the plasma is stable. It is okay to leave the system during sputtering. When finished…

19. Close the substrate shutter.
20. Close the source shutter.
21. Enter ramp rate (check Materials Information sheet).
22. Enter 0W for Working Power SP. Wait for power and all other indicators to ramp down to 0.
23. Turn off the source power supply.
24. Turn off the source switch.
25. Enter the 'Platen Motion' screen.
26. Turn off substrate rotation by pressing the 'FWD' button.
27. Enter the 'Gas' screen.
28. Enter 0mTorr for Capman Pressure SP.

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29. Enter 0 mode for all MFCs.
30. Close the Gas Injection valve.
31. Enter the 'Vacuum' screen.

If finished, the chamber may be vented by activating the 'Start PC Vent' recipe.

Deposition via Recipe Control

Deposition via Recipe Control is only permitted to users who have a mastery of manual control of the system. It is best suited to individuals who are repeatedly performing the same process.

Additional training is required for recipe creation and deposition. Please contact the Nanofabrication Staff for further information.

Closing Steps Prior to Leaving

1. Confirm that the turbo pump is on.
2. Confirm that PC Turbo Backing valve is open.
3. Set Turbo Pump Speed SP to 50.
4. Logout.

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References and Files

Kurt J. Lesker PVD 75 Operation Manual

Contact Information

Questions or comments in regard to this document should be directed towards Chris Balicki (balicki@4dlabs.ca) in 4D LABS at Simon Fraser University, Burnaby, BC, Canada.