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## **1.0 Purpose/Scope**

- 1.1 This document covers the procedure that should be followed for normal operation of the Lesker PVD75 Sputter Coater for the purpose of depositing zinc oxide on substrate materials that will be used for research purposes. **It is suggested that you review this document thoroughly before proceeding with the operation of this tool.**

**If an error condition occurs at anytime during your process immediately shut off the power supplies if they are on & place the tool in a safe mode. Place the sign on the tool to down, contact CSSER staff & submit a service request.**

## **2.0 Reference Documents**

- 2.1 PVD 75 Operation Manual

## **3.0 Equipment/Supplies/Material**

- 3.1 Isopropyl Alcohol  
3.2 Nilfisk clean room vacuum  
3.3 Clean room wipes  
3.4 Timer

## **4.0 Safety**

- 4.1 Follow all safety procedures outlined in the CSSER Rules and Procedures Handbook. The handbook can be found at <http://www.fulton.asu.edu/fulton/csser/safety.php>  
4.2 Red EMO Button can be pressed at any time a emergency situation arises.

## **5.0 Set Up Procedures**

- 5.1 Tool preparation.  
5.1.1 Fill out machine log sheet with name, date, and time.  
5.1.2 Computer Log In-To Be Determined.  
5.1.3 Open the valves for the oxygen and argon cylinders.  
5.1.4 Check the cooling water supply by touching the “Cooling” page. Check to see that a green field is displayed on the “Src1 Flow Switch.”  
5.1.5 The software includes a system for entering values into the individual set points. Touch the set point box and another window will open. It is a keypad that allows the user to enter any variables to be used as set points. Also the maximum and minimum values are displayed for each set point.

## **6.0 Procedures**

**THE TOUCH SCREEN IS FRAGILE AND EXPENSIVE! Use only light touches with your fingers to operate it, extra pressure will not make it work better. DO NOT USE PENS, TWEEZERS OR ANYTHING ELSE.**

- 6.1 Vent Chamber  
6.1.1 Ensure the touch screen is displaying the vacuum control screen by touching the “Vacuum” button.

- 6.1.2 Touch the “Start PC Vent” button and wait for approximately 2 minutes for a recipe complete message and then touch “OK” button.
- 6.1.3 Open the chamber door.
- 6.1.4 Clean the inside base plate of the chamber with the Nilfisk vacuum. Wipe down the chamber seal and O-ring with isopropyl alcohol on a clean room wipe.

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|---|
| <b>Request staff to replace the Aluminum foil shielding if it is burned, peeling, or flaking.</b> |
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- 6.2 Load Substrate
  - 6.2.1 Touch “Motion” button to display motion control page.
  - 6.2.2 Touch “Home” button. The platen can only be removed while in the home position. Remove platen and close chamber door.
  - 6.2.3 Load substrates into the center of the platen. The maximum substrate size is approximately 4”. Substrates larger than 4” will have uneven deposition due to the size of the small shutter compared to the large target.
  - 6.2.4 Open chamber door and replace platen. Close chamber door. Start the motion of the platen by touching the “Fwd” button.
- 6.3 Pump Chamber Down
  - 6.3.1 Ensure the touch screen is displaying the vacuum control screen by touching the “Vacuum” button.
  - 6.3.2 Touch the “Start PC pump” button and wait for approximately 5 minutes for a recipe complete message and then touch “OK” button.
  - 6.3.3 Wait for approximately 1 hour for the chamber to reach a pressure of 1.0 X10<sup>-6</sup>.
- 6.4 Substrate Heater
  - 6.4.1 The substrate heater cannot be turned on until the chamber has reached 1.0 X10<sup>-6</sup>.
  - 6.4.2 Ensure the touch screen is displaying the heater control screen by touching the “Heating” button.
  - 6.4.3 Touch the Substrate Heater On/Off button to display “ON”
  - 6.4.4 Enter the Substrate Heater set point by touching the “Temp SP” window. Enter the value desired.
  - 6.4.5 Enter the Ramp/Rate by touching the “R/R” window. Enter the value desired.
  - 6.4.6 Touch the Auto button to display “ON” and the Auto SP will start to increase and the heater temperature will also increase.
  - 6.4.7 Ensure the platen is spinning. Look at the “Deposition” page and refer to the Platen Control window.
  - 6.4.8 The Substrate Heater will take about 35 minutes to get to a set point of 350 degrees.
- 6.5 Gas Flow
  - 6.5.1 The typical gas flow for this tool is a pressure control set at 10mT and a 50/50 ratio of argon to oxygen flow. I am going to describe that setup in this paragraph. This set up can be adjusted to fit the user’s needs.

- 6.5.2 Ensure that the turbo pump speed SP is at 50% and turn the wide range gauge wide range gauge filament “OFF”. Refer to the “Vacuum” page.
- 6.5.3 Ensure the touch screen is displaying the gas flow control screen by touching the “Gas” button.
- 6.5.4 Touch the “Gas Injection” button to open the gas flow valve.
- 6.5.5 Enter a value of “10” in the set point window for the Capman Pressure SP.
- 6.5.6 Enter a value of “4” in the “Mode” window of MFC 1. Mode 4 sets the MFC 1 flow to control the chamber pressure. The chamber pressure is determined by the Capman Pressure SP.
- 6.5.7 Enter a value of “11” in the “Mode” window of MFC 2. Mode 11 sets the MFC 2 flow to match the set point of MFC 1.
- 6.6 Sputter Deposition
  - 6.6.1 Ensure the touch screen is displaying the deposition control screen by touching the “Deposition” button.
  - 6.6.2 Enter the Power Supply 1 set point by touching the “Set point” window. Enter a value of 50.
  - 6.6.3 Turn on the Power Supply by touching the “ON” button.
  - 6.6.4 Light Plasma
    - 6.6.4.1 Open and then close the shutter by touching the “Substrate Shutter” twice. A value should register on the “DC Bias” window when the plasma is ignited.
    - 6.6.4.2 If that does not work, then increase the Capman Pressure SP to “20” and then return it to “10”. Check for a DC Bias and plasma.
    - 6.6.4.3 If further problems with lighting the plasma persist, then contact CSSER staff.
  - 6.6.5 Enter the Ramp Rate by touching the “Ramp Rate” window and enter a value of “2”. If a value of 0 is entered then the power supply will ramp at a maximum rate and damage the target due to thermal stress. It is strongly suggested that only a ramp rate value of 2 be used.
  - 6.6.6 Change Power Supply 1 Set point by touching the “set point” window and enter “300”.
  - 6.6.7 The Deposition page has options of changing the set points of the Capman pressure, Substrate Heater, Platen rotation, and the gas flows, that can be used for any final tweaks to the process.
  - 6.6.8 Verify that all inputs have reached their set points and stabilized. Record values into log sheet.
  - 6.6.9 Open the shutter by touching the “Substrate Shutter” button and start the timer.
  - 6.6.10 At the end of the target deposition time, close the shutter by touching the “Substrate Shutter” button.
  - 6.6.11 Record target usage time displayed in the Source1 window.

**6.7 Shut Down**

- 6.7.1 Referring to the Deposition Page, set the Ramp Rate set point to “2”. Set the Power Supply1 set point to “50”. A slow ramp rate is encouraged to keep the target from cracking due to thermal shock.
- 6.7.2 After Power Supply 1 reaches a set point of 50, turn of the Power Supply button to “OFF”.
- 6.7.3 Referring to the Heating page, turn the Substrate Heater off and the set point to “0”. To help cool the heater, ensure that the shutter is open. IT takes approximately 1 hour for the substrate heater to cool down to 80°.
- 6.7.4 Referring to the Gas page set the Capman pressure and MFC Mode and flows back to “0”.
- 6.7.5 Refer to the Vacuum page and touch the “Start PC Vent” to vent the chamber. The PC Vent recipe will not vent the chamber until the substrate heater temperature is below 80 degrees.
- 6.7.6 After chamber is vented, open chamber door, remove substrate from platen, replace platen and close chamber door. Touch the “Start PC pump” button to pump the chamber to a vacuum.
- 6.7.7 Close the shutoff valves for the oxygen and argon cylinders.
- 6.7.8 Computer Log Out-To Be Determined.

**7.0 Forms**

**7.1 PID values**

|                  | P   | I   | D    |
|------------------|-----|-----|------|
| Substrate Heater | 1.6 | 0.2 | 0.05 |
| Capman           | 3   | 0.8 | 0.1  |
| Platen Motion    | 500 | 2   | 250  |

7.2 Log Sheet

**ZNO LESKER LOGSHEET**

|                  |  |  |  |  |  |  |  |  |  |
|------------------|--|--|--|--|--|--|--|--|--|
| Name             |  |  |  |  |  |  |  |  |  |
| Date             |  |  |  |  |  |  |  |  |  |
| Start Time       |  |  |  |  |  |  |  |  |  |
| End Time         |  |  |  |  |  |  |  |  |  |
| Base Pressure    |  |  |  |  |  |  |  |  |  |
| Sputter Pressure |  |  |  |  |  |  |  |  |  |
| Argon MFC Flow   |  |  |  |  |  |  |  |  |  |
| Oxygen MFC Flow  |  |  |  |  |  |  |  |  |  |
| Substrate Heater |  |  |  |  |  |  |  |  |  |
| Platen Rotation  |  |  |  |  |  |  |  |  |  |
| Deposition Power |  |  |  |  |  |  |  |  |  |
| Deposition Time  |  |  |  |  |  |  |  |  |  |
| Target usage     |  |  |  |  |  |  |  |  |  |

**8.0 Figures**

8.1 None

| Effective Date | Originator | DESCRIPTION OF REVISION | Issue |
|----------------|------------|-------------------------|-------|
| 03/02/09       | Todd Eller | Initial Release         | A     |
|                |            |                         |       |
|                |            |                         |       |
|                |            |                         |       |