

Arizona State University NanoFab

LESKER 4 EVAPORATOR STANDARD OPERATION PROCEDURE

Rev D

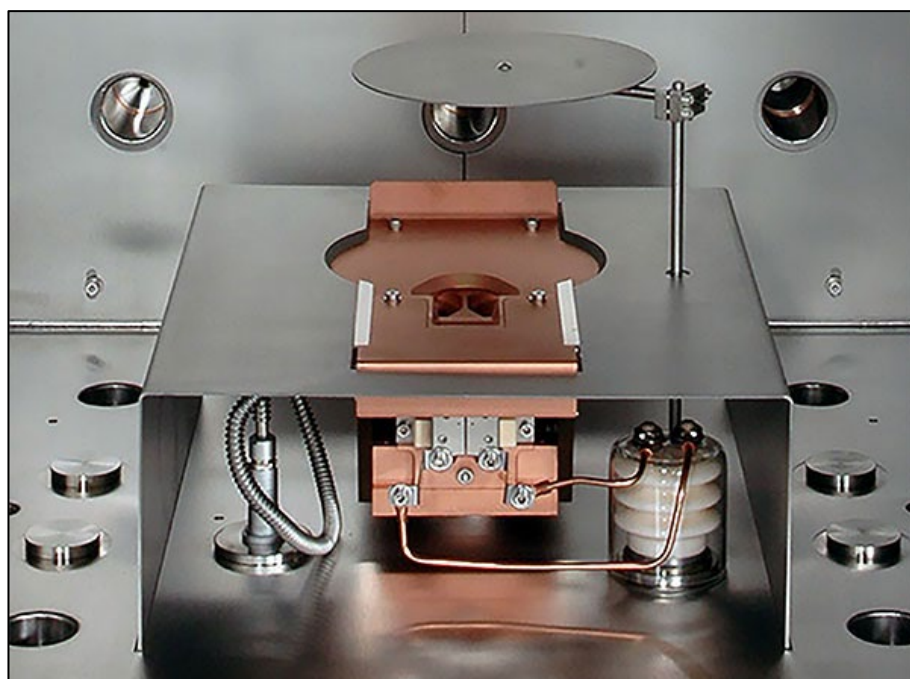


Table of Contents

1.0 Purpose/Scope.....3
2.0 Reference Documents 3
3.0 Equipment/Supplies/Material 3
4.0 Safety 3
5.0 Tool Reservation Policies 3
6.0 Set Up and Genius Controller Procedures 3
7.0 Materials List 5
8.0 Operation Procedures.....5
9.0 Revision History 8

1. Purpose / Scope

- 1.1 This document covers the procedure that should be followed for normal operation of the Lesker PVD75 PRO line Electron Beam Evaporator.
- 1.2 12” platen size. Sample sizes-any size up to a 300mm wafer.
- 1.3 Source materials allowed: Contact ASU NanoFab for approval for any material not listed.

2. Reference Documents

- 2.1 Chemical Safety & Hazardous Waste Management Rules & Procedures Handbook
- 2.2 PVD Series Operation Manual

3. Equipment / Supplies / Material

- 3.1 Clean room vacuum.
- 3.2 Tweezers, Kapton tape.

4. Safety

- 4.1 Follow all safety procedures outlined in the NanoFab Handbook
- 4.2 Follow safety procedures for high voltage when working with high voltage or RF energy.
- 4.3 Due to the unpredictability of high power eBeam on source materials, all deposition processing requires to be monitored at all times.
- 4.4 Follow safety and handling procedures when working with vacuum systems and source materials.
- 4.5 Do not attempt to repair the tool under any circumstances. Submit a service request and contact ASU NanoFab staff.
- 4.6 Red EMO Button can be pressed at any time an emergency situation arises. Contact NanoFab staff to follow up with any emergency condition.

5.0 Tool Reservation Policies

- 5.1 Only trained users will be allowed to use this equipment.
- 5.2 Recommended to schedule your runs to secure you scheduling and to alert other potential users of the tool.
- 5.3 Our NanoFab 15-Minute rule.
 - 5.3.1 Please start within 15 minutes of your equipment scheduled time or the tool becomes available to anyone. Please place a ‘Tool in Use’ tag when you arrive to indicate use.
 - 5.3.2 Please have the equipment available for the next user within 15 minutes after your scheduled time
- 5.4 Cancellations.
 - 5.4.1 If you cannot meet the equipment schedule, please cancel your iLabs schedule to allow other users to utilize the equipment.

- 5.4.2 Scheduling on iLabs allows cancellation within 24 hours of your scheduled time. Please email staff if cancellation within 24 hours.
- 5.4.3 We discourage last second cancellations.
- 5.4.4 We discourage scheduled equipment no-shows.
- 5.5 Scheduling Overnight runs.
 - 5.5.1 Please complete overnight runs by the following morning at 9am.

6.0 Set Up & Genius Controller Procedures

- 6.1 Stack Light. The stack light has 4 lights to indicate status of the tool. The green light indicates that everything is OK. The blue light indicates that there is a recipe that is running. The yellow light indicates an alarm condition. The red light indicates an abort condition.
- 6.2 Insure Lesker 4 placard is UP (Green).
- 6.3 Tool preparation
 - 6.3.1 Select the Deposition page on the display.
 - 6.3.2 Refer to the Sensor Status box; ensure that all 3 sensor boxes are Green.
- 6.4 For Single films, select proper pocket on eklipse software before venting. You would avoid using the Genius software to rotate pockets while at atmosphere.
- 6.5 Use of the Genius controller is required to rotate the source pockets while at atmosphere.
- 6.6 Please use only the Metal_P1 Material on Genius controller for all the recipes.
- 6.7 Genius Controller operation used only to rotate pockets while chamber at atmosphere.
 - 6.7.1 Open the door and ensure that the Genius Controller displays “Automatic operation”.
 - 6.7.2 LH and RH denote left hand joystick and righthand joystick. Up, down, left and right denote the arrow direction.
 - 6.7.3 Press the MENU/QUIT button at any time to return controller to the top page. The controller is normally operating in Automatic Mode.
 - 6.7.4 Set to Manual Mode from the top page.
 - 6.7.4.1 Press MENU/QUIT button
 - 6.7.4.2 LH-down to Auto/Manual
 - 6.7.4.3 RH-up to Manual operation
 - 6.7.4.4 RH-right (ensure arrows are pointing to service) than RH again (login) and enter code of 2031
 - 6.7.5 Rotating Source Pockets.
 - 6.7.5.1 Set controller to manual mode.
 - 6.7.5.2 LH-up or down (Set pocket).
 - 6.7.5.3 RH-up or down (Choose pocket).
 - 6.7.5.4 Select momentarily to the right.
 - 6.7.5.5 RH- Hold joystick to the right until pocket rotates and stops at position.

- 6.7.5.6 Place desired crucible liner with source material in pocket.
- 6.7.5.7 Load or remove your crucibles. Repeat if required.
- 6.7.6 When completed with rotating and loading/unloading materials in pockets, rotate the source pocket to match the same pocket shown on the eKLipse software. Otherwise the following error occurs: **Error 29: Vacuum interlock blocks rotation.**



- 6.7.7 Set to back to Automatic Mode from the top page.
 - 6.7.7.1 Press MENU/QUIT button
 - 6.7.7.2 LH-down to Auto/Manual.
 - 6.7.7.3 Press MENU/QUIT button several times to display Automatic mode.

7.0 Materials List

6.1. Lesker 4 Material List

If the material is not listed, check with ASU NanoFab staff for approval.

6.2. The NanoFab will only provide Aluminum and Nickle materials.

Allowed Materials	Not Allowed
Aluminum	Gold
Aluminum Oxide	Silver
AL w/1% Si	Copper
Chrome	Indium-Tin-Oxide
Molybdenum	Lead
Nickle	Zinc Oxide
Palladium	
Platinum	
Silicon	
Silicon Dioxide	
Titanium	

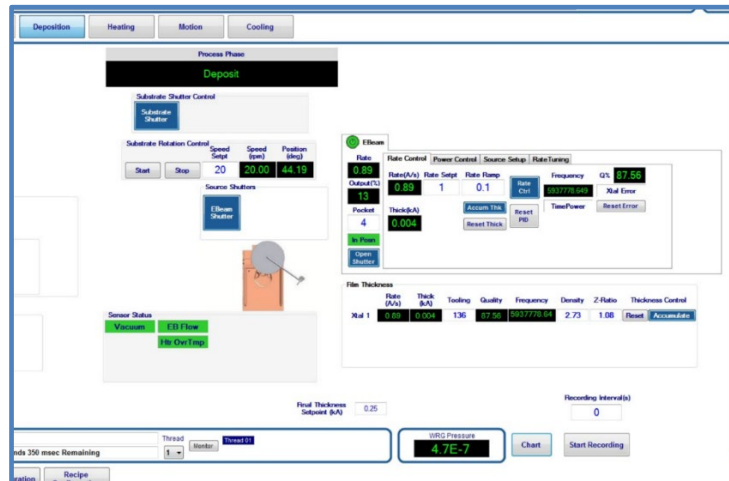
8.0 Operation Procedures

- 8.1 Vent Chamber
 - 8.1.1 Sign in and start a run on the NanoFab run log with your intended materials and thickness.
 - 8.1.2 Recommended: Select your intended pocket you wish to use before you Vent.**
 - 8.1.3 Select Vacuum screen to view the current tool pressure.
 - 8.1.4 Ensure the Genius controller is set to Automatic operation mode, the desired material and pocket, and desired data set.
 - 8.1.5 Depress PC Vent button. Wait till this recipe shows complete.
 - 8.1.6 Open the chamber door.
 - 8.1.7 Use the Nilfisk vacuum to remove any loose particles from inside the chamber if necessary.
 - 8.1.8 Replace the chamber viewport Mylar liner in the view window if necessary
- 8.2 Load source material
 - 8.2.1.1 Place source material in pocket if required. Ensure material in the crucible liner is enough but note clearance. Al is typically placed on pocket 4.
- 8.3 Load Substrates
 - 8.3.1 On the Deposition screen, depress the Substrate Shutter button to Open (Blue).
 - 8.3.2 Depress the Home Substrate Motor button to Home the platen.
 - 8.3.3 Remove the platen. Be careful not to bump the crystal when removing.
 - 8.3.4 Load substrate(s) into the center of platen with clips or Kapton tape.
 - 8.3.5 Reinstall platen into chamber carefully.
- 8.4 Load your materials in crucibles. Please leave the provided Aluminum material in pocket 4.
- 8.5 Close the chamber door.
- 8.6 On Deposition page, insure XTAL quality is >60%. Notify engineering if XTAL requires replacement before the chamber is pumped down.
- 8.7 Pump Chamber Down
 - 8.7.1 Depress the PC Pump button on right side of screen. The Pump PC recipe will complete with a pressure of 5.0E-5 Torr. Lower pressures are recommended.
 - 8.7.2 When recipe meets 5.0e-5 Torr pressure, enter “time remaining” value on the NanoFab log sheet.
- 8.8 Run Deposition Recipe.

Warning: Please do not leave tool unattended while the Beam Power is ON.

- 8.8.1 Select Run Recipe button on the Deposition screen.
- 8.8.2 Choose desired Deposition recipe. Double check you selected the proper recipe.

- 8.8.2.1 Recipes for the Chrome and SiO₂ materials use extremely low powers.
- 8.8.3 The Parameter Passing Recipe window will open up.
 - 8.8.3.1 Enter the crucible pocket, target thickness, and dep rate (0.5 – 3Å/sec).
 - 8.8.3.2 Thickness displayed in kÅ unit.
- 8.8.4 Select the Continue Load button. The recipe will now START processing.



- 8.8.5 Ramp-up and Deposition steps.
 - 8.8.5.1 Settings. Fixturing updated
 - 8.8.5.2 Ramp1 and Soak1. eBeam power level started.
 - 8.8.5.3 Ramp2 and Soak2. eBeam power level increased.
 - 8.8.5.4 Shutter Delay. eBeam increased while monitoring dep rate. Once rate is at 50% intended value, deposition will start soon after.
 - 8.8.5.5 Deposition. Shutter opens, rate is maintained.
 - 8.8.6 Monitor eBeam and parameters during processing.
 - 8.8.6.1 Insure eBeam is on targeted properly on material. Keep visual on material during your processing,
 - 8.8.6.2 Monitor that Dep Rate and Power levels are stable.
 - 8.8.7 Enter the Power value on NanoFab run log towards end of the dep.
 - 8.8.8 When recipe completed, Blue light turns off and “completed” message displays.
 - 8.8.9 If you have multiple layers, go back to step 7.8 to start the next layer.
- 8.9 Post Deposition
- 8.9.1 Before Venting the system; allow 5 minutes for the system to cool off.
 - 8.9.2 Depress the PC Vent button.
 - 8.9.3 Open chamber when the Vent recipe is completed.

- 8.9.4 Unload Substrates.
 - 8.9.4.1 On the Deposition screen, depress the Substrate Shutter button to Open (Blue).
 - 8.9.4.2 Depress the Home Substrate Motor button to home the platen.
 - 8.9.4.3 Remove the platen. Be careful not to bump the crystal.
 - 8.9.4.4 Unload substrate(s). Reinstall platen.
- 8.9.5 Clean the inside of the chamber with the Nilfisk vacuum. Do not use the vacuum on the filament or source metals as it may contaminate them.
- 8.9.6 Retrieve your materials in crucibles.
- 8.9.7 Replace the view port Mylar liner as a common courtesy to next user.
- 8.9.8 Close the chamber door.
- 8.9.9 Depress the PC pump button to pump down the chamber.
- 8.9.10 Change the tool status to Run Completed on the NanoFab run log.

9.0 Revision History

Effective Date	Originator	DESCRIPTION OF REVISION	Issue
8/27/14	Todd Eller	Initial Release	A
1/25/18	Todd Eller	Update procedures	B
8/21/18	Jaime Quintero	Checklist version of operating procedures.	C
08/29/19	Jaime Quintero	Updates and Tool Reservation Policies	D