Metal Deposition using the Angstrom Sputterer

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The Angstrom Sputterer display has two screens- the Process screen and the Chamber screen. The first is used for starting and stopping the sputtering process, whilst the latter is used to control and monitor which valves are open and the chamber pressures. There are three main parts to the Sputterer (from left to right)- the Load Lock (LL), the Main Chamber and the Transfer Arm.

1. Bring up the Chamber screen on the display using the ball mouse. Valves which are open are indicated by green lights whilst red lights indicate closed valves.

2. Check which targets are in place by clicking on ‘Source Details and Shutter Control’. Click the ‘Close’ button to exit that screen.

3. In any case, before moving the transfer arm, make sure the **Load Lock Gate Valve** is open (green).

4. To vent the chamber and put in your sample, first press LL Autovent on the Chamber Screen. Confirm the command by clicking “Start Selected Cycle” to confirm the Venting.

5. When the chamber is vented, open the load lock and take out the sample holder. Close the chamber.

6. Center your sample on the underside of the sample holder and clamp it into place by with the arms screwed in.

7. Open the LL and place the sample holder into the chamber (with the sample underneath). Note that there are notches on the sample holder (a single notch and 180 degrees around the sample holder a pair of notches). The single notch should face to the front of the LL (towards you) and slot into the pin that is in the chamber. For the pair of notches at the back, make sure the pin in the LL slots into the left-most notch as shown in Figure 1.

![Figure 1: Pins must slot into indicated notches.](image)

8. Close the LL.

9. On the Chamber Screen, press LL Pump down and confirm with “Start Selected Cycle”.

10. Wait for the chamber to pump down. We are preparing to move the transfer arm but in any case, before moving the transfer arm, make sure the **Load Lock Gate Valve** is open (green). This indicates that the LL is also pumped down and the sample can be transferred to or removed from the chamber. A message on screen also indicates when the chamber is pumped down.

11. Open the shutter on the main chamber using the knob next to the viewport to be able to look inside.

12. Turn the black knob to the right of the chamber (the one which moves the transfer arm) ACW so that the light in the center chamber turns on and the arm starts to move through the sample chamber from right to left. Continue turning the knob until some resistance starts to be felt.
13. At this stage, move to the other side of chamber and peer into the load lock. Use the black knob to the left of the central chamber to move the fork SLOWLY into the top of the sample holder in the load lock. Note that the knob must be turned CW for the arm to move to the left. If necessary, move the stage which supports sample holder up and down using the grey knob to the left of the Load Lock.

![Figure 2:](image1.png)

14. Once the arm (whose tip is effectively a fork) is in far enough in the notch on the top of the sample holder (see Figure 2), lower the stage which supports the sample holder until the pin in the stage which was initially in the single notch of the sample holder is completely out of the notch.

15. Pull the sample holder (held by the arm) into the chamber using the black knob to the right of the central chamber (CW). Make sure that the sample holder is not centered but instead slightly to the right inside the chamber. This is to allow for the hook that supports the sample holder during the process to be lowered from the top of the chamber.

16. Lower the hook using the switch to the left of the central chamber until the brass hook is low enough that it will be able to slot into the hook on the top of the sample holder.

17. Slowly move the arm with the sample holder to the left to slot the two hooks together.

18. Once this is done, slowly raise the brass hook VERY SLIGHTLY so that the sample holder is now held by the hook and not by the arm. This will be evident when a very small gap will exist between (a) the top of the notch (on the sample holder hook) and (b) the top surface of the sample holder and the arm (this means that the arm is not holding the sample holder anymore).

![Figure 3:](image2.png)

19. Slowly pull the arm completely off the edge plate (CW) to the RIGHT (but not completely to the end otherwise the light in the chamber will turn off).

20. Raise the sample holder as far as possible- check that it is going up by looking through the chamber viewport.

21. Now, move the transfer arm as far as possible to the right (CW). The light in the chamber will turn off and the light next to the transfer arm on the chamber screen (on the display) will turn from red to green.

22. Close the shutter (ACW) on the chamber viewport.

23. On the display, switch to the other screen
24. Click File > Process > and choose a particular recipe. Click Yes to confirm the choice. J. Palmer must be contacted for a custom recipe (AND to change the targets inside the chamber).

25. Click ‘Start Process’ to begin the sputtering.

26. Briefly open the shutter in the front of the chamber to check if the plasma has been triggered. Close the shutter quickly.

27. The ‘Start Process’ button will turn red. Initially the LL gate valve closes and the power will ramp up (at this stage the deposition has not yet begun) as can be seen on the graph on the process screen. Note that rotation of the sample holder also begins as can be seen by the turning black knob above the chamber.

28. When the power reaches the required steady value set in the recipe, the axes will automatically switch to deposition rate vs time and the deposition will begin.

29. Once the deposition is complete, the ‘Start Process’ button will turn back to green.

30. PUMP DOWN the Load Lock so that the Gate Valve will open (do this as before by pressing LL Pump down and confirming with “Start Selected Cycle”).

31. WAIT till the Load Lock Gate Valve opens.

32. Open the shutter on the viewport to be able to see into the chamber.

33. Bring the arm very slightly in (to the left) just far enough so the light in the chamber turns ON.

34. Lower the brass hook and sample holder using the switch to the left of the chamber. Lower it sufficiently so the arm will be able to slot into the notch under the two hooks.

35. Adjust the rotation of the notch using the black knob above the chamber so that it is aligned to the hook.

36. Slowly bring in the hook ensuring it does not touch the top of the sample holder until the fork goes into the notch in the hook atop the sample holder. Adjust the height and rotation of the sample holder very carefully while doing this.

37. Once the fork at the end of the arm is in place, lower the brass hook slightly so the hook on the sample holder no longer touches the brass hook. Lower it far enough that the sample holder now rests on the fork and not on the brass hook.

38. Slowly pull the fork arm to the right (CW), just clear of the brass hook.

39. Raise the brass hook far enough that the sample holder will be able to move to the load lock.

40. The Gate Valve must be already be open for this step but check anyway. Move the fork/arm and sample holder to the left into the center of the Load Lock.

41. Raise the stage in the Load Lock far enough so that the pin in the stage once again fits into the sample holder notch AND so there is sufficient clearance above and below the fork/arm and the top and bottom of the notch (between the hook and sample holder top) so that the arm can be pulled out.

42. Pull the fork/arm back (ACW) to the far right through the deposition chamber until the light turns off (and the arm light on the display has turned green). Make sure the shutter at the front of the deposition chamber is also closed.

43. Press ‘LL Auto Vent’ and confirm with “Start Selected Cycle” to vent the load lock.

44. Remove the sample and sample holder. Close the chamber.

45. Unscrew the sample off the sample holder.

46. Place the sample holder back into the LL. Close the LL.

47. On the Chamber Screen, press LL Pump down and confirm with “Start Selected Cycle”.

48. Fill in the Log.