USC UNIVERSITY OF SOUTHERN CALIFORNIA

STANDARD OPERATING PROCEDURE FOR CHA EVAPORATOR

USC University of Southern California

DPS emergency number 213-740-4321

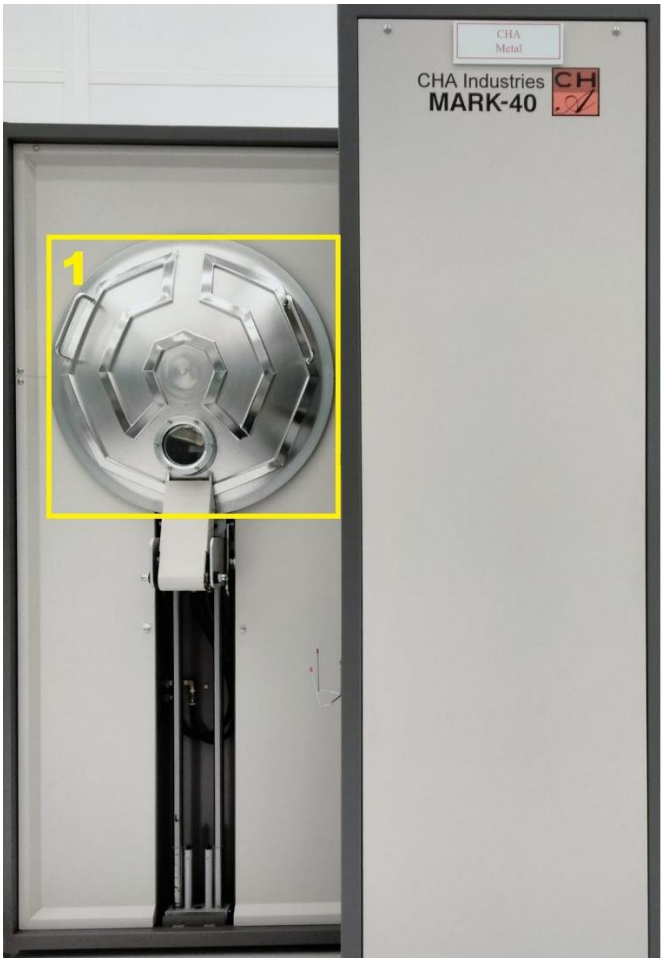
USC UNIVERSITY OF SOUTHERN CALIFORNIA

OVERVIEW

The CHA Evaporation tool is intended for thin film deposition of metals under high vacuum. The Deposition Chamber has six pockets available. Pockets not in use are obscured by a cover plate to prevent cross contamination.

The approved evaporants are Gold, Platinum, Titanium, Silver, Nickel, Chromium, Palladium Please contact staff for approval of other evaporants.

TOOL PARTS



Chamber Door View

Control View

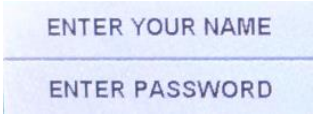
1 – **Deposition Chamber.** The Deposition Chamber is opened to unload and load the Substrate Holder.
2 – **Emergency Button.** The Emergency Button can be pushed to stop all operations in the event of a fire, the presence of smoke or loud noises and/or other emergencies.
3 – **Touch Screen.** The Touch Screen is used to vent or pump down the chamber, control the shutters, rotate pockets, and initiate processes.
4 – Power Supply Controller. The Power Supply Controller is automatic and does not need adjusting.

5 – Deposition Controller. The Deposition Controller is used to select materials, adjust deposition rates, and set final thickness.
6 – Programmable Sweep. The Programmable Sweep automatically controls the E-beam sweep pattern and does not need adjusting.
7 – Cryopump Controller. The Cryopump Controller is set and does not need adjusting.
8 – Marathon Power Supply. The Marathon Power Supply is set and does not need adjusting.
9 – Telemark SX Power Supply. The Telemark Power Supply needs to be manually powered on before running a process and manually powered off at the end of the process.

LOADING SUBSTRATE

1. Press the **STANDBY** button from Menu on the right-side of the touchscreen.


2. Press **LOG ON**


3. Press ENTER YOUR NAME and ENTER PASSWORD to log on.


4. Press **VENT** and wait for chamber venting to complete.

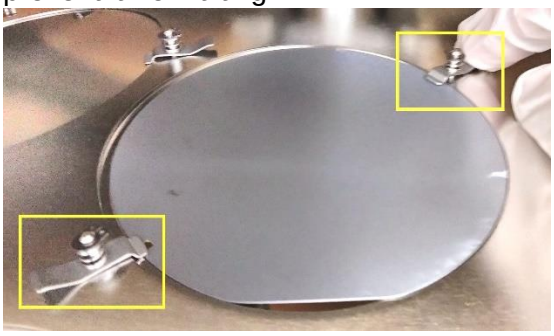

5. Use two hands to open the chamber by gently pulling the handles out and slowly sliding the chamber door down.

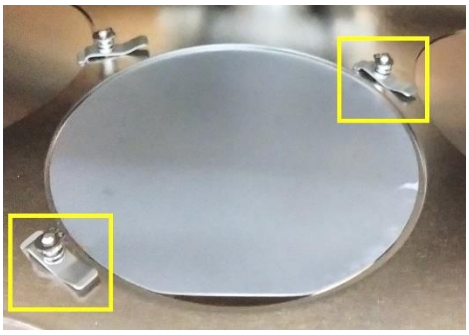

6. One Substrate Holder Pocket is loaded with a dummy 4 Inch Si Wafer. The remaining pockets are covered with metal Pocket Covers. There are two clips securing the Pocket Covers and Si Wafer.

7. **Steps 8 thru 13 are procedures for loading one 4" sample or sample pieces.** If you are loading more than one 4" sample, skip to **Step 14** to unload the entire Substrate Holder.

8. If you are loading one 4" sample or sample pieces, press **JOG FIXTURE** to rotate the dummy Si Wafer to the front of the chamber.

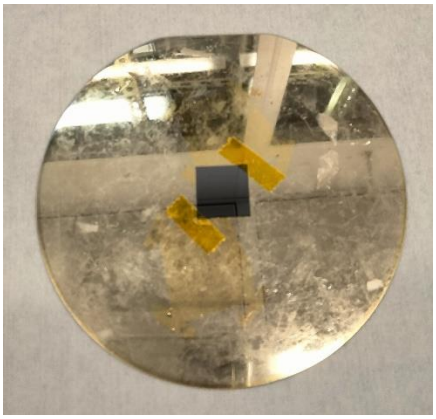
9. Unsecure the Si Wafer by pressing down on the back of the clips and rotating the front of the clips away from the wafer. You may need to use one hand to hold the Substrate Holder to prevent it from tilting.





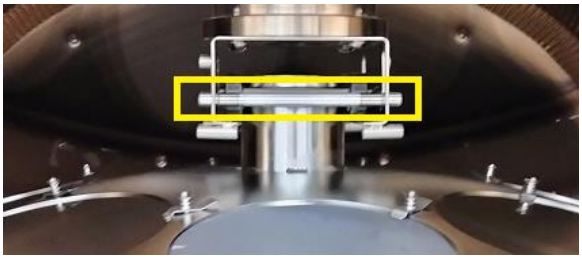
10. Use a clean tweezer to remove the Si Wafer and the place Si Wafer on a cleanroom wipe.
11. Close the Chamber Door while loading samples to prevent contamination.

12. Use Kapton tape to load your sample pieces onto the dummy Si Wafer and load the Si Wafer into the pocket or load your own 4” sample into the pocket. Do NOT tape sample pieces to the Pocket Covers.

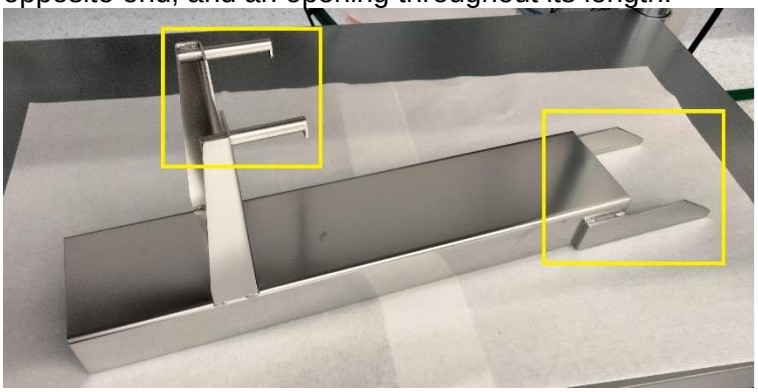


13. Rotate the clips back to secure your sample or Si Wafer.

14. **If you are loading more than one 4” sample, you will need to unload the entire Substrate Holder.** Press **JOG FIXTURE** to rotate the Substrate Holder to move the Securing Bar to the front of the Chamber. The Securing Bar must face the front of the Chamber Door to remove the entire Substrate Holder.



15. Locate the Substrate Holder Removal Tool under the nearby stainless steel table. The Removal Tool has 2 slanted extensions located at one end, two hooks located near the opposite end, and an opening throughout its length.

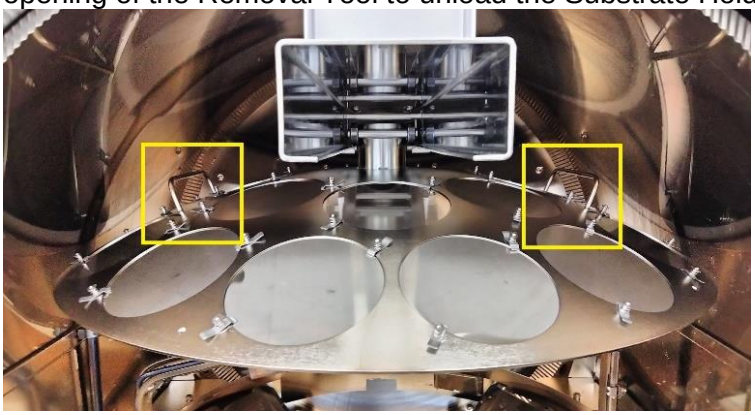


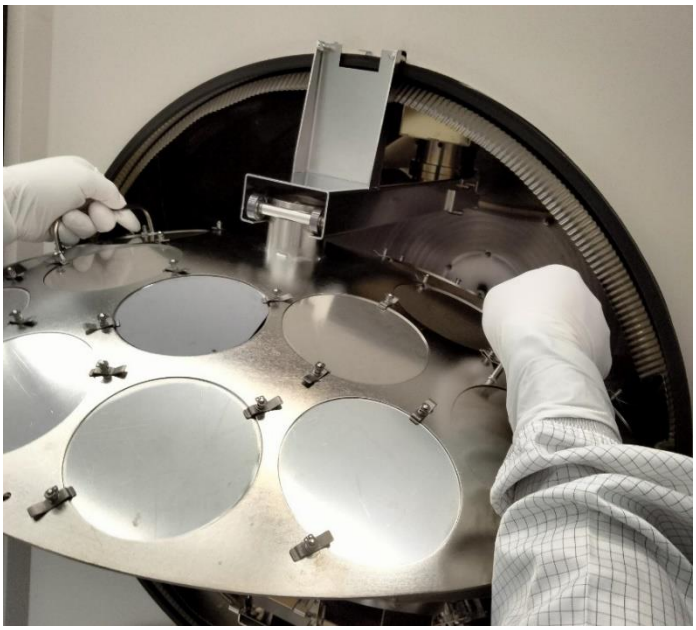
16. Fully Insert the slanted extensions of the Removal Tool under the Securing Bar to lift it.

17. Fully insert the hooks into the holes on top of the Chamber Door to secure it.
    Do **NOT** press the JOG FIXTURE button while the Removal Tool is in position!

18. Line the stainless steel table nearby with cleanroom wipes.

19. The Securing Bar should now be lifted to allow the Substrate Holder to unload. Use two hands to hold the Substrate Holder by the handles and slowly pull the Substrate Holder out of the opening of the Removal Tool to unload the Substrate Holder from the Chamber.

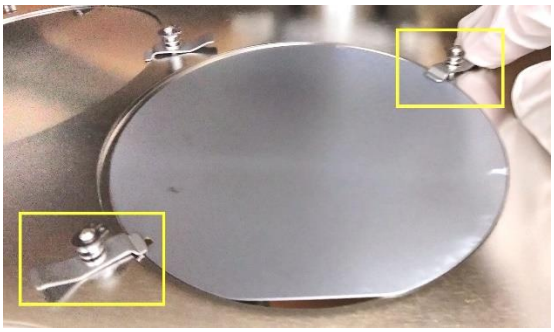


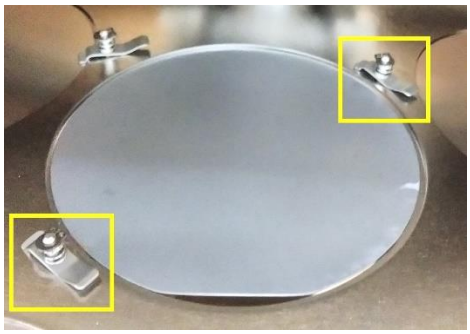


20. Place the Substrate Holder on top of the cleanroom wipes.

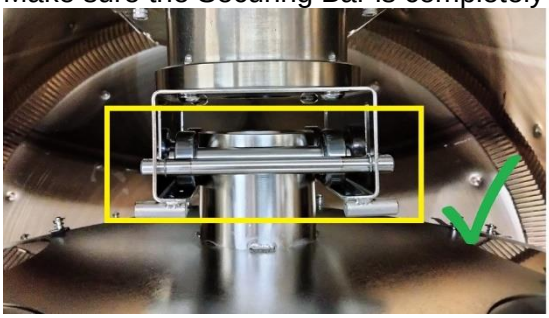
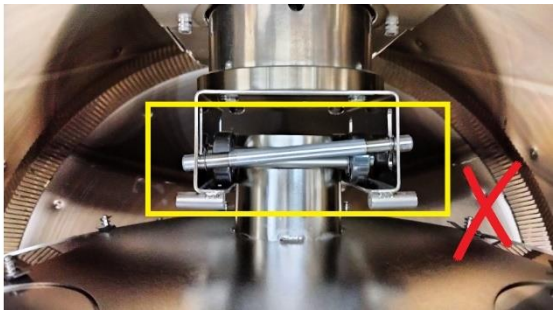
21. **Close the Chamber Door while loading samples to prevent contamination.** First, lift the hooks of the Removal Tool and gently pull the Removal Tool out of the Chamber and place it under the nearby stainless steel table.

22. Close the Chamber Door.
23. Only unload the necessary number of Pocket Covers. Unsecure the Si Wafer and/or Pocket Covers by pressing down on the back of the clips and rotating the front of the clips away from the wafer.





24. Load your samples into the Pockets.
25. Rotate the clips to secure your samples. All pockets must be covered with either your sample, a Pocket Cover, or a Si Wafer.
26. Repeat Steps 15 – 17 to reposition the Removal Tool to the Chamber opening.
27. Use two hands to hold the Substrate Holder by the handles and slowly reload the Substrate Holder into the Chamber through the opening of the Removal Tool.
28. Make sure the Securing Bar is completely lowered.

29. Press **EB GUN SHUTTER** to open the crucible shutter to inspect the Crucible.
    Do **NOT** use a vacuum to clean the chamber while **EB GUN SHUTTER** is open.

30. Note the Pocket # of your material(s) on the Material Spreadsheet.

Materials	Ti	Au	Pt	Pd	Ni	Ag	Cr	
Process Recipes	11	12	13	14	15	16	17	18
Pocket #	4	1	3	6	2	6	5	3

31. Select the Pocket # to rotate the crucible pockets. Selecting the Pocket # will automatically begin the pocket rotation.

32. Inspect the crucible(s) to make sure they are free of defects and have materials filled to at least ½ of the volume. Contact staff if materials are below ½ of the volume.

33. Press **EB GUN SHUTTER** to close the crucible shutter.

34. Use cleanroom wipe to wipe the O-ring of the Chamber Door.
35. Close the Chamber Door.
36. Press **PUMP DOWN** and wait until base pressure 9.00E-7 Torr is reached.

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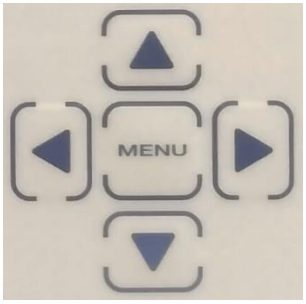
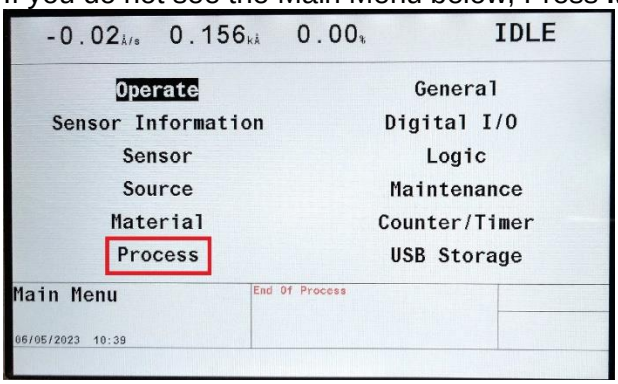
RUN PROCESS

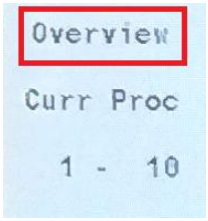
1. On the INFICON IC6 Deposition Controller, Press **MENU**.



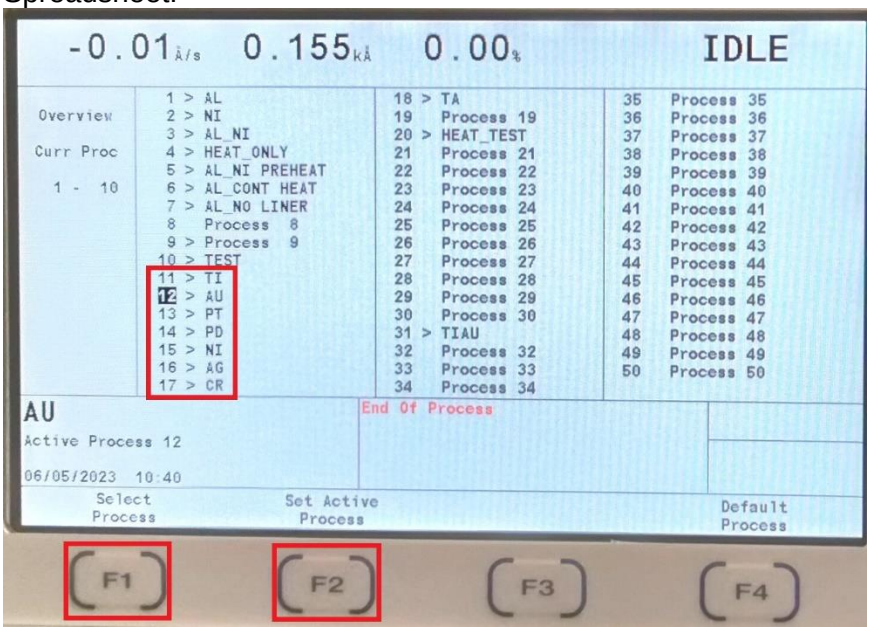
2. If you do not see the Main Menu below, Press **MENU** again.



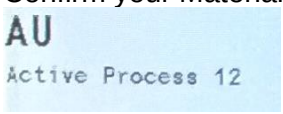
3. Use the Arrows Keypad to highlight **Process** and press **MENU** to select.
4. Use the Arrows Keypad to highlight **Overview** on the left list of tabs.



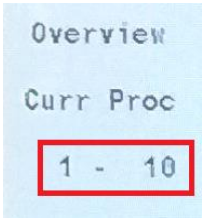
5. Use the Arrows Keypad to highlight your Process Number and Material based on the Material Spreadsheet.



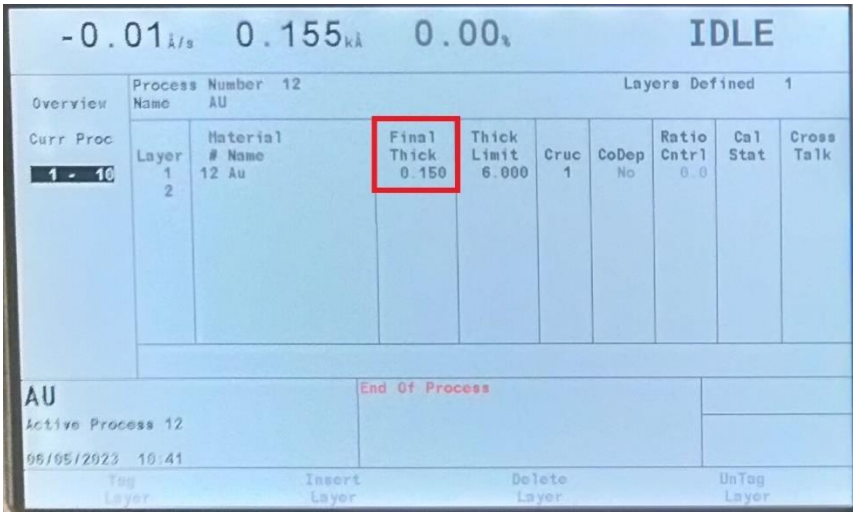
6. Press F2 to set as Active Process
7. Press F1 to Select Process.
8. Confirm your Material symbol and Active Process number are displaying. See example below:



9. Use the Arrows Keypad to highlight "**1 – 10**" on the left list of tabs.

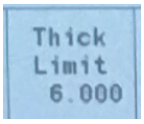


10. Use Arrows Keypad to highlight Final Thick value and input your final thickness value in unit of kÅ.

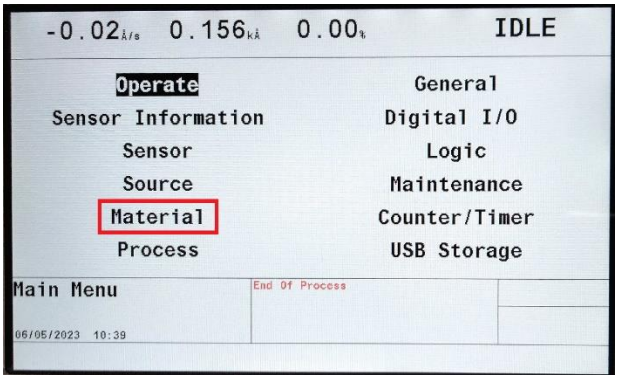


11. Press **ENTER** to confirm editing.

12. Confirm that Limit Thick value is greater than your Final Thick value.
    a. If Limit Thick value > Final Thick value, then do not adjust Limit Thick value.
    b. If Limit Thick value ≤ Final Thick, then input a Limit Thick value of 6 kÅ. Press **Enter** to confirm editing.

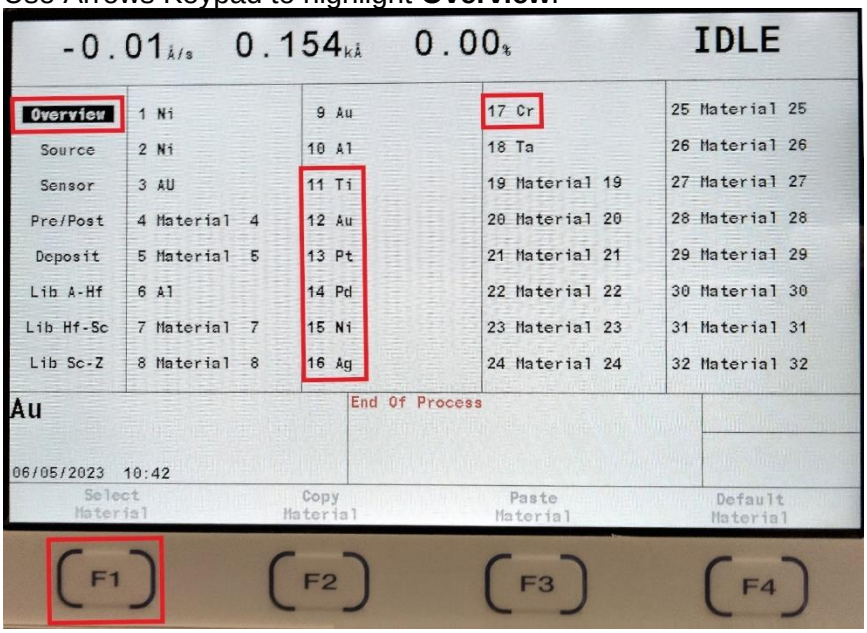


13. Press **MENU** to return to the Main Menu below.

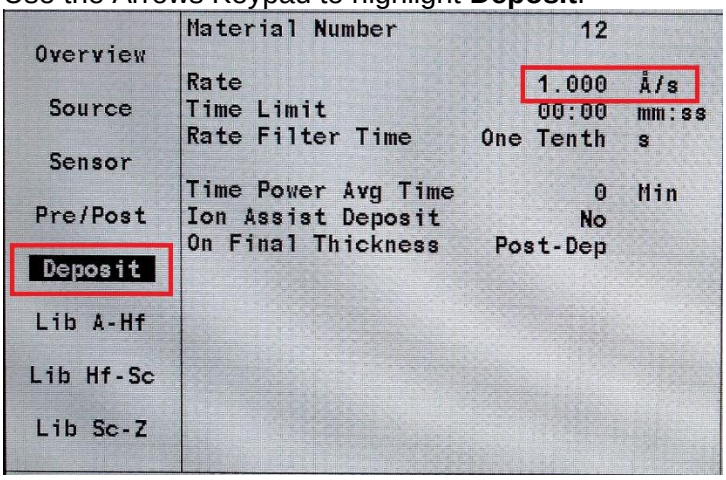


14. Use Arrows Keypad to highlight **Materials** and press **MENU** to select.

15. Use Arrows Keypad to highlight **Overview**.

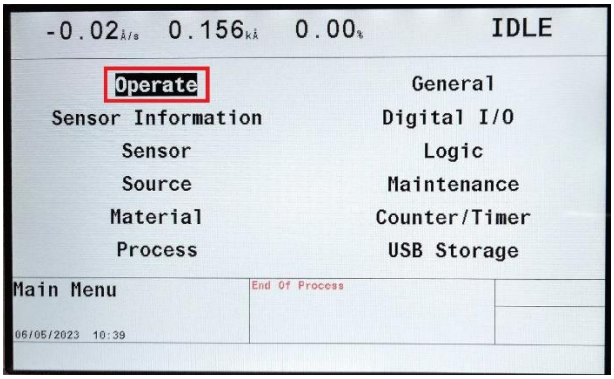


16. Use the Arrows Keypad to highlight your Process Number and Material based on the Material Spreadsheet.
17. Press F1 to Select Process.
18. Confirm your Material symbol is displaying.
19. Use the Arrows Keypad to highlight **Deposit**.



20. Use the Arrows Keypad to highlight the deposition rate and input your deposition rate. Contact staff for approval if you need a deposition rate greater than 2 Å/s. Press **ENTER** to confirm editing.
21. Press **MENU** to return the Main Menu.

22. Use the Arrows Keypad to highlight **Operate** and press **MENU** to open the Deposition Rate Monitor.

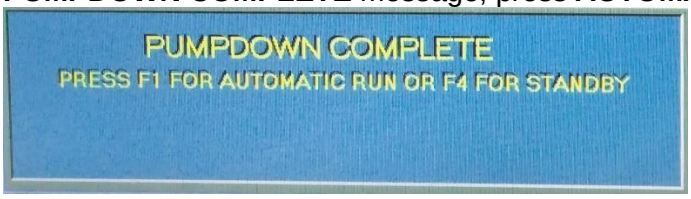


23. Confirm Chamber base pressure is below 9.00E-7 Torr.

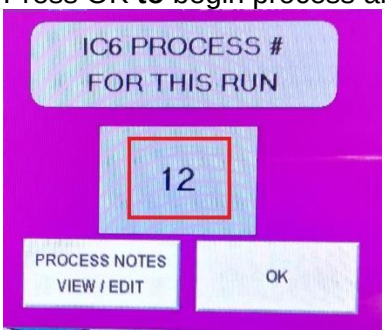
24. Confirm you have enough time reserved on NEMO for your deposition.
    Do **NOT** abort the recipe if your process has already begun as this will cause thermal shock to the crucible.

25. Press the Power **On** button on the Telemark SX Power Supply.

26. Press the **PUMPDOWN COMPLETE** message to select Process Number. If you do not see the **PUMPDOWN COMPLETE** message, press **AUTOMATIC RUN**



27. Press the Process Number to input your Process Number based on the Material Spreadsheet. Press OK **to** begin process and wait for the Process to complete.

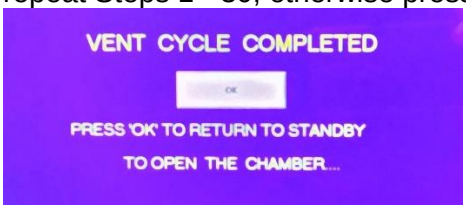


28. At the end of the process, a TIMED EVENT count-up timer will display. The duration will vary by Process Number.

29. Press the Power **Off** button on the Telemark SX Power Supply.

30. Wait for the TIMED EVENT to complete.

31. If you are depositing another layer, press Abort to prevent the chamber from venting and repeat Steps 1 - 30, otherwise press VENT.



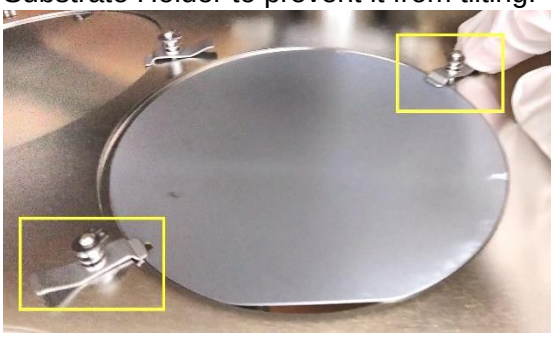
UNLOADING SAMPLE

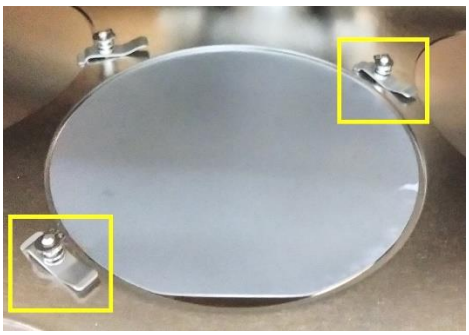
1. Use two hands to open the chamber by gently pulling the handles out and slowly sliding the chamber door down.

2. **Steps 3 thru 8 are procedures for unloading one 4” sample or sample pieces.** If you are unloading more than one 4” sample, skip to **Step 9** to unload the entire Substrate Holder.

3. If you are unloading one 4” sample or sample pieces, press **JOG FIXTURE** to rotate the dummy Si Wafer or your 4” sample to the front of the chamber.

4. Unsecure the Si Wafer or your 4” sample by pressing down on the back of the clips and rotating the front of the clips away from the wafer. You may need to use one hand to hold the Substrate Holder to prevent it from tilting.





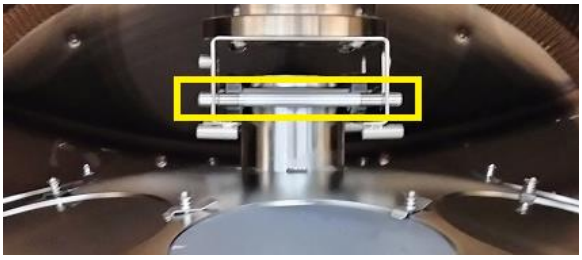
5. Use a clean tweezer to remove the Si Wafer or your 4” sample and the place it on a cleanroom wipe.

6. Close the Chamber Door while loading samples to prevent contamination.

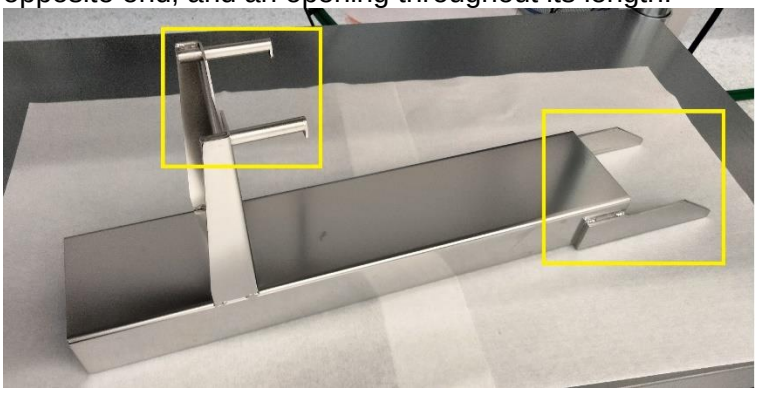
7. If you have sample pieces, remove your sample pieces from the Si Wafer. Reload the Si Wafer into the pocket.

8. Rotate the clips back to secure the Si Wafer.

9. **If you are unloading more than one 4” sample, you will need to unload the entire Substrate Holder.** Press **JOG FIXTURE** to rotate the Substrate Holder to move the Securing Bar to the front of the Chamber. The Securing Bar must face the front of the Chamber Door to remove the entire Substrate Holder.



10. Locate the Substrate Holder Removal Tool under the nearby stainless steel table. The Removal Tool has 2 slanted extensions located at one end, two hooks located near the opposite end, and an opening throughout its length.

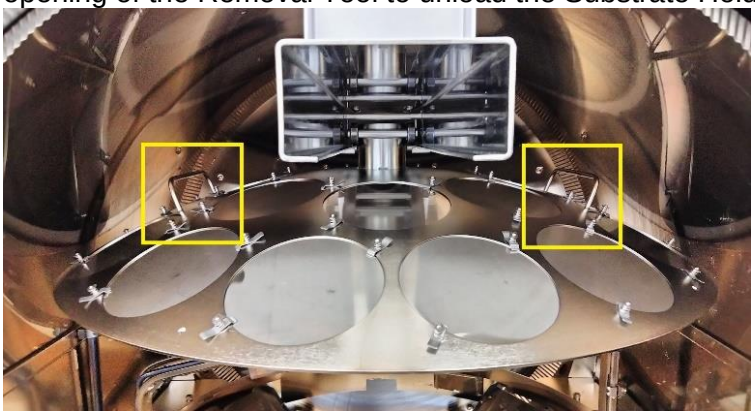


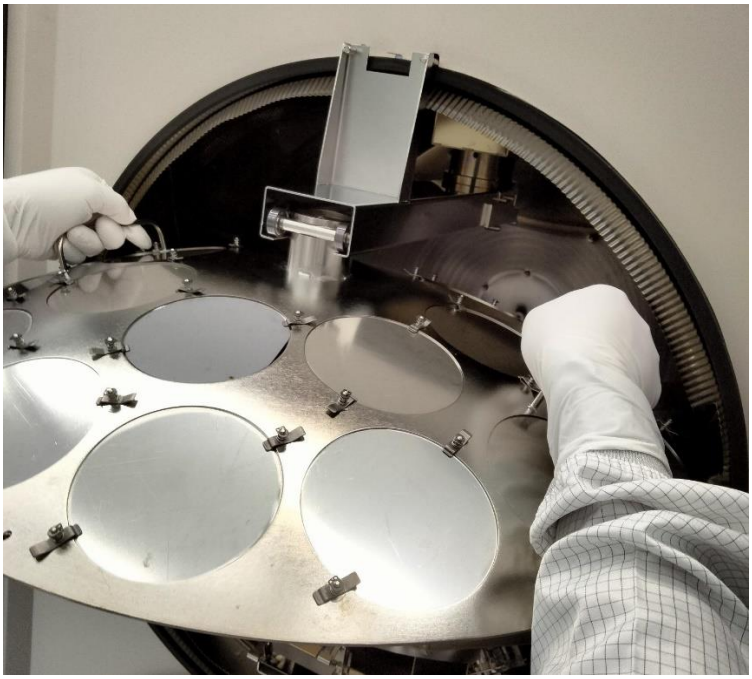
11. Fully Insert the slanted extensions of the Removal Tool under the Securing Bar to lift it.

12. Fully insert the hooks into the holes on top of the Chamber Door to secure it.
    Do **NOT** press the JOG FIXTURE button while the Removal Tool is in position!

13. Line the stainless steel table nearby with cleanroom wipes.

14. The Securing Bar should now be lifted to allow the Substrate Holder to unload. Use two hands to hold the Substrate Holder by the handles and slowly pull the Substrate Holder out of the opening of the Removal Tool to unload the Substrate Holder from the Chamber.

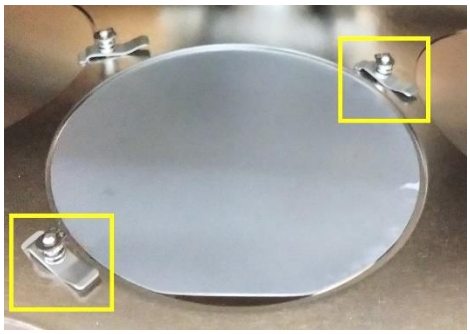




15. Place the Substrate Holder on top of the cleanroom wipes.

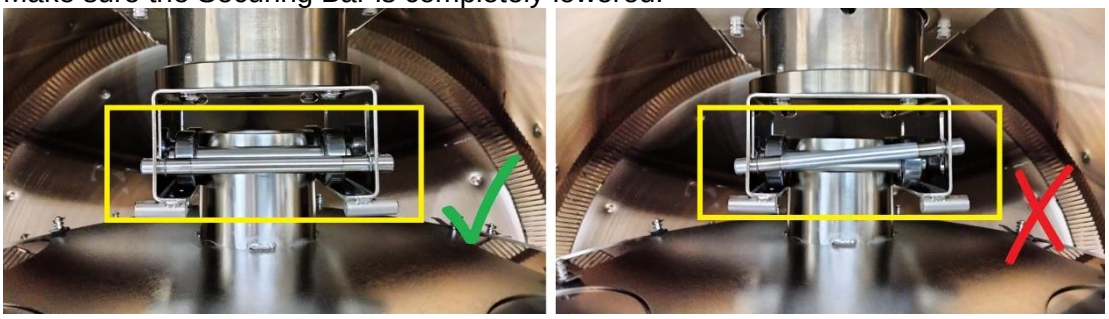
16. **Close the Chamber Door while loading samples to prevent contamination.** First, lift the hooks of the Removal Tool and gently pull the Removal Tool out of the Chamber and place it under the nearby stainless steel table.

17. Close the Chamber Door.
18. Unsecure your 4” samples by pressing down on the back of the clips and rotating the front of the clips away from the wafer.



19. Unload your samples from the Pockets.
20. Load and secure the Pocket Covers back into the pockets. All pockets must be covered with either a Pocket Cover or a Si Wafer.

21. Repeat Steps 10 – 12 to reposition the Removal Tool to the Chamber opening.
22. Use two hands to hold the Substrate Holder by the handles and slowly reload the Substrate Holder into the Chamber through the opening of the Removal Tool.
23. Make sure the Securing Bar is completely lowered.



37. Use cleanroom wipe to wipe the O-ring of the Chamber Door.
38. Close the Chamber Door.
39. Press **PUMP DOWN** and wait until Crossover to Cryo-pump is reached or until Chamber Pressure is below 5.00E-3 Torr.

40. Press LOG OFF

Contributors	Revised Date
Joey Vo	07/11/2023