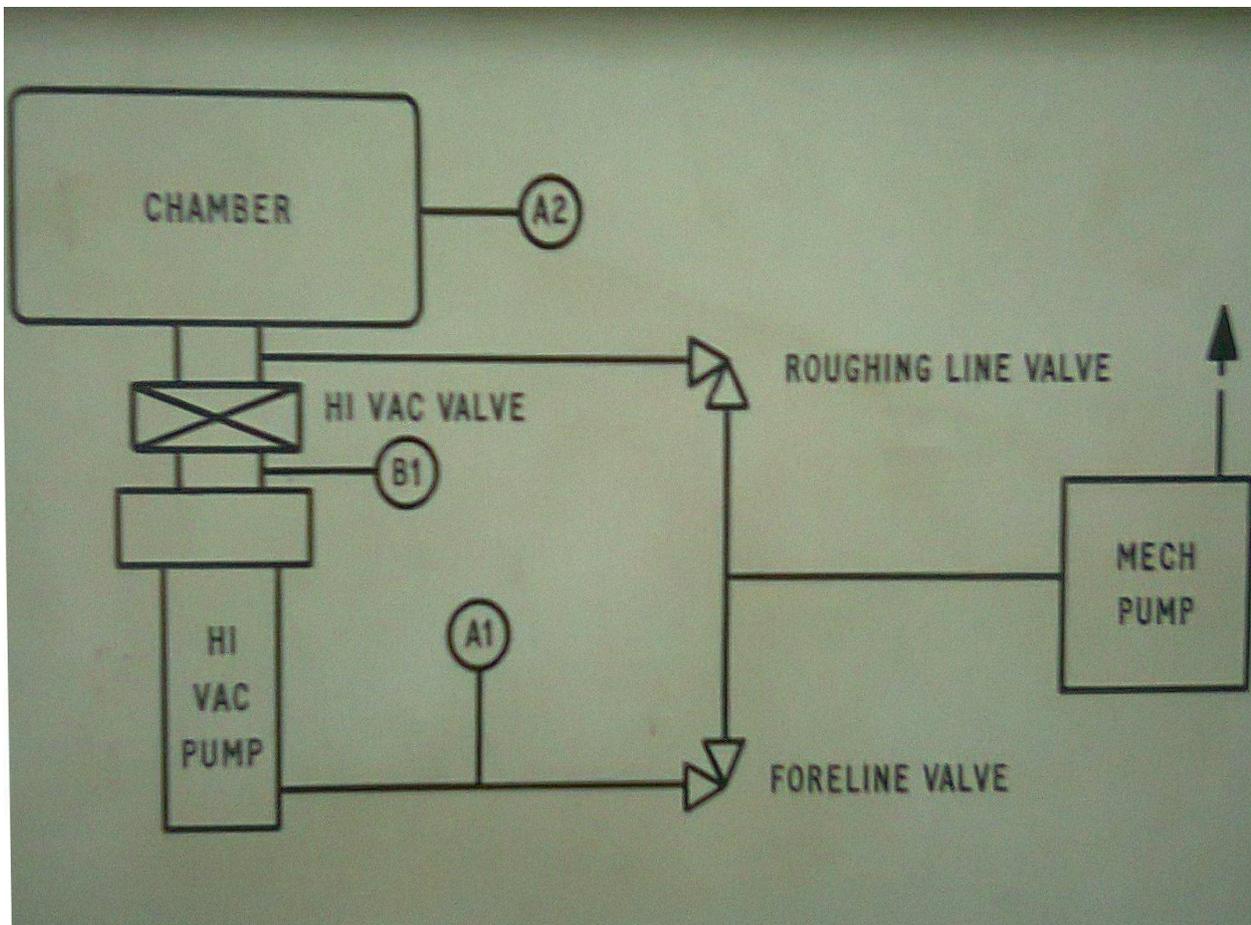


Nordiko Metal Sputtering System – Standard Operating Procedure

Specifications :

Target Size	: 2 inch or 4 inch
Gases used in the system	: “Ar for sputtering” and “Nitrogen for venting”
Base pressure	: 1.3×10^{-5} mbar
Sputtering pressure	: 2.7×10^{-3} mbar
Substrates used	: Si, Ge, Glass, polymer, PDMS.
Substrate size	: Small coupons, 2" and 4" diameter wafer.
Substrate temperature	: Room temperature to 400 °C
Materials that can be deposited	: Cr, Au, Ti, Pt, Ir, Cu, Ag, W, ITO, AZO, Mo, Pd



Check the following facilities before using the system:

1. Check the cylinder pressure of N₂ and Ar cylinder. If it is less than 100 psi (below red line), then immediately report to the facility team and get it changed.
2. Check the line pressure of N₂ and Ar cylinder. The line pressure of N₂ cylinder should be 5-6 mbar and for Ar it should be 4 mbar.
3. Check the temperature of the micro 1 chiller (It should be 20-23 °C).
4. Check the water lines (both the inlet and outlet should be ON).

Metal sputtering Process:

1. Switch ON N₂ knob from back side of the tool.
2. Check if gate valve is 100% closed.
3. Vent the Chamber by pressing **V** button on front panel and after venting, switch off the vent button. (Observe vacuum levels in A1 (roughing) and B1 (base vacuum))
4. Open the door of the Chamber & load the wafer.
5. Close the door & press **MP** button ON.
6. Switch ON the Roughing Valve (**R**).
7. Check the Sensor **A2** (pirani gauge for process chamber). It should indicate **3.9×10^{-2} mbar**.
8. Switch OFF Roughing Valve (**R**).
9. Switch OFF **MP**.
10. Open Gate Valve by **100%**.
11. If you want to heat the substrate during deposition, press **HR** (to start the heater) and adjust the knob for required temperature
12. Sensor **B1** should indicate **1.3×10^{-5} mbar** (varies depending upon condition of the tool, however higher base vacuum gives smoother films).
13. Close the **Gate valve** by **80%**. Make sure that shutter is closed.

14. Switch ON Argon Gas flow (using toggle switch on front panel).
15. **B1** should indicate 2.7×10^{-3} mbar. If the value is different, then adjust the pressure by using flow meter.
16. Switch on **RF** generator and set forwarding power (according to deposition set the required RF power).
17. Close the **gate valve** by **100%**.
18. After plasma creation, open the **gate valve** by **20%**.
19. Match the reflected RF value in single digit (**0-6 watt**) only for position **B (Pt)** and **C (Au)**. **For target position A, it will be automatically matched.**
If the RF reflected power is higher, then you can set it manually for all positions (A, B and C).
20. Start deposition by removing the **shutter** (using knob above the gate valve).
21. Do deposition as per your thickness requirement by refereeing to updated deposition rates from the chart.
22. After deposition, close the shutter. Switch off the **RF** and **RF generator**.
23. Switch **off** the Argon gas flow (using toggle switch on the front panel).
24. Open the **Gate valve** by **100%**.
25. **B1** should indicate 1.3×10^{-5} mbar, (varies depending upon condition of the tool, however wait at least for 5min if it does not reaches base vacuum).
26. Close the **Gate valve** by **100%** (**Make sure that it is closed properly**).
27. Vent the process chamber by pressing **V** button and after venting switch off the vent button and open the chamber.
28. After taking out your sample from the substrate holder, close the chamber and switch on **MP** and Roughing Valve (**R**) to create a vacuum up-to 3.9×10^{-2} mbar.
29. Switch OFF Roughing Valve(**R**) and **MP**.
30. Switch off N2 knob from back side of the tool.
31. Please fill all the details in the log book.

Steps to be followed when the cryo is off (to be done ONLY by system owner, co-system owner, operator and EMT)

1. Make Sure that gate valve for Cryo Pump is fully closed.
2. **Start** the system by Switching on the Power.
3. Switch ON the **Main** button on front panel.
4. Switch ON the **Mechanical Pump (MP)**.
5. Switch ON **Fore line Valve (F)**.
6. Wait till the sensor **A1** (pirani gauge) shows pressure of **3.9×10^{-2} mbar**.
7. Switch OFF the **Fore line (F)**.
8. Switch OFF the **MP**.
9. Switch ON **CryoPump (CrP)** (Its take **5-6 hrs** to get high vacuum)
10. Do not start the process before cryo reaches vacuum of the order **10^{-8} mbar**.

Safety and Precautions:

- If the cryo gets condensed then immediately switch off the cryo, main power, close the gate valve completely and inform the SO, Operator, Lab In charge and EMT through mail.**
- Always check that gate valve is 100% closed before venting. Otherwise nitrogen gas may enter in the Cryo pump and condensation will take place and high vacuum will be lost, so always take care of it.
- If chiller goes OFF Or UPS goes OFF then switch OFF the Cryo Pump and Power supply. Micro1 chiller is connected to the Nordiko.
- Always check the line pressure of cylinders (5-6 mbar).
- Always check the circulated water temperature.
- Always mention the target position in the log book.
- Before trying any new material, an approval is **REQUIRED** from faculty in charge, Process committee and SO.
- Authorized users are not allowed to change the target from position B (Pt) and C (Au) at any circumstances. Only target from position A can be changed.

Useful Information:

Sensor **A1** (Pirani gauge for Fore Line) – Fore line Valve.

Sensor **A2** (Pirani gauge for process chamber) – Chamber (Roughing vacuum).

Sensor **B1** – High Vacuum Pump (Base vacuum).

During roughing vacuum (while pressing MP and R) and when gate valve is completely closed (100%), B1 vacuum reading should be constant. If it is fluctuating during MP and R is ON. **Please inform to SO, operator, EMT through mail and note down in the log book.**

For deposition rates, please have a look on the deposition rate chart pasted on the body of the tool above the gate valve.

Training and Authorization Policy:

Interested student should fill up the new user request form available on CEN website. Based on the request one trainer will be assigned to the student. Multiple trainee students will be allowed for a training session. In first session trainer will describe the system and one demo run will be given to the trainee student. From the next session student will do the run with the help of trainer. After training one final test run has to be done in front of trainer without trainer's help.

Violation Policy:

1. User should not violate any of the steps mentioned in SOP.
2. Don't forget to make a log book entry for process.
3. Don't try new material and do not make any hardware changes in the system without System owner's permission.
4. User should activate and then use the slot that he/she has booked.
5. For a fair distribution of slots, don't over-book them.
6. If you measure the thickness, resistivity or other characterization parameter's of the metal deposited, you have to report it to the operator and in the log book. Please measure thickness in Center, Right and Left.

If it is found that user is not following the above rules and regulations, then his/her authorization may be cancelled or any other punishable measure can be taken after discussion with faculty in-charge of this tool.

Note: Please inform to SO, co-SO, Operator and EMT, if any mis-operation happened and any observation of the tool through mail.

Thanks (SO)

