

POLYMER EVAPORATION SYSTEM (Thermal)

System owner:

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Authorized Users:

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Allowed materials:

Pentacene, Organic materials which can be removed by solvents like IPA, Acetone or Methanol.

Training Procedure:

1. Get faculty approval for getting authorization
2. Read the system operation steps carefully
3. Get 3 number of training runs with AU/SO
4. Demonstrate 2 number of independent runs in presence of AU/SO without looking at the operating steps
5. Wait for authorization from the system owner

Violation Policy:

If violation like not cleaning of the system is found the person has to clean the system completely for next 2 runs whoever is using the system.

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- Operation steps

Checklist before turning ON the system:

- ✓ Make sure the chiller is ON and the chilled water is circulating on the system
- ✓ Make sure the availability of Liquid Nitrogen (LN2), if it is not available in the containers, get it from LN2 plant
- ✓ Make sure the availability of required apparatus and chemicals; such as, tweezers, polymer material, lint-free cloth, IPA, Acetone etc.
- ✓ Make sure about the planned electrical shut-down if it is within 2hrs don't plan your process
- ✓ Wear Hairnet, Facemask and Gloves before operating the system

Instructions for Operating the System

1. Switch ON the main switch on the right side of the system
2. Switch on the rotary vacuum pump by pressing the green rotary vacuum pump starter button on the front panel
3. Wait for 1-2 mins. Switch ON the pirani gauge
4. Check the rotary pump by means of Gauge Head-1 for its satisfactory operation every day
5. Open the combination valve to backing position. Wait till the pressure falls below 0.05 mbar in order to switch on the diffusion pump
6. Switch ON the diffusion pump by selecting the diffusion pump switch to DP position on the front panel. The diffusion pump will take about 30 minutes to reach the operating temperature (mean while clean the chamber and load your sample)
7. Vent the chamber by opening the air admittance valve
8. Open the chamber door when the pressure inside is equal to the atmospheric pressure. Gas flowing out sound from the chamber door of the system confirms that the chamber is ready to be opened without much effort
9. Load the filaments or boats with the polymer material and fix the substrates on the work holder
10. Close the chamber door. Close the air admittance valve
11. Close the backing valve and open roughing valve by turning the handle of the combination valve towards the top position (Roughing position)
12. Select Gauge head 2 in pirani gauge
13. When gauge head 2 show 0.05 mbar pressure close roughing valve, open backing valve
14. If by this time DP is warmed up (30 minutes) then go to point 15 else wait for the warming up of DP (30 minutes to complete)

15. Liquid Nitrogen (LN2) needs to be poured in to the LN2 trap before the HIVAC valve is opened. This ensures that DP oil vapors will condense without entering in to the chamber.
16. When gauge head 2 shows 1×10^{-3} mbar, switch OFF pirani gauge and switch ON the penning gauge. Do not keep the penning gauge on for longer time. Intermediate checking would be preferable. Wait till the penning gauge indicates vacuum $> 3 \times 10^{-6}$ mbar.
17. **Steps for performing polymer evaporation(thermal) is as follows:-**
 - A. Switch on the mains for LT (1)
 - B. Verify that the current adjustment knob is in its minimum position
 - C. Switch ON the LT (1) circuit breaker
 - D. Switch ON the thickness monitor
 - E. Looking through the view port of the chamber, very slowly increase the LT current knob
 - F. As the current is increased, with the clockwise turning of the LT knob, the material in the boat starts heating up
 - G. Check the pressure in the chamber on the penning gauge. If the pressure is increasing too much (i.e. Crossing 1×10^{-4} mbar) reduce the current by turning the LT knob anticlockwise and keep at a lower value (not zero) till the degassing is complete
 - H. After degassing is complete and when the pressure reaches the minimum value increase the emission current
 - I. When the material in the boat starts melting, open the shutter
 - J. When the required thickness is reached close the shutter, bring the LT knob to minimum position to make the current zero, switch off the LT circuit breaker
When the evaporation is complete switch OFF the LT (1)
18. Switch OFF the Penning gauge. Wait for 15 minutes and then, close the HIVAC valve
19. Vent the chamber by opening the air admittance valve
20. When the chamber pressure reaches the atmospheric value, open the chamber and take out the coated substrate. Handle the fresh films with care
21. Reload the work holder and filaments when necessary and proceed as before for the next cycle of evaporation.

Procedure for shutting down the system

If there is no other sample for deposition after step 20 above, thoroughly clean the chamber with suitable solvents of the polymer, close the chamber, close the air admittance valve and follow the procedure for shutting down the system

22. Switch OFF the diffusion pump
23. Pump the chamber down to (10^{-4}) mbar or better

24. Continue to run the rotary pump for a period of at least 30 minutes, keeping the combination valve on the backing position, and keeping water supply to DP till the diffusion pump cools down to a safe level
25. Close the backing valve
26. Switch OFF the rotary pump and close the water supply to DP
27. Switch off mains by using both the mains isolator on the unit and at the power supply point
28. Switch OFF the pump and the chiller (if no other systems working on the chiller)

Precautions:

1. Always clean the load chamber, glass slides and glass window with IPA before and after every deposition
2. Before starting the deposition always makes sure that the LT knobs are at the minimum positions
3. Before opening the high vacuum valve always ensure that the chamber pressure is < 0.05 mbar and the combination valve is at the backing position
4. Pour LN₂ in its trap before opening the high vacuum valve
5. Before switching off the DP, ensure that the high vacuum valve is in closed position
6. After switching OFF the DP wait at least for 30 mins. and then switch off the rotary pump and cooling water supply
7. Do not keep any of the gauges running for long duration. This is more critical for penning gauge
8. Venting the chamber should be done slowly by slightly opening the air admittance valve
9. Always keeps the system in vacuum condition when not in use

Emergency shut-down of the system/Electricity failure

1. Close the HIVAC valve immediately
2. Move the combination valve to CLOSE position
3. Turn OFF the DP switch
4. Turn OFF main switch of the system