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# SOP

## Glove Box-2 with Evaporator

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**Faculty In-charge:**

Prof. Dinesh Kabra ( [dkabra@gmail.com](mailto:dkabra@gmail.com))

**System Owner:**

Pravin Rathod, Naresh Kumar Kumawat

**Operator:**

Rajib Kumar Modak

**Contact:**

Naresh K: [naresh10121985@gmail.com](mailto:naresh10121985@gmail.com)

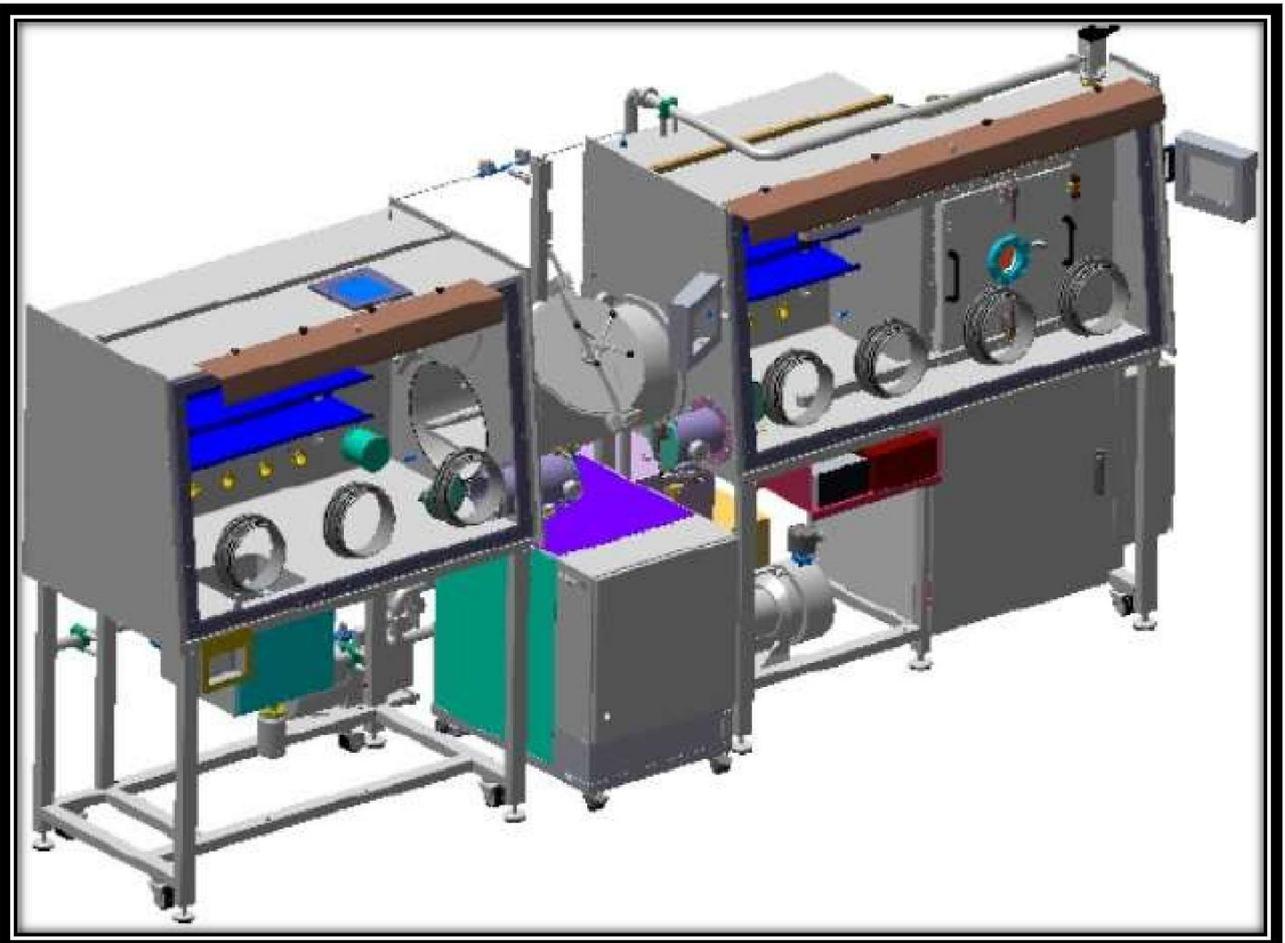
Mobile No. - 9967325525

Pravin: [rathodpp11.phy@gmail.com](mailto:rathodpp11.phy@gmail.com)

Mobile No. - 8879314959

Rajib: [rajibkumarmodak508@gmail.com](mailto:rajibkumarmodak508@gmail.com)

Mobile No. - 7506122804



## General instructions:

1. After entering the organic device lab first wear the lab coat, clean lab shoes, Hair net and gloves for process
2. Make sure to check the entry in logbook before starting the process
3. Check N<sub>2</sub> gas cylinder pressure. if it is less than 10 kg/cm<sup>2</sup> do not start any process inside GB & then contact authorized lab users to change the cylinder
4. Make sure the line pressure is greater or equal to 6 Kg/cm<sup>2</sup>.
5. Make sure all the things needed for the process are there in the GB-2. Such things are:
  - i. Evaporation Mask, you want to use
  - ii. Tweezer
  - iii. Spatula
  - iv. Charge, you want to deposit
  - v. Extra Boats for the material you want to evaporate
  - vi. Orange Gloves
  - vii. Blue Extra Large GlovesIf something is missing ask lab in-charge
6. No sharp objects are allowed inside the glove box
7. No sticky or wet samples are allowed inside the glovebox
8. Samples Processed outside the GB should be taken inside through small antechamber with 3 times evacuation and refill cycle.

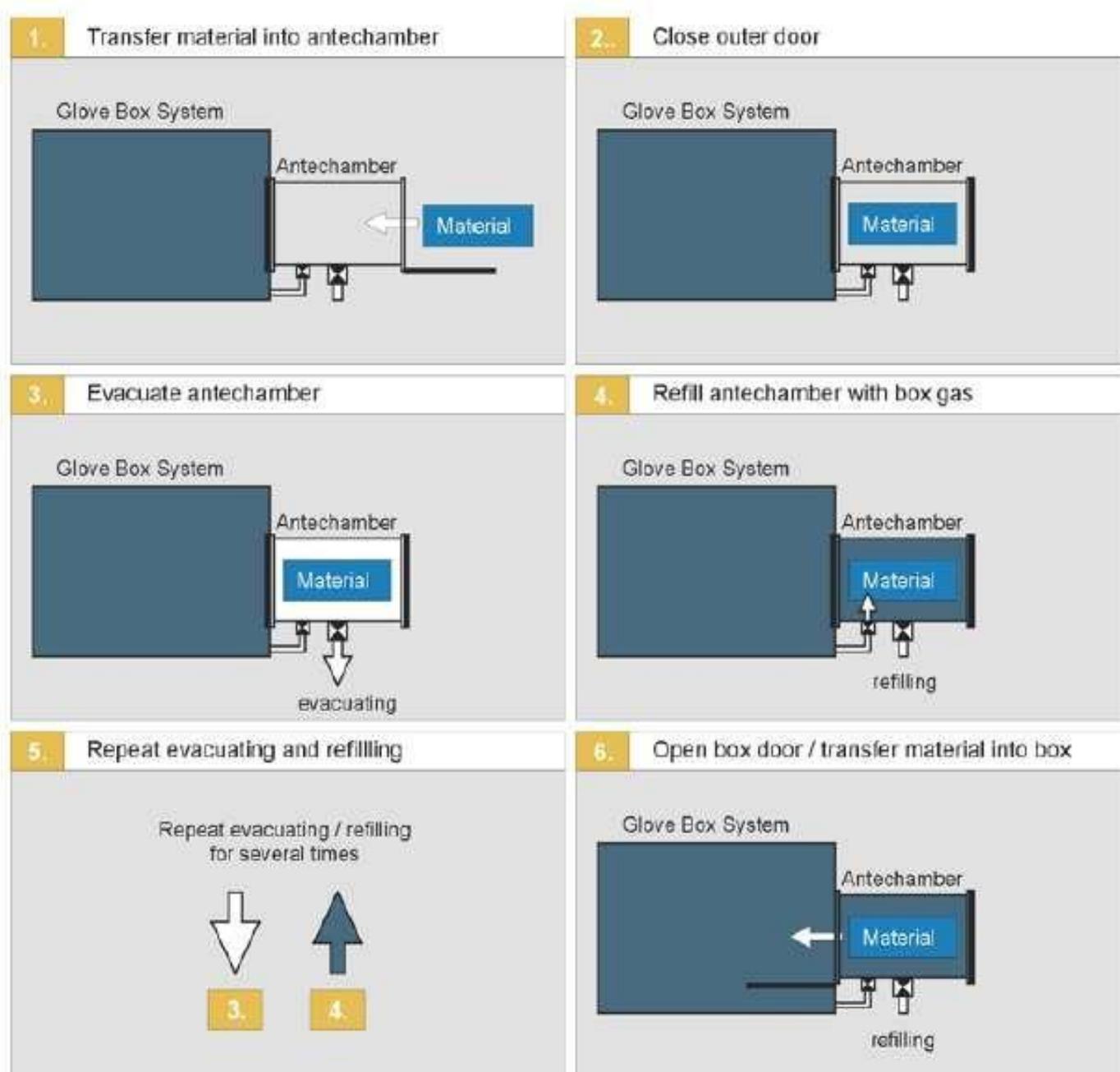
NOTE: Always try to arrange the things you want to enter in the GB-2 first and then enter all things together through the antechamber to minimize gas wastage and chance to increase the O<sub>2</sub> and H<sub>2</sub>O level.

9. The box is controlled by PLC with Touch Panel and in Touch Panel, **Circulation Purifier**, **Analyzer** and **Vacuum Pump** should permanently be switched on. Other switches on the touch screen are not to be operated by the users.
10. Check whether the chiller is ON and is at 16°C
11. Note down the ppm level of O<sub>2</sub> & H<sub>2</sub>O from the PLC in the log book before starting the process & after the ending the process. Ideal levels should be O<sub>2</sub> << 0.1ppm & H<sub>2</sub>O << 0.1ppm
12. Make sure before putting your hand in the Glove box you have removed all accessories from your hands like watch, Rings, bangles etc. and you must wear cotton gloves so that your nails will not cut the gloves of GB.
13. Sample boxes and Petri dishes also should be taken out after experiment.
14. Note down the levels of O<sub>2</sub> and H<sub>2</sub>O, gas pressure and all the information in the log book, with time and signature
15. Don't use any solvent in glove box-2
16. Al, Ag, Au, MoO<sub>3</sub>, Cr and Ca are allowed to deposit in glove box-2 evaporator
17. There are 4 default boats in the Evaporator chamber. These are Al, Ag, Au, Ca. You can change the Ca boat with MoO<sub>3</sub> or Cr boat or any other specially permitted material boat when you want to deposit them but after the process you have to replace it again with the default one.

## Glove Box-2 Evaporator for electrode deposition:

1. Before process please check the cylinder pressure, line pressure, chiller temperature (16C to 18C) and it should be on (feel by hand the vibration of the motor).
2. Book the slot if you are AU and also activate your slot.
3. Write down the O<sub>2</sub>, H<sub>2</sub>O level from PLC and N<sub>2</sub> cylinder pressure in off line log book, if you notice any error please inform to system owner.
4. Put your sample box inside the antechamber and evacuate and refill the three times. After this take the sample inside the glove box-2 (Make sure your sample box don't contain O<sub>2</sub> or H<sub>2</sub>O. To ensure this make your sample box slightly open when you are putting it inside GB-2)

The procedure of taking sample inside through small antechamber is shown below:



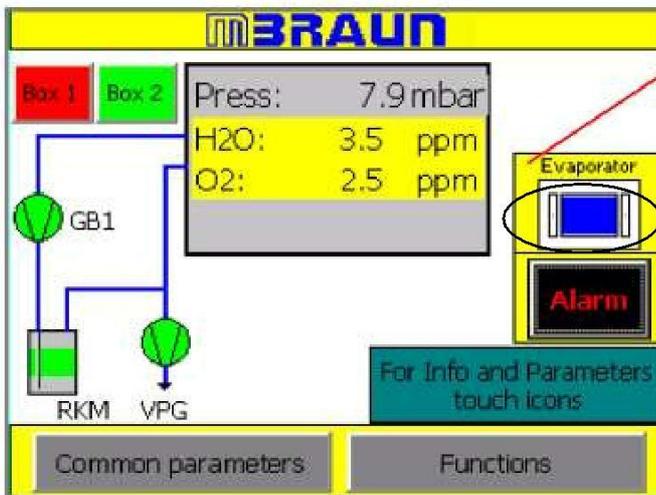
- After that switched on the evaporator main switch



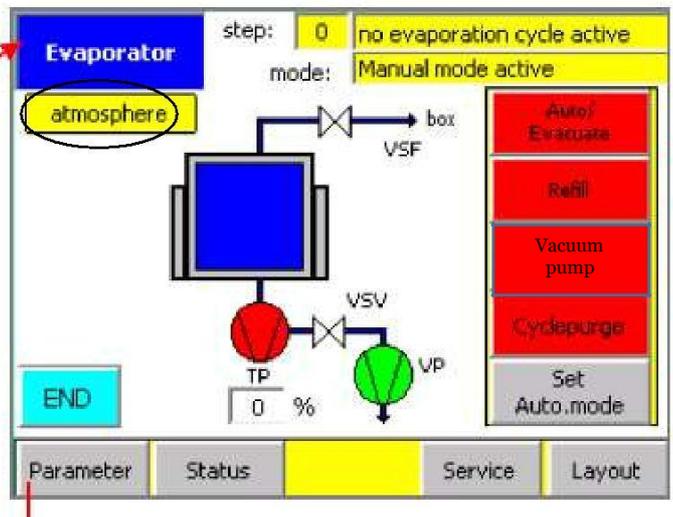
- ▶ Turn the main switch from the **O OFF** to position **I ON** (located at the electrical cabinet of the Evaporator)

- Put your substrates on the mask carefully.
- After that press “Evaporator” on main screen using PLC

Start screen



Screen Evaporator



- After that clean the Square shaped rubber ring (called O-Ring) this is attached to the evaporator box with lint free cloth. This ensures the cleaning of any metal or dust particle on the O-Ring which can give rise to leakage of the Evaporation box.
- After that close the door of evaporator carefully and lock it.
- After that you reached at evaporator screen and press the “**Set Auto. Mode**” button
- Then press “**Vacuum pump**”. It will be show green color.
- Wait for 30s and press “**Auto evacuate**” button
- Once vacuum reached 0.5mbar, a characteristic sound come. This indicates TMP start. Note down the time to reach 0.5 mbar and wait until the pressure comes down to  $4 \times 10^{-6}$  mbar. Note down the time to reach final pressure ( $4 \times 10^{-6}$  mbar) from starting of evacuation in log book (it is around 15 or 20 mins). After the pressure reaches  $4 \times 10^{-6}$  mbar you can start the evaporation process.
- In the meantime when the pressure is going down to reach  $4 \times 10^{-6}$  mbar you can set the parameters in the **Inficon** Thickness Monitor placed below the GB-2.
- To change the thickness
  - Press **Next Menu** button 2 times. Then you can see **Process Menu** button on the screen of the Thickness Monitor.
  - Press **Process Menu** button.
  - Select the Program name by rotating the knob and press **Select** button. Generally programs are named after the corresponding metals.
  - Press **Edit** button 2 times.

- v. Select the Final Thickness option by rotating the knob and then press **Edit** button and change the thickness with the knob and then press **Enter** button.

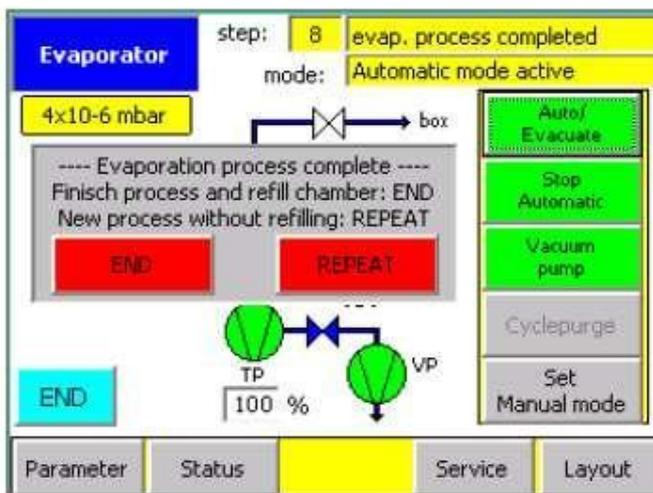
Note: User can change final thickness only

- vi. Check the source and sensor option it should be according to the Source-Pocket Matrix.
- vii. Press **To Main Menu** button
- viii. Press **Film Menu** button and select material by rotating the knob and press **Edit** button and check the Pocket option, it should be according to the Source-Pocket Matrix.
- ix. Press **To Main Menu** button, the Thickness Monitor will show the main screen.



Thickness Monitor  
(SQC-310 Deposition Controller)

- 19. Now wait till pressure reaches  $4 \times 10^{-6}$  mbar. After that press **Start** button, it will change color from green to red.



After the evaporation process is completed, a message is displayed on the screen. This must be acknowledged by the user before the system will complete the automatic cycle.

Touch **END** to finish cycle.

Touch **REPEAT** to reset the automatic cycle.

A new evaporation process can be started with the SQM-310.

- 20. Once your process is done then you get following screen on PLC.

21. Press the **END** to complete the process or press **REPEAT** (and follow step no. 27 and 28) for depositing another layer.
22. After pressing **END** button, press **Set Manual Mode** button in PLC. The TMP will automatically slow down its speed. It goes from 100% to 0%.

Note: We always break the vacuum in manual mode because in case of auto mode due to some malfunctioning in the system the vacuum breaks abruptly which can damage the blades (which are very delicate) of the TMP.

23. When the TMP reaches 0% press the **Vacuum Pump** button to *off* it.
24. Press **Refill** button to *refill* the chamber and wait till the atmospheric pressure is reached. The pressure indicator in the screen will show *atmosphere*
25. Press **Refill** button to *stop* refilling process.
26. Open evaporator door and take out your sample and close the door properly.
27. In case you want to perform another Evaporation process for another material (which charge you have put on the corresponding boat already) you have to press **REPEAT** button and select and set the material and final thickness in the Thickness Monitor as the process step no. 18, and then press Start button.
28. After ending the process follow the steps no. 22 to 26

## Trouble Shooting

Case: The deposition rate is going down to zero and remain at zero for long time (more than 3 mins.) and there is an alert message on Thickness Monitor screen showing “Alert: Max. Power”.

### What to do:

May be the charge is insufficient for the thickness set at Thickness Monitor. You have to break the vacuum to put more charge on the boat or otherwise if you are satisfied with current thickness deposited, then also you have to break the vacuum to collect the samples. But as the final thickness is not acquired the PLC will not show **END** or **REPEAT** message and without this message on PLC you cannot break the vacuum. So to break the vacuum follow the following steps:

1. After pressing **Stop** button in the Thickness Monitor press **Next menu** button then the Thickness Monitor will show a **Reset** button at the place of **Start** or **Stop** button.
2. Press **Reset** button, the **END** or **REPEAT** message will arrive on the PLC.
3. Follow the steps from 22 to 26.

Case: Long after (5 mins.) pressing Start button the deposition is not yet started.

### What to do:

Check the MCB switches by opening the door at the main switch position.

1. If MCB switches are in off position then switch it on.
2. If MCB are in ON position then open the window at the Evaporator door for small time and see the corresponding boat is glowing or not.
  - i. If the boat is not glowing and also no other boat is glowing then the corresponding boat may be broken. Then you have to break the vacuum and change the boat.
  - ii. If the corresponding boat is not glowing but any other boat is glowing that means may be the source, pocket selected in the thickness monitor program are not according to Source-Pocket Matrix. Call system owner or Lab in-charge in this case.

Case: Any unknown Alarm or Warning coming on the PLC.

### What to do:

Check the 10<sup>th</sup> and 12<sup>th</sup> chapter of Evaporator manual and note down the error in the Log Book. Call System Owner or Lab In-charge to sort out the problem.

### Alarms:

- 1) Error in turbo pump TP: when main round switch is ON
- 2) Turbo pump is running up: when Turbo molecular pump starts

### What to do:

Acknowledge and go back

- 3) Valve is faulty: When line pressure goes below 6 kg/cm<sup>2</sup>

### What to do:

Make line pressure till 6 kg/cm<sup>2</sup>