Thermal Evaporator Instructions

Please contact MFC Staff for initial training and usage requests.

(figure 1: The thermal evaporator system)
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**Section 1: Venting**

**Initial check before beginning setup instructions:**

1) Check if the lid (cage) is airtight and check and record the pressure reading on digital pressure gauge.
   a. If it is, refer to Venting Procedure
   b. If it is not, you can move directly onto “Placing your sample…”. The system should remain under vacuum when not in use.

**Venting:**

To place a sample within the chamber, you must bring the system back to atmospheric pressure. The system should remain under vacuum when not in use.

1) Turn off the turbo pump by pressing the button indicated in the image below. Wait approximately 15 minutes (this assures the turbo pump has time to turn off and the equipment is not damaged). Note: the backlight on the button means that the turbo pump is in the on position.

![Pump pressure control display.](figure 2: Pump pressure control display.)

2) Vent the chamber by flipping the pump down switch shown in figure 3 to the “Vent” position. Watch the bell jar to make sure it does not pop up and fall off the table.

![Pump pressure control display.](figure 3: Pump pressure control display.)
3) When the bell jar pops up, flip the pumpdown switch to the “Seal” position. Failure to flip the switch from “Vent” can lead to unnecessary and potentially hazardous release of Nitrogen gas. The chamber can now be accessed for placement of materials.

Section 2: Sample Placement

Placing your sample within the chamber: there are a few ways to optimize your material transfer.

1) Place your wafer or the sample you are depositing on onto the bottom side of the bridge. You want the side you wish to deposit on to be facing downwards toward the ground.

Very important: make sure to fasten your sample to bridge very securely. To assure a more optimal coating make sure that you do not cover your desired deposition space with fasteners.

2) Grab a tungsten tray (or coil) for placing your desired deposition material into. The boats (trays) and coils within the facility have varying composition. Make sure to obtain something that is complimentary to the material you are utilizing and will not cause an adverse effect. Some other material types we have are, Molybdenum, and tantalum. Note: tungsten is often preferred in this due to its high level of durability and limited amount of reactivity with volatile metals. IMPORTANT: If you wish to deposit aluminum, contact a staff member for specific instructions.

(figure 4: Deposition chamber.)
3) Place the tray end to end between the washers (seen in picture). To loosen the washers, loosen the screw ending. Make sure to tighten the washers back into place by tightening the screw ending; this will assure that your tray is fastened to the device. Now, degrease rubber ring and then grease rim in preparation to replace lid.

**WARNING:** The boat or coil cannot touch the steal guards around the electrodes or the glass of the bell jar.

4) Place the lid of the evaporator back on top and assure that the sides fit securely within the grooves.
(figure 7: This image is of the cage (lid) placed in the proper grooves)

You are now ready to bring the system to vacuum.
**Section 3: Vacuum**

**Bringing the chamber to vacuum:** To achieve the vacuum necessary for the process, we have a 2-pump process to optimize efficiency. First, a roughing pump is turned on and then a super-pump takes the system from there to create the vacuum effect. IMPORTANT: It is very important that you follow this process step by step in the order that it is presented. It is also very important that you check the assurance the chamber is in the proper positioning before returning the system to vacuum.

1) The roughing pump will always be on, however, you must switch the system to allow the pump to access the chamber. Make sure you move the switch into the “Pump down” position. Refer to image below. Allow a for approximately 15 minutes to pass for the roughing pump to deliver the desired pressure within the chamber.

![Pump pressure control display](image8)

2) After allowing 15 minutes for the roughing pump to operate or the pressure gauge is showing a pressure below 30 mTorr, turn on the turbopump. Press the button on the image below. If the button is backlit then the turbo pump is now on and the pointer on the green/red gauge should start moving to the green area. Contact MFC staff if it is not.

![Pump pressure control display](image9)
Section 4: Power Settings

Conducting the transfer: it is very important to the purity of your sample and for your safety that you assure the system is in complete vacuum before conducting this step of the process. Please refer to “Bringing the chamber to vacuum.”

1) The system shown in the image below is the voltage delivery system. The black knob is used to regulate the amount of voltage you wish to deliver. Note: the right-hand side of knobs and switches are the only ones currently working (view image below for reference).

(figure 10: Voltage control display.)

2) To turn the system on, switch the silver switch into the on position (up).

(figure 11: Voltage control display.)
3) Now that the system is in the on position, you can set the voltage by rotating the voltage knob. This is the black knob. Remember to assess the desired voltage (heat) at the current pressure within the chamber.

(figure 12: Voltage control display.)

4) Deposition rate will be determined by the voltage settings you have set, and the type of material chosen for deposition. You can conduct trial runs to determine deposition rate to assess the exact types of materials and quantity necessary for your specific deposition. If you choose not to determine the exact deposition rate prior to your usage, then you must keep a close eye on the system and be ready to reduce you voltage to zero when the material within the tray or coil has been reduced to zero.

5) After reducing the voltage to zero, you are now ready to flip the on/off switch to the off position.

6) We now suggest that you wait a minimum of 15 minutes for the system to regulate and self-regulate temperature before applying drastic external changes due to pressure or exposure to air.

You are now ready to refer to “Pressure release” to retrieve your sample.

Final Check (after use instructions): After conducting your deposition, it is important to follow the following maintenance steps to assure that the system continues working properly.

1) Remove all materials from within the chamber. This includes the trays (boats) and/or coils, the deposition sample from under the bridge as well as any materials used for adhering the sample.
2) VERY IMPORTANT: After removing all materials, now it is time to bring the system back to vacuum. After use of the thermal evaporator system, it is necessary to return it to vacuum to avoid damaging the equipment. Please refer to “brining the chamber to vacuum.”
Section 5: Images for reference

(figure 13: Pump change system)

(figure 14: Pressure gauge for monitoring change)
(figure 15: Voltage delivery system)