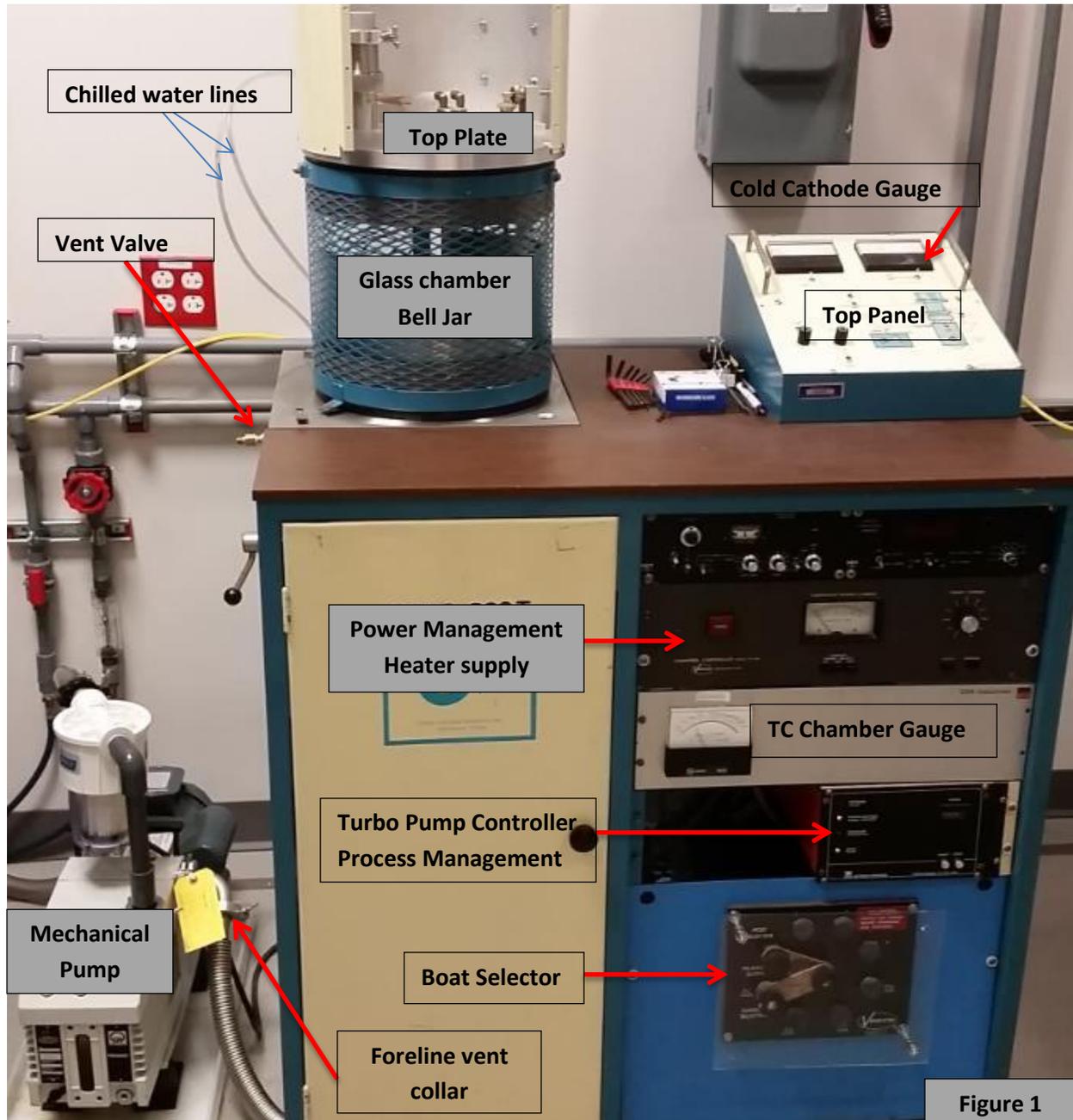
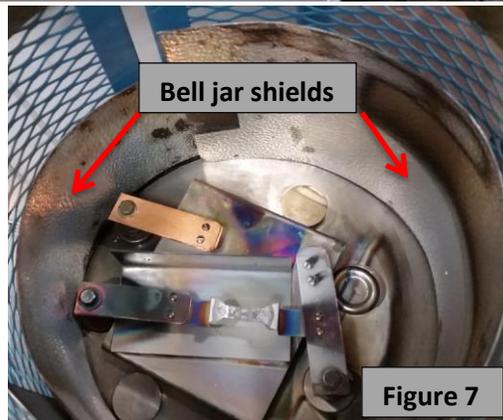
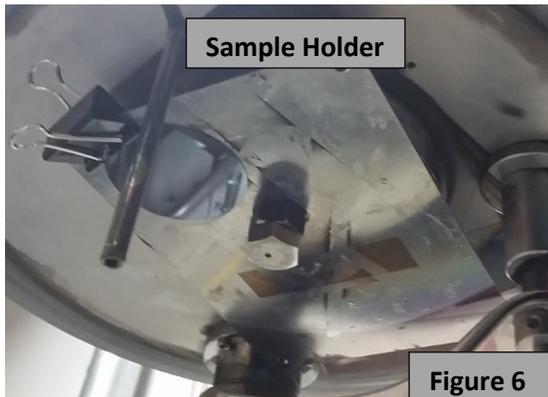
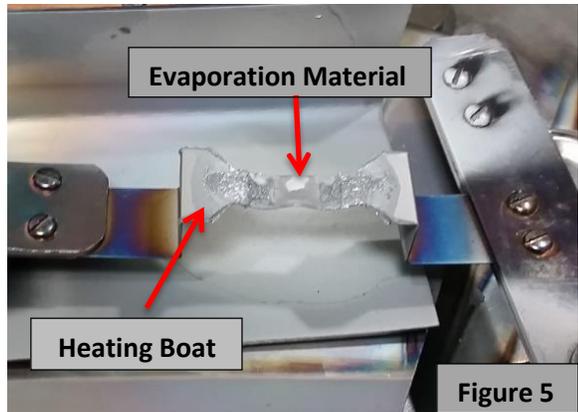
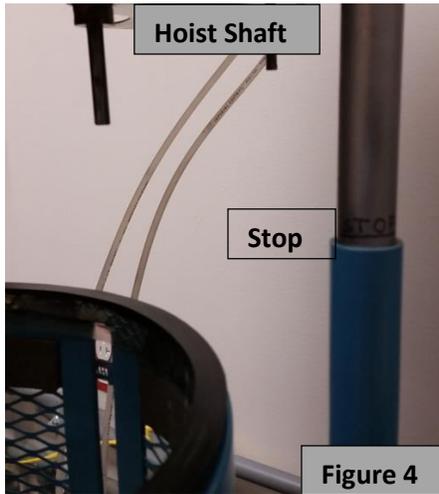
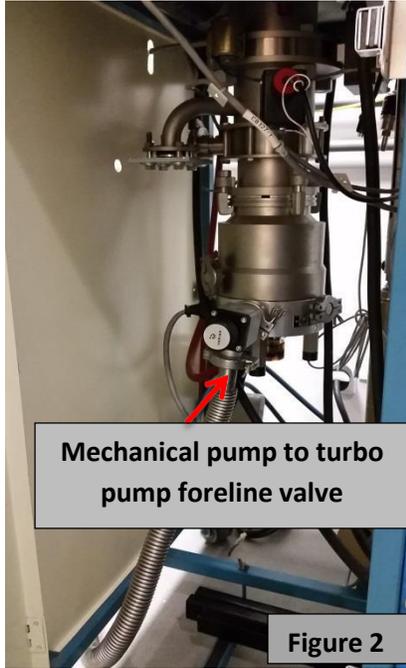


# Cooke Thermal Evaporator SOP

## Overview of the Thermal Evaporator



# Parts of the Thermal Evaporator System



Before starting the experiment, make sure that

1. On the top panel, the mechanical pump, the turbo pump, and the cold cathode gauge switches are OFF.
2. On the front panel, the power control dial is set to 0.
3. The vent valve (Figure 1) and the fore line valve to the turbo pump from the mechanical pump (Figure 2) are CLOSED.

## **System Start Up and Sample Loading**

1. The chamber is under vacuum when first approached. Vent the chamber by opening the vent valve on the tools left panel (see Figure 1).
2. Raise the top plate to separate it from bell jar by using the raise hoist, switch located on the top panel (see Figure 1). Stop the hoist when the "STOP" mark appears on the hoist shaft (see Figure 4).
3. Rotate the top plate away from you to gain access to bottom of chamber. Inspect boat (see Figure 3) and make sure it is not cracked. If the boat needs replacement please contact NRF staff.
4. Load small amount of the metal being evaporated on center of boat (see Figure 5).
5. Attach sample onto sample holder by using provided clamps (see Figure 6). Put a shadow mask over the sample. Smaller gap between the shadow mask and the sample will make the pattern sharper. Remember to partially overlap the two glass slides for monitoring thickness of the deposited metal film.
6. Make sure bell jar shields are properly placed inside the chamber (see Figure 7).
7. Swing top plate assembly directly over bell jar and carefully actuate the hoist to the lower the top plate until contact is made with the face of the bell jar.

## **Chamber Pump down**

1. Ensure that the vent valve is closed and the fore line valve is open.
2. Turn on the mechanical pump (the switch located on the top panel).
3. Wait for the vacuum to reach 100 to 150 mtorr. This value is read of the chamber TC gauge (see Figures 1 and 2). If this vacuum is not achieved within 5 minutes, there might be a leak in the chamber. Please contact the NRF staff.
4. Power the turbo pump by turning the switch on the top panel and then the start button on the turbo controller. The green acceleration light should turn ON (see Figure 1). After two minutes or so, the normal operation light should turn ON. If the normal operation is not achieved, please contact the NRF staff.
5. Turn on the cold cathode gauge located on the top panel.
6. Wait about 30 minutes for the vacuum to reach  $4 \times 10^{-6}$  torr.

## Deposition

1. Ensure that the heater power supply is turned all the way down to zero and is set to manual.
2. Set the current range to 100. Turn ON the power supply. Begin slowly turning the knob clockwise, while looking at the power meter. Once the meter has reached the maximum range, switch the range to 300. Continue increasing the power and pay close attention to the center of the boat and the material being evaporated. The small pieces will melt into a small puddle. Keep increasing the power until you get to 1.7 Ampere (for aluminum) on the dial. Pay close attention to the amperage since it tends to decrease. Keep increasing the power to maintain 1.7 Ampere. At this point, you will notice the bell jar glass becoming opaque. This is an indication that evaporation is taking place.
3. Once the desired evaporation power has been established, open the sample shutter and time your deposition for 7 minutes. Close the sample shutter when the desired time is reached.
4. Slowly turn the power dial back to 0 on evaporation power supply. Doing it too fast will thermally shock the boat and crack it.
5. Wait for 10 minutes for inside components to cool down. In the meantime, power OFF the turbo pump and the cold cathode gauge. Failure to power off the cold cathode gauge before venting the system will cause damage to the gauge.
6. After the 10 minutes are up, turn OFF the mechanical pump. Slowly vent the system and wait until it is completely vented. You will notice a winding sound coming from the turbo pump at first vent burst.
7. Use the hoist to raise the top plate to retrieve your sample. Remember to stop at the mark on the shaft.

## System Pump Down and Standby Mode.

- 1 Hoist down the top plate to make contact with the face of the bell jar.
- 2 Close the vent valve, turn ON the mechanical pump and wait for 5 minutes for the vacuum to reach 100 to 150 mTorr.
- 3 After vacuum has been attained, close the valve on the fore line to the turbo pump (see Figure 2).
- 4 Turn OFF the mechanical pump and loosen the fore line vent collar. This will vent the mechanical pump and prevent oil to back stream up the fore line. If oil reaches the turbo pump, it will contaminate it. Make sure the vent collar is retightened (see Figure 1).
- 5 At this point the system will be ready for the next user.

## **Analysis of the Deposited Metal Film**

1. Measure the thickness of the deposited aluminum film using Dektak Profilometer.
2. Measure sheet resistance using 302 Resistivity Probe Stand.
3. Calculate the corresponding resistivity of the aluminum film.

## **Cleaning the Bell Jar**

### **Be very careful not to chip or break the bell jar!**

1. Vent chamber and hoist the top plate up.
2. Very carefully remove the bell jar and place it sideways on the working bench.
3. While wearing gloves, apply a small amount of Bell Jar Klean on the inside surface.
4. Moist the powder with acetone and use a clean wipe to remove all the metal evaporated onto the surface.
5. After all metal is removed, apply a coat of Bell Jar Shine in the inside wall. Follow the instruction on the bottle.
6. Ensure all rubber gaskets are free of debris. If necessary, clean with a dry wipe and reapply a small amount of vacuum grease along the top surface of the gasket.
7. Very carefully move the bell jar back to system and reassemble.
8. Proceed to "System Pump Down and Standby Mode".

**Please contact NRF staff if not sure about equipment operation!**