MB05 Evaporator: Aluminum Deposition Protocol

 USERS MUST BE AUTHORIZED BY PROF LEVEY

PRECAUTIONS:
1. To avoid burning (“cracking”) the oil, when Diffusion Pump is on (hot), **foreline pressure (TC2) should never exceed 500mT**.
2. Always **watch TC2 (foreline pressure) when opening or closing valves**...go slowly...if TC2 starts to rise quickly, reverse your action.
3. **Foreline and Roughing valves should never both be open** – only one or the other.
4. The Ion gauge should never be on when chamber pressure is above 10⁻⁴ torr.
5. Do not run high current for long periods of time (300A for a few minutes will overheat wires connecting to the boat).

Setup/Pumpdown
- With main gate valve and roughing valve closed, open vent (slowly at first –see precaution 2 above).
- When chamber at atmosphere (no hiss), lift bell jar.
- Mount substrate (**add tape mask** over part of substrate for shadow/thickness check)
- Ensure shutter is in position; substrate shadowed but not inficon quartz thickness monitor.
- Check/clean/grease o-ring, close the Bell Jar.
- Check the source boat and inficon monitor.
- Close vent valve,
- Close foreline valve and open roughing valve slowly until you hear the mechanical pump. Push down on chamber to seal. When the mechanical pump is less loud, open the roughing valve all the way then back off ~1/4 turn. Record the time. Do not leave the room during this time; should only take 5 minutes. If DP is on, monitor foreline pressure during this process, making sure it stays below ~500 mT... if it rises to that point, close roughing valve, then open foreline valve until it is back under 100mT, then close foreline and open roughing. Remember precaution #3.
- When the Bell Jar pressure has reached 150-200mTorr, close the roughing valve then open the foreline valve and back it off a quarter turn. Follow precautions #2 and #3.
- If DP is already on and cold-trap already filled from a previous run, you can skip the next two steps.
- Once the foreline pressure is under 500mT you can turn on diffusion pump circuit breaker.
- Fill cold trap w/ liquid nitrogen (~6 liters). It takes~15 minutes to fill and cool.
- Slowly open the gate valve ... slowly enough to ensure that the foreline pressure does not ever exceed ~300 mTorr. When the bell jar pressure has reached 35mTorr, you can open the gate valve all the way then back off a quarter turn. Record the time ("crossover time").
- Wait a minute; TC gauge should be ~0, then power the ion gauge by pressing “filament” (see precaution #4).
- Wait approximately 1-2hr for the bell jar to achieve high vacuum (under 2x10⁻⁶ Torr).

Deposition
- Record base pressure.
- Enter Aluminum parameters into the crystal monitor controller (press PG, then arrows to Density=2.7 g/cm³, Z=1.08, press PG) then press STOP and START.
• During deposition, record deposition pressure, rate, and time.
• When the total thickness has been reached (e.g. 500 Å), close the shutter.

After Deposition
• Slowly (~5 min) turn down boat current, then switch off.
• Turn off the ion gauge.
• Close the gate valve.
• If last run for the day/week, turn off Diffusion Pump but not the mechanical pump (it will take an hour for the DP to cool, but it is isolated by the gate valve, so once system/sample/resistive boat is cool you can vent chamber).
• Wait for the sample/boat to cool ~5 minutes.
• The chamber will be vented with air; open vent slowly at first and make sure foreline pressure remains low (probably 10mT, must be <500mT)...if it starts to rise, close the vent valve immediately and think through what you have done wrong. See precautions #1-3.

Preparing for Another Run
• The DP can be left on so long as the foreline valve is open and being pumped by mechanical pump.
• After adding a new substrate and checking the source and inficon, you can go back to pumpdown above, making sure to close the foreline valve temporarily while roughing out the chamber (precautions #1-3).

Shutting Down
• Turn off DP breaker but leave Mechanical Pump on and foreline valve open.
• Wait an HOUR for the DP to cool.
• After DP is cool:
  • close the foreline valve
  • Turn off mechanical pump
• Open Roughing Valve and Vent valve to vent the mechanical pump (and the chamber).