CRESSINGTON 108 MANUAL SPUTTER COATER SOP

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Purpose: To deposit a thin layer of Au or Au/Pd material to the surfaces to enhance SEM imaging by providing a path to ground for electrons and preventing charging without noticeably altering the topography of the sample.

Precautions: Always wear lab gloves when handling any parts related to the sputtering system, and handle the targets with extreme care.

OPERATION PROCEDURE

NOTE: Sputter should be kept under vacuum if not in use.

Following the procedure described in this document will work for the majority of cases. When difficult samples are encountered the procedure will need to be modified (see **Coating Difficult Samples**).

1. Log into **FOM**, it will turn on the sputter coater main power.
2. **VENT:** Vent the system by lightly pushing the poppet valve toward the center of the vacuum jar. Venting will take 8-12 sec.
3. **OPEN CHAMBER:** Lift the hinged cover and tilt it toward the back of the system. Carefully remove the vacuum jar and place it upright on the black pad located to the right of the chamber. Handle the vacuum jar carefully to avoid damage to the sealing surfaces.
4. **SAMPLE PLACING:** Place your sample on the chamber pedestal and carefully place the vacuum jar back. Close the cover and assure the vacuum jar is resting between the rubber seals at its top and bottom.

NOTE:
- Check that the sample has been mounted on a stub suitable for use on the coater sample table.
- Any solvent-based adhesive should have been allowed to dry out thoroughly.
- The sample should be a suitable shape to allow a conducting path to form during coating.
- Check that the sample table height in the coater is suitable for the sample.

5. **PUMP DOWN**: To pump down the chamber turn on the vacuum pump. The vacuum pump is controlled by the power strip located on the table. Let the system pump to pressure**<0.05mB**. Pump down takes about two minutes. You may need to apply some pressure to the top plate to encourage the initial vacuum seal.
6. **ARGON FLOW SETTINGS**: To initiate the argon flow turn the valve located on the top of the argon tank to the on position. **Keep the line valve in the off position until the system vacuum**

reaches the correct value described above! Once you are ready to tune argon flow on turn the line valve to the on position. The precision pressure regulator should indicate a pressure of 3 psi. If the dial is not reading 3 psi slowly adjust the regulator until the dial show 3 psi.

7. SET UP DEPOSITION TIME: Simultaneously depress the PAUSE button and an UP/DOWN arrow to adjust the deposition time.

NOTE: Press TEST to check the sputter current is at 30mA. If necessary, adjust the current using the rear panel control. Release TEST.

8. Zero the thickness monitor.
9. PROCESS START: Depress the START switch. You should see a blue plasma and the timer should begin to count down. The current should read ~30mA on the millimeter.
10. STOP PROCESS: When the thickness monitor reading reaches the desired value press PAUSE to stop coating. Check the value and press START to terminate the cycle.
11. Close the gas control valve and switch off the unit. Vent the chamber and lift the top plate to remove the sample.
12. Leave the tool as you found it by evacuating the chamber to pressure<0.05mB. Remember to turn off the VACUUM switch.
13. Log out from the tool in your FOM account.

COATING DIFFICULT SAMPLES

Tall Samples

Problem: If the sample has large vertical dimensions, the coating will be biased towards the top of the sample and coating may be too thin towards the base. The problem is caused by the relatively large differences in distance from the target of the various parts of the sample. The problem can be exaggerated by sputtering at low argon pressures (below 0.05mb) when the sputtered gold is inadequately scattered.

Solution: Position the sample table close to the baseplate. Sample-to-target distances (top/bottom) are now similar. Also, use a relatively high argon pressure (say 0.10mb to 0.15mb) to give good scattering and coating from a wider range of angles. Note, that long distance plus high scattering will give slow coating so the process time will need to be longer.

Porous Samples

Problem: If a sample is very porous, pumping the chamber will be slow. Sputtering while the sample is still degassing may result in poor coating. The sample surface can "repel" the gold coating by gas scattering. Also, failure to pump to a suitably low pressure for good argon flushing will result in large grain size and stress cracking in the gold coating.

Solution: Longer pumping times and repeated flushings are required. If coating into the pores is a problem, use the techniques for Woven or Tangled Samples.

Woven or Tangled Samples

Problem: Coating at pressures which are "thickness efficient" for magnetron sputter heads (around 0.05mb) can cause inadequate penetration of the coating in this type of sample. The problem is caused by insufficient scattering of the sputtered gold.

Solution: Operate at a relatively high argon pressure (0.10mb - 0.15mb) to improve scattering. If a fine grain coating is required, it may be necessary to operate at lower power than usual (10mA - 15mA). Table height will depend on the size of the sample.

Samples with Fine Detail

Problem: Grain structure in the gold coating may obscure some of the fine detail in certain types of sample.

Solution: The gold coating will need to be as thin and as fine-grained as possible (while still remaining conducting). This implies using relatively low gas pressures (less than 0.05mb) and low powers (10mA - 15mA). Unfortunately, the use of low gas pressures can result in poor coverage of the sample.

The alternative is to change the target material from gold to gold/palladium or platinum. These materials give a coating, which has a smaller grain-size. Care is needed when using Au/Pd target as it can form oxides in a plasma.

This can result in stress cracking by oxidation of the coating if argon handling is not scrupulous. Careful flushing must be used to sweep out any residual oxygen or water vapor from the sputter chamber.