0 Objective:

This Standard Operation Procedure states how Magnetron Sputtering/ FCVA C.SY should be started up and shutting down in a proper manner.

1 Responsibilities:

2.1 Director / HOD / PI

The Director/HOD/PI has overall responsibility for ensuring a system is established for the safe use of the sputtering machine.

2.2 Designated Person

There shall be a designated person to oversee the correct operation and maintenance of the sputtering machine.

a. This person shall periodically inspect the sputter machine to ensure its operational performance.

b. He/she will make necessary arrangements for repair works of the sputtering machine.

d. He/she will report to the Director/HOD/PI unsafe practices by sputtering machine users.

2.3 Staff/ Research personnel

a. All users shall attend appropriate training on the safe use of the sputtering machine.

b. Users shall report any injuries, defects or breakdowns to their supervisor.

2 Procedures:

Before using the sputtering machine, release the water in the compressor first

<u>3.0Releasing water from the compressor*</u>

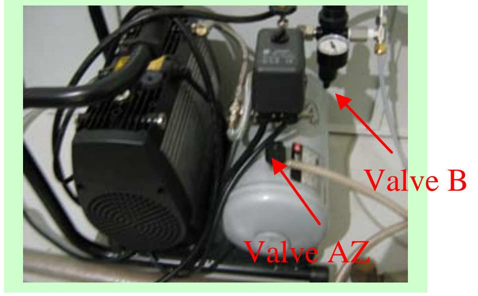

Fig. 1 Compressor

Fig. 2 the Valve AV1

*The compressor is shown in the fig. 1 and located behind the accelerator

- Open the valve A a little bit until the water in the injected flow is gone.
- Press the valve B till no water is in the injected air flow.

3.1 Sample change Procedure

- Turn OFF the high vacuum gauge
- Close valve BFV
- Vent chamber by opening Nitrogen valve
- Change the sample (wear mask + gloves)
- Close the vacuum door.
- Close valve AV1 (isolate the TMP)
- Check if the AV1 is really closed by watching if the related LED (red) on and another is off (See fig 2)
- open the valve AV2 (rough out the chamber).

WAIT! Wait for chamber to reach pressure less than 4.9 x10^{-2}Torr.

- close valve AV2 (stop roughing chamber)
- Open valve AV1 and check if the LED (green) on.
- Open valve BFV (pump system with TMP).

3.2 Sputtering Machine (Cr, Cu and Au targets)

After pumping the chamber down (usually takes more than 6 hours):

3.2.1. Switch on the “Hi-Vacuum Trigger” to monitor chamber pressure. When pressure is less than 1.9x10^{-6} Torr, sputtering procedure can begin.

3.2.2. Close the cooling valves to the FCVA side (8 valves in total).

3.2.3. Behind the machine, choose the target to sputter by plugging the power cable to either the “right target” or “left target”.

3.2.4. Open GV1.

3.2.5. Press the “RUN” key on the mass flow controller labeled “Argon” (press the key shortly; if pressed continuously the controller goes to the fully open mode “8”).

3.2.6. Adjust the “PCV” manually till the pressure is between 2 to 3mTorr.

Open ← → Close

3.2.7. Switch on the MDX power supply at the back.

3.2.8. Switch on MDX front panel (target power) by pressing OFF first then ON (there is now a plasma).

(Maximum time plasma can be left on is 5 min, after which the target needs time to cool before continuing).

3.2.9. Check the power (0.15 kW) and write down the voltage and current.

(New Target ~ 600 V; Old target <200 V (Change target)).

3.2.10. Turn on substrate rotation.

3.2.11. Check shutter is covering plasma and turn the substrate to plasma.

3.2.12. Open shutter for desired exposure time.

3.2.13. Close the shutter and switch OFF the power (MDX front panel).

3.2.14. Switch off MDX at the back.

3.2.15. Press “RUN” key on the mass flow controller (controller displays “OFF”).

3.2.16. Close GV1.

3.2.17. Fully Open “PCV”.

3.2.18. Open the cooling valves to FCVA side.

3.3 FCVA – C and Ti

After pumping the chamber down (usually takes more than 6 hours):

3.2.1. Switch on the Hi trigger to check and monitor the vacuum. When pressure is less than $1.9x10^{-6}$ Torr, FCVA procedure can begin. Operating pressure should be less than $5x10^{-5}$.

3.2.2. Close the unused FCVA target cooling valves.

3.2.3. Connect the power to the target used.

3.2.4. Connect power to the bending system.

3.2.5. Turn on the main power supply ON at the back (down the bottom).

3.2.6. At the control panel, switch on the power (top panels) for the target and also for the magnet guide.

3.2.7. Switch on the anode trigger (red knob) (arc power supply).

3.2.8. Strike with a quick movement back and forth.

3.2.9. Check there is plasma.

3.2.10. Switch on the rotating motor of the substrate holder and turn the sample to the plasma. Keep watch of current – plasma may stop in which case timing needs to stop and new spark needs to be made.

3.2.11. Switch off the anode trigger (red knob) after desired exposure time.

3.2.12. Open the valve for cooling the unused target and the magnet.

3.2.13. Switch off the bending magnet.

3.2.14. Switch off the power for the anode current.

3.2.15. Switch off the Hi-trigger.

3.2.16. Switch off the substrate rotating motor.

3.2.17. If carbon was used, switch off the carbon motor.

Reference:

- ✓ The current of the first cabinet is 3.4, 3.0, 11. 95.9-105.
- ✓ The voltage for Ti, Cu and carbon are around 124, 84 and 34 respectively.

Attention:

- Do not leave the machine while it is pumped with the rough pump only. Machine needs to be left with Turbo pumping chamber (backed with roughing pump).
- High vacuum gauge can only be used for low pressures

3 References:

Manuals kept on the cabinet at S7-01-01 beside sputtering machine's control panels.