

Coating:

Two types of coating material: **Pt**, **Carbon**

1. Choose coating material: (**Pt** or **Carbon**)

2. Make sure correct machine connect to **SPI-MODULE Control**

For **Pt**, is **SPI-MODULE sputter Coater**

For **Carbon**, is **SPI-MODULE Carbon Coater**

3. Put the sample into the **glasswork chamber**.

(CAUTION: DO NOT DAMAGE THE GLASSWARE)

4. Put the **head** (**Pt** or **Carbon**) onto the top of **glasswork chamber** and use **vent knob** (on the top of the **head**) to close the vent valve.

5. Turn on the power of **SPI-MODULE Control**.

6. Use **Gas Leak** control the vacuum. (Counter-clockwise tight up the screw)

(CAUTION: over tightening the screw may cause damage to the valve)

7. When the vacuum is arrived, start to coating.

(For **Pt**, Vacuum: ~2atm, current: 10~20 milliamperes)

Ps. current is related to vacuum.

(For **Carbon**, vacuum: as good as possible, current: 20~40 amperes)

8. **Pt Target:**

(Make sure **SPI-MODULE sputter Coater** is connected to **SPI-MODULE Control**)

8.1 Turn on the power of **SPI-MODULE sputter Coater**.

8.2 Push **TEST** button make sure machine is ready for coating.

8.3 Use **Timer Set knob** setup coating time. (in seconds)

8.4 Push **START** button to start coating.

ex: filter paper: unconductivity material, time = 110 sec.

half-conductivity material, Time = 30 sec.

rock, Time = ~70-80sec.

9. **Carbon Target:**

(Make sure **SPI-MODULE Carbon Coater** is connected to **SPI-MODULE Control**)

(Make sure **Carbon Fiber** is connected well)

9.1 Turn on the power of **SPI-MODULE Carbon Coater**.

9.2 Use **VOLTAGE** control current, current: 20~40 amperes.

9.3 **Outgassing:** turn the switch to **CONT**, rotate **VOLTAGE**, heating **Carbon Fiber** until it become red. (This process is to remove entrapped gas in **Carbon Fiber**.)

9.4 Turn the switch to **PULSE**, push **PULSE** for several times until coating is complete.

10. Complete the coating process. Turn off the power of **SPI-MODULE sputter Coater** or **SPI-MODULE Carbon Coater**.

11. Turn off the power of **SPI-MODULE Control**.

12. Unscrew the knob on the target to release the pressure in the glasswork chamber, to achieve the normal pressure.

(CAUTION: after operate, carbon fiber evaporation head will get “extremely hot”, remove head after it cooled down)

13. Clean the glasswork chamber.

(CAUTION: DO NOT DAMAGE THE GLASSWARE)

Thickness of coating

Gold film thickness: 100~300Å.

$$d = KIVt$$

d: thickness of coating, in Å

K: constant, depends on the material being sputtered, distance between target and specimen
~50mm.

$$K=0.17 \text{ Gold, Argon}$$

$$K=0.07 \text{ Gold, Air}$$

I: plasma current

V = voltage applied, in kilovolts. (V = 1)

t: sputtering time, in seconds

ex: for a typical sputtering using gold in argon with a plasma current 18mA, for 120sec.

$$d = KIVt = 0.17 \times 18 \times 1 \times 120 = 367.2 \text{ Å} (\sim 3 \text{ Å per seconds})$$

Pt target: ~ half the sputtering rate as gold.

Reference:

Merrick, D. M., Eminhizer, L. B., Villaume, J. F. (1973) The role of carbon film thickness in electron microprobe analysis. American Mineralogist, Vol. 58, p.920-925.