

## UiB NanoStructures Laboratory

### Standard Operating Procedure

## SC 7620 Mini Sputter Coater

#### Purpose of the instrument:

The SC7620 Mini Sputter Coater is mainly used for depositing thin conductive metal coatings on to SEM samples(Coating Process), it can also be used as surface cleaning(Glow Discharge Process), allowing high efficiency ion etching of the specimen surface to remove.

#### Location of the instrument:

Allégaten 55, room 286 (entrance via 276, E-Beam lithography Lab)

#### Primary Staff Contacts:

Sabrina Eder (Mob: 9420 47 33, E-mail: [sabrina.eder@uib.no](mailto:sabrina.eder@uib.no))

Martin Greve (Mob: 900 79 974, E-mail: [martin.greve@uib.no](mailto:martin.greve@uib.no))

#### Instrument booking:

No booking required.

#### Instrument access:

The instrument can be used by approved users after an introduction by UiB personnel. For introduction requests please contact primary staff.

#### Service Contacts: (just to be contacted by primary staff)

Quorum Technologies LTD, (Tel: +44 (0) 1233646332, E-mail: [sales@quorumtech.com](mailto:sales@quorumtech.com) )

#### Available source materials:

Gold/palladium (Au/Pd) target



### WARNINGS

Potentially lethal voltages are used in this equipment. Before making / breaking connections to the equipment, ensure power is off and that it is safe to proceed. Contamination can seriously affect the sputtering process. To reduce the possibility of contamination by airborne particles, minimize the time the vacuum chamber is open to the atmosphere.

*The UiB NanoStructures Lab is operated for the benefit of all researchers. YOU MUST HAVE RECEIVED PERSONAL TRAINING ON THE INSTRUMENT TO BE PERMITTED TO OPERATE IT! IF YOU HAVE BEEN TRAINED AND ARE STILL UNCERTAIN AS TO HOW TO OPERATE THE INSTRUMENT CONTACT ONE OF THE STAFF MEMBERS. If you encounter any problems with this piece of equipment, please contact the staff member listed above immediately. There is never a penalty for asking questions. If the equipment is not behaving exactly the way it should, contact a staff member. This SOP only serves as a quick reference. For further details consult the manual and/or service engineers.*

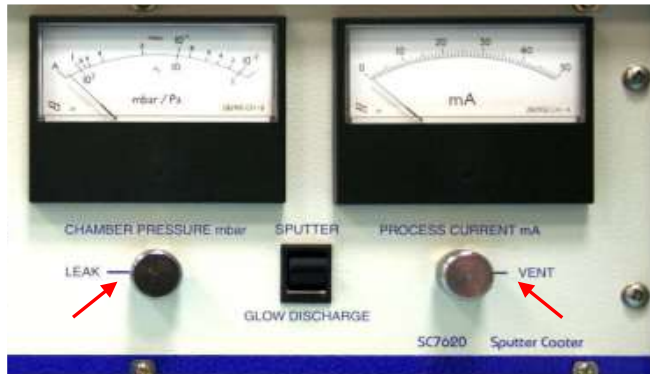
## Basic Usage (Sputter coat Au/Pd)

### 1. Test Procedure

This test procedure, which checks the system is operating correctly, should be performed after any operation that could lead to contamination of the vacuum chamber.

#### (a) Preparation

(i) Check that **LEAK** and **VENT** valves are closed, (fully clockwise).



(ii) Check the argon cylinder regulator is open. Set pressure to 0.5 bar (5- 10psi).

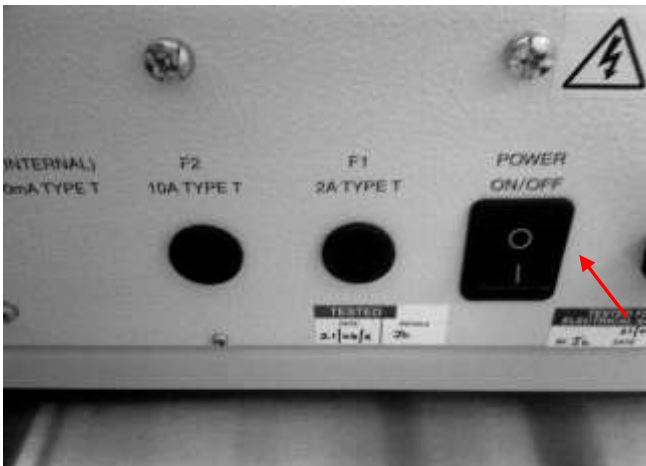


(iii) Set **TIME** control to 15 seconds.



(iv) Check that mains power is available, set the rear panel mounted **POWER ON/OFF** switch to the down

position. (ON).



(v) Check sputter option is selected.



## (b) Set vacuum pressure.

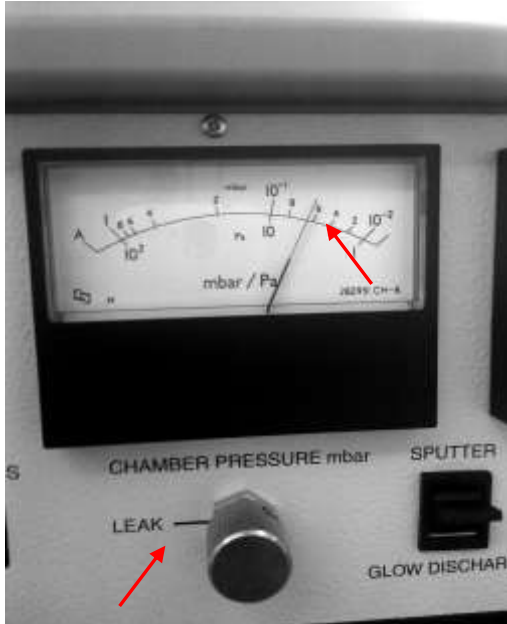
(i) Operate **START PUMP** switch, the integral indicator will illuminate and the rotary pump will start.



(ii) After 10-15 seconds (dependant on the size of rotary pump), the vacuum gauge will register a fall in pressure within the chamber. Continue pumping until the chamber pressure reaches  $5 \times 10^{-2}$  mbar or better,

(indicating there are no major leaks in the system).

- (iii) Open the **LEAK** valve (turn knob counter-clockwise, three to four turns) until the vacuum chamber pressure increases to approximately  $6 \times 10^{-2}$  mbar.



### (c) Set process current

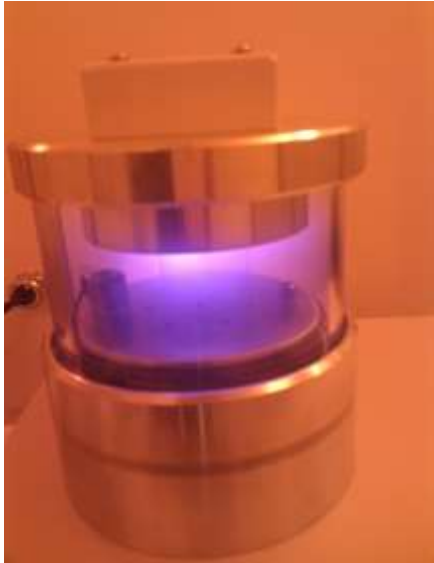
Whilst continuing to adjust the **LEAK** valve, intermittently operate the **SET PLASMA** button, the **PROCESS CURRENT** meter will register the current flow and sputtering will occur. Open or close the **LEAK** valve to adjust the current to 18mA. Release the **SET PLASMA** button.



### (d) Adjust discharge current

- (i) Operate the **START PROCESS** button, the sputtering process will commence. The current will rise to about 18 mA and a blue or purple discharge glow will be visible, gold-palladium (or other target material) will be sputtered onto the base plate. After 15 seconds, the timer will terminate the process, the discharge will

cease and the indicator extinguish.



(ii) Whilst the sputtering process is in progress, outgassing of the system can alter the process current. Use the **LEAK** valve to correct these changes.

**(e) Close down the system, as follows:**

(i) Close the **LEAK** valve (turn fully clockwise).



(ii) Operate the **START PUMP** button, the indicator will extinguish and the rotary pump will be turned OFF.



(iii) Open **VENT** valve to admit gas to the vacuum chamber. When sufficient gas has entered the chamber, positive pressure will 'pop' the top plate open



(iv) Close the **VENT** valve.

## 2. Coating Process

A metal film of uniform thickness between 50 and 300 Å is generally used for SEM investigations.

### (a) Mount specimens

- (i) Prepare specimens on stubs, using an approved method.
- (ii) Hinge the top plate back and remove the glass chamber.
- (iii) Adjust the height of the sample stage. 35mm between top of the sample and the target provides a satisfactory general purpose setting.
- (iv) Mount the stubs (with attached samples) on the sample stage.
- (v) Replace the glass chamber and close the top plate, to enclose the sample. Care to be taken when closing the Top Plate onto the glass cylinder as the glass can easily chip if hit by the Top Plate.

### (b) Preparation

- (i) Check that **LEAK** and **VENT** valves are closed, (fully clockwise).



- (ii) Check the argon cylinder regulator is open. Set pressure to 0.5 bar (5- 10psi).

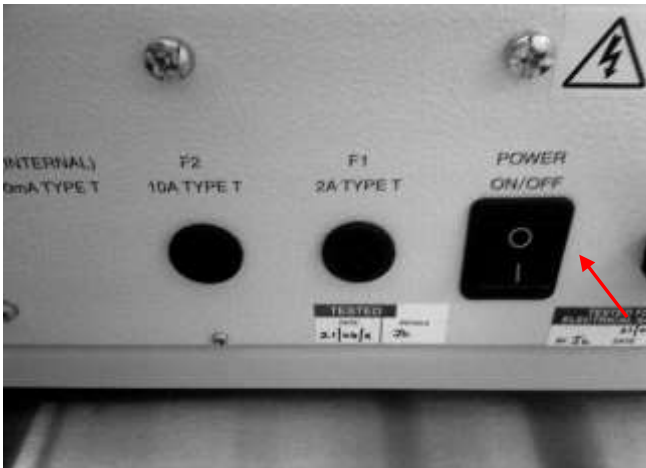


- (iii) Set **TIME** control to required setting, say 120 seconds (the time required is process dependent).





(iv) Check that mains power is available, set the rear panel mounted **POWER ON/OFF** switch to the down position (ON).



(v) Check sputter option is selected.



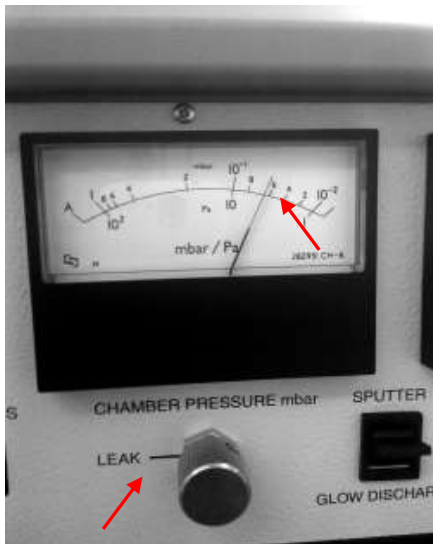
### (c) Set vacuum pressure

(i) Operate the **START PUMP** button, the rotary pump will start and the reducing pressure will be indicated on the **CHAMBER PRESSURE** meter.





- (ii) When the pressure reaches 0.1 mbar, partially open the LEAK valve to flush the vacuum system with Argon. During flushing, allow the pressure to rise to between 0.5 and 1 mbar for 10-15 seconds. Close the LEAK valve and allow vacuum chamber pressure to recover to better than  $6 \times 10^{-2}$  mbar.



#### (d) Set process current

Open the **LEAK** valve and monitor the vacuum pressure. When the pressure begins to rise, intermittently operate the **SET PLASMA** button continuing to adjust the **LEAK** valve. The **PROCESS CURRENT** meter will register the current flow. Open or close the **LEAK** valve to adjust the current to 18mA. Release the **SET PLASMA** button.



### (e) Sputter processing

- (i) Operate the **START PROCESS** button, the sputtering process will commence and a blue coloured discharge glow will be visible in chamber. Gold-palladium or other target material will be sputtered onto the samples for the set time period, then the discharge will cease.
- (ii) For a thicker coating, repeat (e (i) above).

### (f) Remove Specimens

- (i) Close the **LEAK** valve to shut off the flow of argon to the chamber.



- (ii) Operate the **START PUMP** button, the indicator will extinguish and the rotary pump will be turned **OFF**.



(iii) Open the **VENT** valve to admit gas to the chamber.



(iv) When the chamber pressure returns to atmosphere, close the **VENT** valve, lift the top plate clear of the glass chamber.

(v) Remove the specimens.

(vi) If further specimens are not to be coated immediately, close the top plate to seal the chamber.

**(g) Close the argon cylinder regulator**

### 3. Glow Discharge Process

#### (a) Mount specimens

- (i) Hinge the top plate back and remove the glass chamber.
- (ii) Adjust the height of the sample stage. Whilst the most suitable height for a particular application can best be established empirically, 35mm between top of the sample and the target provides a satisfactory general purpose setting.
- (iii) Mount the samples on the sample stage, using approved method.
- (iv) Replace the glass chamber and close the top plate, to enclose the sample. Care to be taken when closing the Top Plate onto the glass cylinder as the glass can easily chip if hit by the Top Plate.

#### (b) Preparation

- (\*) When used in glow discharge mode either for surface treatment or etching of surfaces, if a target was previously fitted for sputter coating, this should be removed.
- (\*) Glow discharge is normally in air, so a process gas is not required.
- (i) Check that **LEAK** and **VENT** valves are closed, (fully clockwise).
  - (ii) Check the argon cylinder regulator is open. Set pressure to 0.5 bar (5- 10psi).
  - (iii) Set **TIME** control to required setting, say 120 seconds (the time required is process dependent).
  - (iv) Check that mains power is available, set the rear panel mounted **POWER ON/OFF** switch to the down position (ON).
  - (v) Check **glow discharge** option is selected.

#### (c) Set vacuum pressure

- (i) Operate the **START PUMP** button, the rotary pump will start and the reducing pressure will be indicated on the **CHAMBER PRESSURE** meter.
- (iii) Allow vacuum chamber pressure to recover to better than  $6 \times 10^{-2}$  mbar.

#### (d) Set process current

Open the **LEAK** valve and monitor the vacuum pressure. When the pressure begins to rise, intermittently operate the **SET PLASMA** button continuing to adjust the **LEAK** valve. The **PROCESS CURRENT** meter will register the current flow.

Open or close the **LEAK** valve to adjust the current meter to required current. Release the **SET PLASMA** button.

#### (e) Glow Discharge process

- (i) Operate the **START PROCESS** button, the glow discharge process will commence for the set time period, then the discharge will cease.

#### (f) Remove Specimens

- (i) Close the **LEAK** valve to shut off the flow of air to the chamber.
- (ii) Operate the **START PUMP** button, the indicator will extinguish and the rotary pump will be turned **OFF**.
- (iii) Open the **VENT** valve to admit gas to the chamber.
- (iv) When the chamber pressure returns to atmosphere, close the **VENT** valve, lift the top plate clear of the glass chamber. Remove the samples.
- (v) If further samples are not to be cleaned immediately, close the top plate to seal the chamber.

## 4. Target Replacement

**Note:** Target removal is required when using the **Glow Discharge Mode**

- (a) Ensure power supplies to the Sputter Coater are all set to **OFF**.
- (b) Hinge the top plate back, to expose the target assembly.
- (c) To release the Shroud, remove 2 x M3 socket screws. Remove the Shroud.
- (d) Unscrew and remove the Target Clamp (if the Target Clamp will not unscrew, lubricate lightly with isopropanol). Remove and discard the old target. If necessary clean the Magnet Holder and Target Clamp, using a gentle abrasive material (Scotchbrite), rinse with isopropanol and dry thoroughly.

## 5. Refit New Target

- (a) Position the new target in the Target Clamp Ring, ensure target is lying flat.
- (b) Carefully fit the Clamp over the Magnet Holder, tighten until the target is securely clamped.
- (c) Re-fit the Shroud and secure using the 2 x M3 socket screws.
- (d) Position the Top Plate assembly on the vacuum chamber and reconnect the services previously removed. Care to be taken when lowering the Top Plate onto the Glass Chamber.
- (e) When taking the system back into service carry out the Test Procedure this will ensure the system is thoroughly dried out.

## 6. No Discharge Current

If after switching power on, **SET PLASMA** is operated and the Sputter Coater does not respond, check the following:

- (a) If **SET PLASMA** indicator is illuminated, ensure the vacuum pressure is  $10^{-1}$  mbar or better, if pressure is above this level check for leaks (check **VENT** is closed).
- (b) If **SET PLASMA** indicator is not illuminated check fuse F3 (fitted within the sputter coater). If fuse is blown replace with the correct fuse F3, 630mA anti-surge as follows:
  - (i) Ensure power supplies to the Sputter Coater are set to **OFF**.
  - (ii) Remove all electrical and gas connections to the rear panel.
  - (iii) Remove 10 screws to release the rear panel, retain the screws for future use.
  - (iv) Ease the rear panel away from the main assembly.
  - (v) F3 fuse holder is mounted in the bottom left corner of the PCB assembly.
  - (vi) Remove the fuse, test and if necessary replace. Discard the blown fuse.
  - (vii) Reassemble the Sputter Coater.
- (c) If **Current limit** interlock LED is illuminated the unit remains interlocked until the power to the instrument is turned off then on again. Please allow between 3 and 5 seconds powered off.

## **Document History**

Version 0.1, February-2012, Author: Xiaodong Guo, Thomas Reisinger, Changes: Basic Usage Procedure and Layout

Version 0.2, 16-October-2023, Author: Sabrina Eder, Changes: Front page