



Ref No. INST/12(111)/2019-Pur

Date:24/09/2019

## **CORRIGENDUM**

Reference to NIT no. INST/12(111)/2019-Pur published in national newspapers on 05/09/2019 for purchase of equipment: **UHV Compatible confocal multi target magnetron sputtering unit.** Below mentioned technical points may be read and corrected as per following:-

### **Revised Specifications**

#### **UHV Compatible confocal multi target magnetron sputtering unit**

Required a UHV compatible multi target confocal sputtering system with arc suppression/protection for deposition of high quality, uniform magnetic and non-magnetic ultrathin films. Turbo pump backed main chamber with high vacuum in 10<sup>-8</sup> torr range.

#### **1. Sputtering Guns**

- (a) Quantity: 4 (four); One RF guns for non-conductive and magnetic materials sputter capability and three DC gun for conductive materials and magnetic materials deposition. The sputtering gun should be compatible with magnetic materials in addition to conducting and non-conducting materials.
- (b) Type: Water cooled magnetron cathodes
- (c) Make: Kurt J. Lesker / Mei VAC or equivalent
- (d) Target size: 2" diameter with necessary option to mount 1" diameter target also
- (e) Target shape: Circular
- (f) Adjustability: The guns should have cross-contamination shield. Also, the possibility of mounting 1" and 2" target in the same gun assembly may be added advantage  
Substrate to target distance should be adjustable around 10 cm
- (g) Shutters: Manually controlled shutters should be present for all sputter sources. The shutters should be controlled from outside and UHV compatible

#### **2. DC power supplies**

- (a) Quantity: 3
- (b) Make: ADL Germany or Advanced Energy or equivalent
- (c) Electrical: The complete system should operate with single phase 220V electrical line with 50Hz frequency.
- (d) DC Power supply: 0- 500W
- (e) High stable arc protection for magnetron sputtering
- (e) Cables and connectors: Suitable cables of appropriate length with connectors

#### **3. RF power Supply**

Quantity: 1 (One)  
Make: Advanced Energy/Huttiger or equivalent  
Input power requirement: The complete system should operate with single phase 220V electrical line with 50Hz frequency.  
RF Power frequency: 13.56 MHz with automatic matching network  
RF power output: 0 - 300 W variable with automatic matching network.  
Display: Power display for all parameters  
System cooling: Air cooled  
Auto matching network suitable for the above  
Cables and connectors: Suitable cables of appropriate length with connectors



#### **4. Sputtering chamber**

- (a) Geometry: D-shape chamber, spherical or rectangular chamber with appropriate dimension and having good access inside the chamber through door and easy loading of the samples,.Sputter up configuration. A provision for future upgrade to connect and have easy accessibility with a load lock.
- (b) Material: Electro-polished non-magnetic, non-corrosive stainless steel
- (c) Vacuum rating: The system should be able to achieve a vacuum of  $6 \times 10^{-8}$  torr or better with given pumps.
- (d) Flanges/ports: Sufficient number of flanges/ports for vacuum pump, gas inlet, substrate-cum-heater, sputtering guns, venting,.
- (e) View port: Atleast one CF 35 metal to glass sealed UHV view port.
- (f) Target configuration: Confocal sputtering arrangements of guns. Sputter up.
- (g) Target number: 4 targets each of 2" diameter. It should have the capability of use with 1" diameter target as well.
- (h) Substrate holder configuration: On the confocal point to all four guns. The substrate holder should be compatible to hold 1" substrate with rotational about the axis. Easy to load and remove the sample. Heating required to 800°C. It should have 25 mm in-situ movement in and out (bellow sealed) Inbuilt shutter with magnetic coupled or bellow sealed seals.
- (i) The system must have appropriate arrangement for future upgrade for addition of a load lock chamber.

#### **5. Vacuum system**

- (a) Base pressure:  $6 \times 10^{-8}$  torr
- (b) High vacuum pump and gauge: Base pressure:  $6 \times 10^{-8}$  torr. Preference will be given to lower base pressure configurations. High vacuum pump: Turbo Pump  $\geq 355$  Liters/sec (Pfeiffer/Edwards/Leybold/Varian/Agilent) backed by suitable pump (atleast  $10 \text{ m}^3/\text{hr}$ ) to meet above criterion.
- (c) Roughing pump: Rotary pump. Suitable configuration required so as to meet above criterion for high vacuum pump. (atleast  $10 \text{ m}^3/\text{hr}$ ) (Pfeiffer/Edwards/Leybold/Varian/Agilent)
- (d) Process pressure: In the range  $10^{-2}$  torr to  $10^{-4}$  torr. Pumping capacity should maintain constant process pressure during entire deposition process of about 5-6 hours.
- (e) Gate valve: Adjustable manual gate valve (VAT or equivalent). To control process pressure
- (f) Pressure gauge Low pressure: Ion Gauge/cold cathode gauge  
High Pressure: Pirani Gauge

#### **6. Substrate-cum-heater for the main chamber**

- (a) Substrate-cum-heater for chamber: Should be able to hold multiple substrates of sizes 5 x 5 mm to single sample of 1".  
The heating assembly should be able to deliver temperatures in the range RT - 800°C during and/or after deposition in presence of oxygen gas with a variable heating rate up to of about 10°C/s and temperature uniformity of  $< \pm 1\%$  on 1"x1" area. The heater should be PID controlled. The maximum admissible limit of putting oxygen at 800°C in the chamber should be mentioned separately.
- (b) Substrate clamping: Mechanical (through clips) with minimum shadow region
- (c) Substrate rotation: Rotation speed should be adjustable up to 10rpm.
- (d) Adjustability: Substrate to target distance should be easily adjustable in both sample holder
- (e) Shutter: Substrate shutter to avoid material deposition during burn-in time should be provided. Both manual and pneumatic shutter is accepted.
- (f) Easy to use: Substrate holders should be easily detachable & replaceable
- (g) It should be possible to RF bias the substrate holder such that the plasma cleaning of the substrate can be done prior to the deposition.

#### **7. Gas Supply System**

- (a) Mass flow controllers (MFC): Two, High quality MFCs (Make: Alicat or equivalent) and display units with  $\pm 1\%$  accuracy of reading (or better) and high repeatability. Suitable for standard type of fitting. It will be used for gas Argon, Nitrogen and Oxygen. (standard gases preloaded)
- (b) Range: 0 to 200 sccm
- (c) Gas channels: 2
- (d) Isolation valves: Isolation valves for each gas line after MFC



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(e) Gas connector fittings: Vendor should supply all gas connector fittings and non-corrosive stainless steel tubing

(f) Process gases: Argon, O<sub>2</sub>, N<sub>2</sub>: MFC should be able to flow multiple gases with proper and quick calibration

(g) Nitrogen purging: Manual venting valve to be provided with N<sub>2</sub> purging arrangement.

## **Water chiller**

Water chiller: PID controlled, closed loop water chiller unit and compatible for above mentioned sputtering system for running entire sputtering unit for 12 hours continuously

## **9. Accessories and Spares**

Cu gasket: 1 set of spare oxygen free Cu gasket for all CF flanges should be provided with the system

Vacuum grease: The good quality vacuum grease (Dow Corning or equivalent) should be provided with the system

Teflon tape: Sufficient amount of Teflon tape should be provided with system for the use Viton

gaskets/Orings: 1 spare set of viton gaskets/O rings to be provided for each of the viton gasket fitted flanges

## **10. Safety/ Interlock**

Proper safety interlocks with sound alarm or messages to be provided for all the equipment components (e.g., vacuum, door, water, compressed air, electrical requirements, etc.) if required.

## **11. Mounting Frame**

A convenient frame with rack to mount all the above to make it a reasonably compact system. Frame should have adjustable height for levelling and castors with stop for easy movement.

## **12. Installation and training**

Supplier has to integrate the system with all mentioned parts above at INST with gases and regulators provided by the institute. Supplier to show sputtering and train the personnel on the system for acceptance of the system. Targets and substrates will be provided by INST.

## **13. Site requirements**

The supplier has to provide the site specific requirement like power, space, gas, water or any other details at least two months before the shipment of the sputtering unit to avoid any delay during the installation.

## **14. Warranty**

At least 3 year.

## **Optional Item**

1. Heating bands for baking the chamber with appropriate power supply

2. Load Lock:

A load lock chamber with vacuum level of at least  $2 \times 10^{-2}$  mbar. The load lock will be separated from the main chamber through a manual gate valve. The transfer of the sample under vacuum from load lock to the main chamber should be possible at ease externally.

3. Thickness monitor

Other specifications and Terms and conditions of the tender are remain unchanged

Sd/-  
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