



NATIONAL INSTITUTE OF TECHNOLOGY SRINAGAR

(An Autonomous Institute of National Importance Established by the Act of Parliament)

OFFICE OF THE COORDINATOR TEQIP III

Tel: +91-194-2422032 Extn: 2814

Email: teqip3@nitsri.net Website: <http://new.nitsri.ac.in>

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Corrigendum

With reference to the “**Invitation for bids for Multi Target Sputtering System**” IBF No. TEQIP-III/nits/189 dated 26-11-2018; the specifications have been revised and can be found at Annexure I. Moreover the last date for the submission has been extended upto **29-04-2019 upto 11:00 am.**

**Coordinator
TEQIP III**

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Specifications of Multi Target sputtering system

1. General

- 1.1. The equipment should be able to deposit any combination of metals, metal alloys, composites, semiconductors, insulators on semiconductor/ glass/ metal/ alloy substrates in a single run as per the number of sputter sources and power supplies detailed herein. The required thickness of deposited film is upto 1 μ .
- 1.2. System shall support DC and RF Sputtering modes.
- 1.3. Deposition uniformity of $\pm 3\sim 5\%$ over 3" diameter substrate.
- 1.4. Substrate heating facility before and during deposition up to 800⁰ Celsius, while substrate rotation is ON with accuracy of $\pm 2^{\circ}\text{C}$.
- 1.5. Ultimate vacuum of 5×10^{-7} Torr in process chamber.
- 1.6. Automatic operation of system. (automation should be recipe and non-recipe mode where from PC one can access and operate each device)
- 1.7. The system shall be compatible to Class 100 or better clean rooms

2. Energy

- 2.1. One DC Power Supply 500W, Make Advanced Energy or ADL or higher with switching controlled according to process.
- 2.2. Display for power delivered, Control Mode Current, Voltage or Power set point.
- 2.3. Two RF Power supplies 300 Watt, Make Advanced Energy/ Comdell/ Huttinger / SEREN or Higher, with frequency of 13.56 MHz.
- 2.4. Substrate cleaning through RF in load lock using the same RF power supply.
- 2.5. RF switch to switch RF supply from deposition to RF cleaning

3. Sputtering Targets

- 3.1. Three Sputtering Targets of 2 inch Diameter, with height adjustable
- 3.2. Three Magnetrons Source of 2 inch diameter (Make M/s GENCOA, MEIVAC, USA or equivalent) For Sputter down, off axis configuration (confocal).
- 3.3. Targets to support both RF and DC, Reactive sputtering Modes.
- 3.4. All targets should be water cooled.
- 3.5. Targets to be easily mountable and replaceable.

4. Substrate Holder

- 4.1. Substrate holder to handle upto 3 inch dia substrate.
- 4.2. It shall also permit to place small irregular pieces of wafers.
- 4.3. Substrate holder shall have provision for substrate rotation 0-20 RPM.
- 4.4. Provision for substrate heating from room temperature to 800⁰ Celsius +/- 2 Celsius with PID Controller.
- 4.5. Substrate vertical movement with controlled speed during process by 50mm
- 4.6. The Substrate holder shall be easily detachable / replaceable.

5. Shutter

- 5.1. Three Pneumatic Shutters between target and substrate holder and shall be made up of SS 316 (or superior).
- 5.2. Shutter shall be easily removable for cleaning.

6. Process Chamber

- 6.1. Fully RF shielded, High Grade Stainless Steel, electro-polished body, cube or SS 304L D shaped Chamber size 400 X 400 (approximate) or superior with High grade Aluminum Front Door.
- 6.2. Convenient sample loading and frequent replacement of target will be normal routine.
- 6.3. View Ports 63 mm diameter to monitor sputtering process and plasma. Two view ports across the chamber.
- 6.4. The inside of chamber shall be easily accessible and complete assembly shall be serviceable
- 6.5. Minimum three additional ports with Blanks for future up gradation on process chamber
- 6.6. Protective liners set: Set liners for protection against coating. Set liners (Walls door and base plate) will be easy removable and made of thin stainless steel sheet.

7. Process Pressure Control

- 7.1. Upstream pressure control which should be able to control the process pressure to +/- 0.1mbar from the set process pressure throughout the sputtering cycle.
- 7.2. Process gas channel
- 7.3. Capacitance manometer Pressure Transducer
- 7.4. Three MFC's for oxygen, nitrogen and argon (0-200 SCCM)

8. Valves

All necessary valves to be able to have a fully automated pumping system should be included. Also, the necessary throttle valve to be able to control process pressure will have to be provided.

9. Gauge Heads

All gauges should be of Edwards/ Leybold / Pfeiffer/Granville Philips make. Necessary gauges for measurement of vacuum to be included in the system. Please note a Temperature Controlled Capacitance manometer should be included for measurement of process pressure & control. The process pressure control should be fully automated capable of controlling process pressure with a stability of +/- 0.1 mbar. Please note that the process control should be fully automated.

10. Film thickness control

- 10.1** Thickness monitor
- 10.2** 10 nos spare crystals

11. Load Lock Chamber

System Load-Lock: The system will provide with manual load- Lock for loading sample holder up to 3 inch wafer or smallest part. Easy transport mechanism of the wafer from the load-lock chamber to the process chamber and vice-versa. Oil free turbo molecular pump 70 litre/sec pumping speed to create vacuum in the load lock Chamber better than 5×10^{-5} Torr within six minutes. Design of the system permits to use it with load-lock sample loading as well as loading through the front door. Load Lock chamber should be equipped with RF facility for substrate cleaning using RF power. Please note that RF cleaning process in the load lock should be completely automated and recipe controlled using the same MFC's of the main chamber.

12. Gas Inlet System

12.1 Three gas inlets with MFC's & fittings. (MFC's Make MKS / TYLAN/ HORIBA / UNIT and AREA or equivalent)

- i. Argon 0-200 SCCM
- ii. Oxygen 0-200 SCCM
- iii. Nitrogen 0-200 SCCM

12.2 Gas micro filters on each line.

12.3 Pneumatic actuated isolation valves on each line after MFC's.

12.4 Nitrogen venting provision.

13 Vacuum Pumping and Measurement

13.1 Ultimate vacuum: 5×10^{-7} Torr in process chamber.

13.2 Total pump down time shall be less than 3 hours to achieve vacuum of 5×10^{-7} Torr in process chamber.

13.3 Roughing Dry Scroll Pump (Make ANESTA IWATA/ LEYBOLD / EDWARD / VARIAN or equivalent) Ultimate Vacuum less than 2×10^{-2} torr 10m³/hrs nominal pumping speed.

13.4 Turbo Molecular Pump 700Liter/ Sec.Make LEYBOLD/ ALCATEL/ VARIAN / EDWARD or equivalent.

13.5 Pumping to be complete in all respect.

13.6 Maximum allowable leak rate $< 1 \times 10^{-9}$ mbar Lt/sec Helium.

13.7 Suitable Stainless Steel bellow sealed pneumatically operated Isolation Gate Valve, Roughing & Vent Valve (Make VAT / MKS / MDC I MEIVAC or equivalent) should be provided. Pumping System should be fully automatic, fully interlocked, as well as service control option offering manual unprotected access.

13.8 Vacuum Gauging (Make GP / MKS / MDC or equivalent) for Pirani & Penning for measuring Vacuum inside chamber from atmosphere to 1×10^{-8} Torr.

13.9 Display for measuring vacuum during sputtering in milli torr or milli bar.

14 PC control system

System Automatic HMI Control PLC-PC interface with window based software for system remote control for process parameters and Manual Operation (service mode)

15. Control Panel

It should display the following

15.1 Selection of sputtering modes

15.2 Target Selection

15.3 RF/DC power

15.4 Substrate temperature

- 15.5 Process gas
- 15.6 Pneumatic actuated gate valves
- 15.7 Vent and purge valve
- 15.8 Vacuum measurement
- 15.9 Interlocks and alarms
- 15.10 Chamber vacuum
- 15.11 Gas flow rates
- 15.12 Fault Identification
- 15.13 Security Protection through password
- 15.14 Fully automated with process recipes builder based on PLC/PC.
- 15.15 Two levels of security (user, service)
- 15.17 Data logger with search capability online and offline.
- 15.18 Activity report non-erasable

16. Documentation

16.1 Vendor to provide complete clean room compatible documentation/manuals soft copy/ hard copy for the systems

- I. Installation manual
- ii. Operation manual
- iii. Maintenance manual

16.2 The documentation/manual shall include all drawings, schematics, spares parts catalogues and also sub-vendor's manuals.

16.3 Trainer for 1 year

17. Support and Maintenance

17.1 Vendor shall commit to provide spares and support for 05 years after expiry of warranty period.

18. Optional (please provide separate quote)

18.1 Three year period critical spare parts, list must be provided.

18.2. Dry Scroll pump less than 2×10^{-2} Torr ultimate vacuum, 10 m³/hrs nominal pumping speed.

18.3 Targets.

Oxides & Nitrides: Al₂O₃, DLC, Er₂O₃, HfO₂, V₂O₅, VO₂, ZrO₂, TiO₂, Fe₂O₃, TiN, PZT, GNP, HBN, CaF₂, TiB₂, WC, WS₂, SiC, SiO₂, Si₃N₄, ZnO with 99.95% or higher purity

Metals: W, Fe, Cu, Ni, Ta, Al, Cr, Co, Graphene, Zr, Nb with 99.99% or higher purity

19. Inspection, Installation & Commissioning

19.1 The system shall be installed / commissioned at customer site. The quotation shall be inclusive of all charges, if any, for installation and commissioning of the equipment by the vendor.

19.2 Extensive operation and maintenance training of two persons for one week at manufacturer's premises before dispatch of the equipment.

19.3 The company should specify the time required to attend any problem in case of sputtering system breakdown.

20. Utilities

20.1 Vendor shall provide the details of all the utilities/ facilities such as power requirement, running load, footprint, pressure and flow rates for compressed air, process gases, cooling water, exhaust requirement etc., along with the size and types of connectors required.

20.2 Electrical Requirement:

The system shall conform to the Indian power supply standards, i.e. 415V \pm 5%, 50Hz, Three Phase.

20.3 Vendor shall provide hands on training for the customer team during installation.

20.4 Vendor must supply and install the facility within 18-20 weeks of the tender date, and must Have supplied similar systems worldwide (please provide customer list).

20.5 The acceptance of the system will be after the demonstration of Magnetron reactive co-sputter deposition sputtering of thin composite films of Metals/ Magnetic Materials of target materials on three substrates with a uniformity of $\pm 3\sim 5\%$ over a 3 inch diameter wafer at customer site. Three deposition cycles must be demonstrated.

The Required Spares and Tool Kit must be quoted.

20.6 **Warranty**

Please quote with 1 year standard warranty after installation and acceptance. Additionally quote for 2 more years of warranty after standard warranty.

20.7 Only reputed original equipment manufacturer (OEM) should submit the tender.

20.8 Vendor should have a full fledged service capability in India.

Note:

1. Vendor shall provide list of three customers (India and abroad) along with email addresses, where the similar system has already been installed.
2. Vendor shall quote along with above compliance (specification) Chart