



INDIAN INSTITUTE OF TECHNOLOGY BOMBAY

MATERIALS MANAGEMENT DIVISION

Powai, Mumbai - 400076

Technical Specifications :

Integrated Argon ion Miller and sputter deposition system

Main chamber specifications:

- 16 inch spherical chamber made out of Electro-polished 304L Stainless Steel
- One CF 150 (or whatever size is appropriate) port for ion source for Argon ion milling
- 3 CF 100 ports for mounting 3 sputtering sources
- One CF 160 port for mounting gate valve.
- One CF 16 port for a manual vent valve
- 2 CF 35 ports, one for roughing and backing of chamber, and one for mounting a combination pressure gauge
- One CF 63 port for mounting load lock chamber & isolation valve.
- One CF 35 view port must be provided
- Main chamber should be able to achieve a vacuum of at least 5×10^{-7} mbar after pumping with a 600lps turbo pump.
- Silicone rubber heating tape (width 1 inch) with appropriate length which will enable wrapping the entire chamber upto the flange for turbo pump should be provided. This tape should have a minimum heating temperature of 150°C and have a timer fitted to it.
- All gas line piping should be of stainless steel.
- 1 blank CF150 flange and 3 blank CF100 flanges must be provided
- 5 spares each of CF150, CF100, CF63 and CF35 gaskets must be provided.
- Gas inlet needle valves to chamber should be VCR type.

Substrate holder:

- Water cooled substrate holder to hold 4 substrates of 2 cm each mounted on each of the faces of a cuboid holder.
- The holder should be such that a rotation mechanism should be designed that enables it to be rotated to positions where each of the 4 substrates are in line of either the magnetrons or the Argon ion source.

Magnetron sputter sources

- One of the sputter Sources should be UHV Compatible and should be fitted to rectangular targets with size - 35.5×55.5 mm, and must be suitable for DC sputtering only. No elastomer sealing should be used in this source. Suitable clamping mechanism should be provided for rectangular targets.
- Length of the DC magnetron source should be such that the source to substrate distance should be approximately 4cm or less.
- SmCo magnets 250° bakeable (enclosed in welded assemblies) should be used in the magnetrons.
- 2nd sputter source must be of circular type, compatible for both RF and DC sputtering. It should preferably be UHV compatible. It must be able to accommodate target thicknesses of at least up to 6.4mm

- There must be a mechanism for Water cooling of sputter sources where water will not be in direct contact with the magnets.
- Suitable O-ring sealed manually operated source shutter must be provided.

Argon ion Gun:

- Water cooled 150CF flange mounted Ar ion gun for using in the above vacuum chamber.
- Argon ion gun should be water cooled, must be inductively coupled type, and powered using RF Generator of 600 W with auto matching network.
- Beam energy must be controllable up to at least 1200 eV.
- Beam current must be controllable from approximately 5 mA upto at approximately 50 mA.
- There must be beam uniformity at least over an area of 1.5inch diameter.
- Housing of gun should be made of stainless steel, and discharge chamber should have high quality ceramics.
- It must have a 2 grid extraction system with suitable grid material (Graphite/Molybdenum) for Argon gas supplied through the source.
- Gun should have a solenoid operated shutoff valve for burst pressure control for the ion source.
- One fine control needle valve must be fixed to solenoid valve for gas entry to the ion source.
- Length of gun should be such that the gun to substrate distance is between 75mm to 100mm.
- Suitable O-ring sealed manually operated source shutter must be provided.
- Gas inlet needle valves to ion gun should be VCR type.
- A set of spare grids for the Ar ion milling gun must be provided

Power sources for ion gun specifications:

- An RF power supply, maximum power of at least 600 Watts (make either RFVII, Seren), with an auto matching network and operating frequency of 13.56MHz, must be supplied with the system.
- Accelerator and Negative DC power supplies will be provided by the user

Load lock chamber:

- Preferably a cuboid shaped chamber with approximate dimensions of 200mm X 200mm X 200 mm
- This must be fitted to a CF63 port and mounted onto a Gate valve. Gate valve will be provided by the user.
- 1 CF 150 (or whatever appropriate size) quick access door for loading/unloading substrate
- Load lock chamber should have a manual venting valve.
- A Rotary pump, capacity of at least 8m³/hr must be provided in order to enable ultimate vacuum up to 2 X 10⁻² mbar in load lock chamber.
- It must come with a substrate locating arm to locate water cooled cuboid substrate holder in load lock chamber during loading and unloading of substrate and to locate water cooled cuboid substrate holder below the respective magnetron or ion source during process.
- It must have a CF16 port for mounting a Pirani gauge.

Other requirements:

- System should be mounted on either a table or a metallic frame and table/frame fitted with caster wheels with locking function in order to ensure easy mobility.
- A PLC HMI for vacuum gauge display (1 combination gauge and 2 pirani gauges) and start/stop of rotary pump and turbo pump and roughing, backing and vent valves and for actuating the shut off valve for ion source must be provided

- Backing line for turbo must have a KF16 port for mounting Pirani Gauge.
- All gas line piping must be of stainless steel.

The following will be provided by the user to the vendor for assembly:

- 600 lps (or higher capacity) turbo pump
- 18m³/hr (or higher capacity) rotary pump
- A combination gauge pressure measurement from atmospheric to UHV pressures
- 2 Pirani gauges
- One CF160 and a CF63 gate valve
- A Positive DC power supply of 1200 W
- A negative DC power supply of 500W