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Specifications for a multi-target removable flange fitted UHV sputtering system

Deposition chamber specifications:

- System design should be such that it should reach a base pressure of 5×10^{-9} mbar after bake out with heating tapes, and without using liquid nitrogen.
- System should have an inner and outer chamber (triple walled) with a liquid nitrogen jacket in between.
- Chamber material should be electro polished Stainless Steel 304L Nonmagnetic. Recommended approximate outer chamber diameter is 320mm.
- Flange with OFHC copper gasket sealing on the top of the chamber to accommodate Sputter Sources, Substrate holder & rotation assembly.
- 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.
- Must have valves for Gas inlet through two parallel connections; one via Right Angle Valve and another via an all metal variable leak valve, both connected to gas mix chamber (more details in specifications for Gas Mix chamber)
- An all metal valve should provide isolation between inner and outer chambers, and pumping path will be from inner chamber to outer chamber to turbo pump. (Turbo pump of 1000 l/s capacity along with relevant gate valve will be provided to the vendor for assembly)
- DN200CF flange to be provided on the side walls for fitting turbo pump with appropriate connecting pipes. The connecting pipe (possibly elbow connector or something equivalent) should have the provision for the following:
 - One DN40CF port for full range gauge.
 - One DN16CF port for connecting to a Baratron/Baratron compatible gauge for precise measurement of chamber pressure.

- Alternatively, these ports can also be fitted to the outer chamber. All gauges and required valves for fitting gauges, will be provided to the vendor for assembly
- One DN40CF port should be provided on side wall along with an all metal valve for rotary pumpingsystem. (Rotary/dry scroll will be provided to the vendor for assembly)
- A butterfly valve to be provided for backing the turbo pump.
- Backing line must have a DN16CF port for Pirani Gauge.
- DN63CF for titanium sublimation pump. (TSP will be provided to the vendor for assembly)
- DN40CF port for fitting Residual Gas analyser (RGA will be provided to the vendor for assembly)
- Four additional blank ports (Three DN40CF and one DN63CF) must be provided.
- One DN200CF blank flange for keeping the chamber in vacuum at all times when system is in idle mode.

Magnetron cluster assembly:

- 6 magnetrons to be fitted into a DN200CF flange preferably using DN16CF flanges.
- The flange should have lifting handles to enable lifting by single person. The lifting handles should be fitted with two DN16CF viewports. (UHV Viewports will be provided to the vendor for assembly).
- All Magnetron Sputter Sources should be UHV Compatible and should be fitted to rectangular targets with size-35.5 x 55.5 mm, and must be suitable for DC sputtering.
- All magnetrons should be separated by contamination shields and no elastomer sealing should be used.
- Magnetrons must have water cooling of sputter source where water is not in direct contact with the Magnets. All magnetrons must have interconnecting water pipes.
- SmCo magnets 250° bakeable (enclosed in welded assemblies) should be used in the magnetrons.
- Suitable clamping mechanism should be provided for rectangular targets.
- Should have a stainless steel plate of 6 inches' diameter capable of holding maximum up to 1"x1" or smaller substrates supported at the center from the top flange through bellows-sealed UHVcompatible motorized rotary motion drive.

- Substrate holder table should be rotatable by 360 degrees by a precision stepper motor which can be computer controlled. The program for controlling the motor must be provided.
- Substrate holder will have motorized rotation up to 5 rpm. Rotation rate must be controllable from at least 0.05 RPM to 5 RPM.
- Suitable mask (with opening of at least 10 mm) should be provided below each magnetron and above the rotating substrate plate to confine the deposition flux to a limited area of rotating table.
- Two wooden/iron/aluminium frames should be provided by vendor for holding the 6 magnetron fitted flange when it is not in use.

Gas mix chamber specifications:

- A 5-10 litre electro-polished stainless steel 304L gas mixing chamber fitted with a Baratron/Baratron compatible gauge for accurately measuring pressure upto 100 Pascals. (gauge will be provided to the vendor for assembly)
- Must have two parallel connections from the mixing chamber to the outer vacuum chamber.
 - One through an all metal DN40CF Right Angle Valve connecting straight to the outer chamber
 - The other through an all metal variable leak valve having both inlets and outlets as DN40CF flanges.
 - Both valves will be provided to the vendor for assembly
- Chamber must have connection to roughing pump through an all metal right angle DN40CF valve.

Gas Delivery system:

- Three ¼ inch diameter stainless steel (SS) pipes as gas input lines from 3 separate gas cylinders, connected to cylinders by means of a ferrule connection and appropriate gas regulators (make GCE druva).
- Each SS pipe must have a liquid nitrogen cold trap wrapping it, in order to purify the gasses passing through it into the gas mixing chamber.
 - Liquid nitrogen will be poured manually into the traps as and when required
- Each SS pipe must individually lead to a DN16CF all metal right angle valve, which will help in starting or stopping the flow of each individual gas into the gas mix chamber.

- Ahead of the three all metal DN16CF all metal valves, there should be another port for a DN16CF all metal right angle master (or safety) valve that will control the flow of all gasses into the gas mix chamber
- Around the master/safety valve, there should be a port another all metal DN16CF right angle valve that leads to a Baratron/compatible to Baratron gauge for accurate readings of pressure in the gas mix chamber.

(all valves and gauges, except the regulators, mentioned in this section will be provided to the vendor for assembly)

Other requirements:

- All relevant gaskets must be made of OFHC copper and should be able to withstand minimum baking temperatures of 150 degrees centigrade.
- Following numbers of spare copper gaskets of the mentioned sizes should be provided:
CF200 – 100
CF63 – 10
CF40 – 10
CF16 – 10
- All necessary nuts, bolts and fasteners should be provided, along with a set of spares.
- A PLC controller with display panels for Pirani Gauge, Combination Gauge, 2 Capacitance gauges (Baratron compatible) and turbo pump must be provided.
- An aluminium frame should be provided to mount the vacuum chamber and it should have castor wheels for mobility.
- Assembly of all items mentioned above must be done by vendor.