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Department of Electrical Engineering  
**Indian Institute of Technology, Madras**  
 I.I.T.P.O., MADRAS – 600 036.

Ref. No.

ELE	DEBD	2019	Thermal Evaporation System
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Date: 01.05.2019

Due Date: 22.05.2019

Under Certificate of posting

To:

Dear Sirs,

1. Quotations are invited in duplicate for the various items shown below/overleaf/enclosed list.
2. The Quotations duly sealed and superscribed on the envelope with the reference no. and due date, should be addressed to the undersigned so as to reach him on or before the due date stipulated above.
3. The Quotations should be valid for sixty days from the due date and period of delivery required should also be clearly indicated.
4. If the item is under DGS & D Rate contract, Rate Contract Number and the price must be mentioned. It may also please be indicated whether the supply can be made direct to us at the Rate Contract price. If so, please send copy of the R.C. (Please note that we are not Direct Demanding Officers).
5. Relevant literature pertaining to the items quoted with full specifications (and drawing, if any) should be sent along with the Quotations, wherever applicable.
6. Local Firms: Quotations should be for free delivery to this Institute. If Quotations are for Ex-Godown, delivery charges should be indicated separately.
7. Firms outside Chennai: Quotations should be F.O.R Chennai. If F.O.R consignor station, freight charge by passenger train / lorry transport must be indicated. If Ex-Godown, packing, forwarding and freight charges must be indicated.
8. The rate of Sales / General Taxes and the percentage of such other taxes legally leviable and intended to be claimed should be distinctly shown along with the price quoted. Where this is not done, claim for Sales / General Taxes will be admitted at any stage and on any ground whatsoever. The taxes leviable should take into consideration that we are entitled to have Concessional Sales Tax applicable to non-Government Educational Institutions run with no profit motive for which a commission Sales Tax certificates will be issued at the time of final settlement of the bill.
9. Goods should be supplied carriage paid and insured.
10. Goods shall not be supplied without an official supply order.
11. Payment: Every attempt will be made to make payment within 30 days from the date of receipt of bill / acceptance of goods, whichever is later.

**Specifications enclosed and quotation to be sent to the below address:**

**Dr. Debdutta Ray**  
**Assistant Professor,**  
**Department of Electrical Engineering,**  
**Indian Institute of Technology, Madras,**  
**Chennai – 600 036.**

Yours faithfully,

HEAD / Project Co-Ordinator

**Functional thin film co-evaporation system with custom designed load-lock with the following specifications (Note: Turbo molecular pump (TMP) with Electropneumatic gate valve, Backing pump, Integrated Cold Cathode and Pirani Gauge (1 No.) will be provided by IIT Madras):**

Sl. No.	ITEM	SPECIFICATIONS/FEATURES
1	Vacuum chamber with necessary ports required for Pumping, evaporation sources, Gas Inlet, Vent, gauge, feed through, view port, load lock and port for substrate holder etc.	<ul style="list-style-type: none"> <li>• Made out of non-magnetic SS grade powder coated, AISI-304L Cylindrical shaped chamber having maximum dimensions 300mm (Ø) X 400mm (H).</li> <li>• One high vacuum compatible, toughened glass view port (150mm diameter for the glass).</li> <li>• Two numbers of side ports (inner diameter 50mm).</li> <li>• One set of thin stainless-steel sheet liner to prevent the deposition on the chamber wall.</li> <li>• Chamber must be provided with ports to connect turbo pump, gate valve (DN 100 CF-F), rotary pump and gauges.</li> <li>• Chamber must also be provided with ports for evacuation, vacuum measuring gauge heads, gas feeding valves etc.</li> <li>• Chamber base plate must be provided with necessary required feed through ports for mounting, shutters etc.</li> <li>• Eight (8) material evaporation sources with individual shutters, out of which at least two (2) must have temperature controllability of <math>\pm 0.1^{\circ}\text{C}</math>.</li> <li>• Top cover and chamber must have slots for alignment.</li> <li>• Pressure <math>&lt; 5 \times 10^{-7}</math> mbar (should be demonstrated)</li> <li>• Bottom plate must be provided with electrical feed throughs with white LED lighting.</li> </ul>
2	Substrate holder	<ul style="list-style-type: none"> <li>• Substrate holder is a rectangular box having 48mm L, 40mm W and 12mm H, which can hold two (2) substrates of 1"X0.5" dimension with the separation of not more than 2mm .</li> <li>• It has two slots of 27mm L, 14mm W and 0.5mm depth, in which samples are placed.</li> <li>• It also has the provision to screw a pull rod having 8mm Ø and 1000mm L on one end. The rod and substrate holder assembly should be levelled inside and outside of the chamber.</li> <li>• There must be provision to fix the position of the rod such that low pressure conditions cannot alter the position of the substrate holder once it is set at one position.</li> <li>• Substrates are held by using a top cover, which is a 48mmX40mm stainless steel plate having a rectangular hole of 32mmX21mm on it, which is screwed on the substrate holder at its four corners.</li> </ul>



		<ul style="list-style-type: none"> <li>• Top cover has a rail on it, through which the stainless-steel mask-plate of 1 mm thickness can be moved.</li> <li>• The whole substrate holder assembly has to be rotated by 180 degrees before starting deposition such that mask plate can hide/expose the substrates.</li> <li>• Top cover must not occupy more than 1mm space in between mask and substrate.</li> <li>• Distance between any of the sources and the substrate holder is 300 mm.</li> <li>• Facility to heat the substrates to 150°C.</li> </ul>
3	Mask plate and mask mover rod	<ul style="list-style-type: none"> <li>• Mask plate is a stainless-steel plate having 1mm thickness, 100mm L and 27mm W (Length includes a T-shaped extension for locking to the mask mover).</li> <li>• Mask is moved with respect to the substrate holder by using a rod (mask mover) having 8mm Ø and 250mm length. Mask mover rod should be levelled inside and outside of the chamber.</li> <li>• Mask mover comes from one side port (opposite to the one from which substrate and mask come in). This side port must have a 50mm cylindrical extension (with 10mm Inner Ø) having two vacuum seals on both ends to provide additional support for rod.</li> <li>• Mask mover has a locking system on its tip which can lock it with the mask attached to the top cover of the substrate holder and this tip is always inside the chamber.</li> <li>• There must be provision to fix the position of the rod such that low pressure conditions cannot alter the position of the substrate holder once it is set at one position.</li> </ul>
4	Chamber Gadgetry	
(a)	Wires for source heating	<ul style="list-style-type: none"> <li>• Eight (8) LT evaporation sources (boats) out of which at least two (2) has to be specially designed to have temperature controllability of <math>\pm 0.1^\circ\text{C}</math> which can be operated from 50°C to 600°C.</li> <li>• These special sources must lie opposite to each other.</li> <li>• These sources must be able to hold minimum 1 cc powdered material.</li> <li>• The sources must have the control over the stability in the deposition rate in the range 0.2 to 5.0 Å/sec at a distance of 300 mm.</li> <li>• Apart from the two (2) special sources, others are made out of electrolytic pure copper having 200Amps current carrying capacity.</li> <li>• The temperature controllers should have the flexibility to connect with any of the desired sources.</li> </ul>

(b)	Chamber gadgetry on the bottom plate	<ul style="list-style-type: none"> <li>Stainless steel mesh filter covering the pumping port to protect the turbo molecular pump from entry of unwanted particles.</li> <li>A dummy plate made out of SS is mounted above the mesh filter &amp; fixed to the base plate using three/four pillars.</li> </ul>
5	Vacuum system	
(a)	Gate valve (1 No.)	<ul style="list-style-type: none"> <li>Manual (50mm Inner Ø) gate valve (used with load lock) (1No.).</li> </ul>
(b)	Plumbing lines	<ul style="list-style-type: none"> <li>Made of SS304L material of 1" NB.</li> </ul>
(c)	Pirani gauge	<ul style="list-style-type: none"> <li>1 Pirani sensor.</li> <li>Measuring range from <math>10^3</math> mbar to <math>10^{-3}</math> mbar with display of pressure.</li> </ul>
6	Digital Thickness Monitor (3 No.)	<ul style="list-style-type: none"> <li>3 display units for rate and thickness monitoring.</li> <li>5 crystals with holders and feedthroughs. <ul style="list-style-type: none"> <li>Two (2) crystals near to the each specially designed sources.</li> <li>Two (2) crystals for other sources placed on opposite walls.</li> <li>One (1) crystal near the substrate holder</li> </ul> </li> <li>Rate Display: 3 Digit LED Auto Ranging from 0.00 to 999 Å/sec .</li> <li>Thickness Display: 4-digit LED display.</li> <li>Crystal Frequency: 6 MHz.</li> <li>Film Density: 0.800 to 99.99 gm/cc.</li> </ul>
7	Load lock	<ul style="list-style-type: none"> <li>Cylindrical shaped.</li> <li>50mm (Inner Ø) x 150mm (L).</li> <li>Opened on one end (standard KF 50 port mouth) and on other end attached to a movable rod (substrate pull rod through vacuum seal). Movement should be leak-free and should withstand high vacuum. Rod diameter: 8mm. Length: 1000mm</li> <li>Must have a 100mm cylindrical extension for the load lock (with 10mm Inner Ø) having two vacuum seals on both ends which provides additional support for rod.</li> <li>The substrate pull rod must have an extension having square cross section (4mm) and length 8mm with a 2mm screw hole on it. This portion is always inside the load lock and is for connecting to the substrate holder.</li> </ul>
8	Utilities	<ul style="list-style-type: none"> <li>Details should be provided in the offer for facilities and utilities such as space, power supply, gases, etc. for system operation.</li> </ul>
9	Drawings, Manuals and user training	<ul style="list-style-type: none"> <li>Necessary electrical drawings and manuals (Hard &amp; soft copy) to be given after installation and acceptance of equipment.</li> <li>Training of the system should be given to the IIT Madras personnel.</li> </ul>

10	Associated Accessories and parts should be supplied with the system	<ul style="list-style-type: none"> <li>Spares (1sets of O-rings and gasket, Tungsten Helical (1 pack), Tungsten Basket-(1 pack), Molybdenum boats- 2 No's, crystals for film thickness monitor-10 No's and Alumina crucible- 3No's.</li> </ul>
11	Installation, and Commissioning:	<ul style="list-style-type: none"> <li>Installation, complete interfacing of the system with its subsystems, and commissioning is to be carried out by the vendor's factory-trained engineers, followed by a demonstration of the system's performance at IIT Madras.</li> </ul>
12	Warranty	<ul style="list-style-type: none"> <li>36 months from the date of commissioning and acceptance of equipment for workmanship.</li> </ul>

Optional:

1. Full colour touch screen PLC based HMI.
2. Process control: PC/PLC based process automation with GUI for recipe control, data logging and remote support.
3. Alternative way to access the sources without opening the top-plate of the chamber.

Important Notes:

1. Please provide complete drawing of the system along with utilities connection and range. We may reject the tender if a proper drawing is not provided OR if the outlay/design proposed is not found satisfactory.
2. Please provide photographs, drawings and technical specifications of the specially designed temperature-controllable sources.
3. TMP with pumping speeds more than 350 l/s, 1 Integrated Cold Cathode and Pirani Gauge, 1 backing pump will be provided by the institute and should be integrated by the vacuum evaporation system supplier to demonstrate pressure of  $< 5 \times 10^{-7}$  mbar .
4. Please provide at least 3 references of laboratories (in India) where you have installed similar systems with full specification of the systems. We may reject the tender if we find the reference systems unsatisfactory.
5. Please provide details of after sales service. The supplier should have service centre or facility with complete infrastructure in India to handle major repair of the system. Critical spares should be available off the shelf in Indian offices. In case of a break down, maintenance and replacement of parts should be possible at purchaser's site. We may reject the quote if the after-sales service details or feedback from previous purchasers are found unsatisfactory.
6. Please provide separate technical and financial bids in sealed envelopes.
7. Please mark tender number on top of the cover envelope.
8. Provide list of mandatory and optional spares along with wear & tear consumables list.