

## **Tender Notification to procure a new Ion Milling System for TEM Sample Preparation**

**(Last Date -28<sup>th</sup> September 2018)**

**Kindly Send the Quotation for the following Item :**

The Department of Materials Engineering, the Indian Institute of Science desires to acquire a new Ion Milling system for TEM Sample Preparation The detailed specifications are given below.

### **SPECIFICATION FOR ION MILLING SYSTEM FOR TEM SAMPLE PREPARATION**

The ion-beam thinning equipment should be a capable of preparing transmission electron microscopy specimens (3 mm diameter) containing large electron transparent regions of both conducting and non-conducting semiconductor samples and should not induce artifacts during the specimen preparation. The quoted system should consist of followings.

### **ION BEAM MILLING SYSTEM**

<b>S. No.</b>	<b>Item</b>	<b>Description</b>
<b>1.</b>	Ion-guns	<ul style="list-style-type: none"><li>• Two ion guns each with independently adjustable gas control utilizing mass flow controllers to permit either rapid milling or slow precise ion polishing.</li><li>• Ion beam energy shall be continuously adjustable from 100eV to 8keV.</li><li>• The alignment of the ion beams should be user friendly with either a fluorescent screen or a suitable mechanism. Also a mechanism is to be provided to measure the ion beam currents/operating voltage.</li><li>• Ion gun should produce narrow ion beam width at the sample (FWHM at the sample should be around 600-800<math>\mu</math>m throughout the energy range). Data supporting that should be included in the bid.</li><li>• The milling angle shall be continuously variable from +10° to -10° and fully adjustable during operation.</li><li>• Custom recipe design shall be standard and be able to automatically drive the motors. This feature should be offered as optional items.</li><li>• Independently measurable current on each gun and should be variable from 0 to 100 micro Amps.</li><li>• Operational Mode for preparing cross sectional samples for TEM analysis should be offered as standard.</li></ul>

		<ul style="list-style-type: none"> <li>•</li> </ul>
2.	Specimen Stage	<ul style="list-style-type: none"> <li>• A specimen exchange mechanism shall be incorporated in the system to permit loading or unloading of samples without venting the work chamber to atmosphere. Specimen stage should allow rapid transfer of specimens (It should take less than 1 minute for loading or unloading a sample ).</li> <li>• The Specimen stage should have provision for the rotation of the specimens during milling. Rotational speed shall be continuously variable from 0 – 5 rpm or more.</li> <li>• Provision of a mechanism for Sector milling (i.e. milling the specimens from only one side or any side) over a range of 30 to 90 degrees should be available. The mechanism should permit the preparation of cross-sectional TEM specimens of multilayer's without significant milling of the glue-line (or bonding layer used to prepare cross-sections).</li> <li>• The Stage shall incorporate in-situ X &amp; Y motion to assist the user in positioning the specified mill location at the center of the beam polishing area. The minimum stage travel shall be ~ +/-0.5 mm (i.e. ~ 1mm in total) in X and Y directions. Please note that it should be possible to load the sample in the mill &amp; then use the optical microscope for X &amp; Y Alignment.</li> </ul>
3.	Sample holder	<ul style="list-style-type: none"> <li>• The specimen holder should be able to hold 3 mm diameter TEM specimens by either clamping mechanism or sticking mechanism. For loading unloading of the sample in specimen holders, suitable user-friendly mechanism should be provided.</li> <li>• Specimen heating: A glue-type specimen holder shall be supplied to optimize heat dissipation.</li> <li>• The holder should have long life time and durability. They should be compatible for cooling the TEM specimens with liquid nitrogen during the ion milling.</li> </ul>
4.	Cold stage	<ul style="list-style-type: none"> <li>• Cold stage shall offered as standard as per the following specifications: <ul style="list-style-type: none"> <li>○ 6-8 hour Dewar capacity</li> <li>○ Sample temperature: -It should be able to maintain the specimen at any user defined temperature in the range of minus 160 °C to Room Temperature, during ion milling. A mechanism to measure the relevant temperature should be provided. The cooling/warm-up</li> </ul> </li> </ul>

		<p>of the specimen's should be done rapidly (~30-45 minutes) and in-built mechanism for this operation should be provided.</p> <ul style="list-style-type: none"> <li>○ Electronic temperature regulation: minimum range (-180°C to +100°C)</li> <li>○ Through transmission illumination of sample</li> <li>● Built in Dewar heater</li> </ul>
5.	Specimen Viewing	<ul style="list-style-type: none"> <li>● In-situ viewing: It should be possible to view the sample any time without shutting down the ion guns or raising the sample into the airlock.</li> <li>● Shutter: An automatic shutter shall be incorporated to reduce window contamination when not viewing the specimen.</li> <li>● Sample illumination: Reflection and through transmission with the intensity set via the Touch Screen.</li> <li>● A Stereo binocular microscope with 40X &amp; 80X magnification should be offered as standard along with the equipment.</li> <li>● Remote Access to PIPS-II should be possible using network connectivity</li> </ul>
4.	Milling Termination	<ul style="list-style-type: none"> <li>● Milling termination by elapsed timer or optional light operated Auto-Terminator.</li> </ul>
5.	User Interface	<ul style="list-style-type: none"> <li>● A ~10" color touch-screen graphical user interface (GUI) should be supplied as standard. All system functions (gun settings, gas flow controls, stage movements, etc.) shall be optionally controlled through this screen.</li> <li>● Although not mandatory, the users should be able to set up recipes &amp; design his / her own recipes for their samples &amp; store it for easy re-call. This facility is most desirable. .</li> </ul>
6.	Vacuum System and vacuum reading	<ul style="list-style-type: none"> <li>● The vacuum system shall be totally self-contained within the enclosure.</li> <li>● A totally oil-free vacuum system, pumping with turbo pump and oil free backing pump</li> <li>● Work chamber base pressure: ~1E -6 Torr</li> <li>● Operating pressure: ~1E -5 Torr.</li> <li>● Suitable gauges to monitor the vacuum levels in main chamber and baking pump.</li> <li>● Vacuum gauge should be present in the chamber area to read the vacuum in the specimen preparation area</li> <li>● Sample exchange through air lock</li> </ul>
7.	Cooling	<ul style="list-style-type: none"> <li>● Preferably air cooled system .</li> </ul>

8.	Documentation	<ul style="list-style-type: none"> <li>The detailed user instruction manual, operation/instruction manual, trouble shooting and maintenance manual and writing diagrams in English should be supplied free of cost along the system</li> </ul>
10.	Mandatory Accessories	List of Consumables Sample Holder Glue Type (3mm Sample) ----- 1 Nos Sample Holder Clamp Type (3mm Sample) --- 3 Nos Sample Holder for single side milling (set of 3 or more) --- 1 No Appropriate lubricant for cold stage, 1 gm or more ---- 1 No Seal for Cold stage ----- 1 No Cold Stage Window (pkg. of 8 or more) ----- 1 No
12.	Spares/ consumables	<ul style="list-style-type: none"> <li>Provide a list of spares/consumables for the uninterrupted operation of the equipment for the period of five years. Also, provide a separate quotation for these items.</li> </ul> List of Additional Spares Complete Service Kit Spare turbo molecular pump oil cartridge Port Window, Quartz Cold cathode gauge maintenance kit Anode insulator Anode Precision Point Tweezers Diaphragm pump Repair kit

**Special conditions**

**A point by point answer of the above specifications is needed. The vendor is encouraged to quote as optional any other items that will enhance the capability of the mill. The committee in its judgment reserved right to allow small deviations in specification in case it is convinced that technically the mill will perform as well.**

### **Other Terms and Condition**

1. Vendor will be required to demonstrate the operation of the equipment by preparing customer sample. Start up assistance and training on sample preparation has to be provided on-site for user scientists & students.
2. Warranty of 12 month from the date of acceptance for all the above items
3. Power Supply – 230 V, 50 Hz single phase
4. The Supplier should be able to provide after-sales support on site for at least five years by the factory trained engineers. Provide the address in India where after sales support can be provided during the next five years. Also, the supplier should provide uninterrupted supply of spares and accessories for a period of 10 years after warranty.
5. Operating and maintenance manual, wiring diagrams, spare part list as applicable for all above item to be provided separately.
6. The supplier should have the experience of setting up at least Ten numbers of such operational TEM Ion Milling Equipment Facilities in India. This is an essential requirement. Please provide evidence in the technical bid.
7. A two part sealed quotations covering technical details and financial bid need to be submitted.
8. In the technical bid, individual compliance statement for all the items mentioned in the specifications (1-12) must be provided. In case compliance is not there please mention clearly.
9. Vendor can provide reasons and justification for not compliance for the technical committee to consider. However, final decision of the technical committee will be final.
10. Once technical committee short list the tenders on technical ground, the financial bids only of the shortlisted ones will be opened by the purchase committee.

Both the Technical and Commercial bid addressed to  
Chairman,

Department of Materials Engineering  
Indian Institute of Science Bangalore-560012

should be put in separate sealed envelopes and both the envelopes should be put in another cover superscribing the “ quotation ION MILLING SYSTEM FOR TEM SAMPLE PREPARATION for and should reach

Prof. Subodh Kumar  
Department of Materials Engineering  
Indian Institute of Science Bangalore-560012  
on or before September 28, 2018 (before 5.00 PM)