

December 31, 2018

To Whom It May Concern

Limited Tender for a Ion Milling system for TEM Sample Preparation at CeNSE, IISc.

This is an RFQ (Request for Quote) for procurement of a Ion Milling system for TEM sample preparation as part of an open tender for the Centre for Nano Science and Engineering (CeNSE) at IISc, Bangalore.

CeNSE is a multidisciplinary research department at IISc that houses a 14,000 sq. ft. cleanroom and characterization facility used by 50 faculty members from various disciplines at IISc. CeNSE also a user-facility which has hosted over 6000 participants from more than 700 universities and institutes all over the world. Consequently, any tool in CeNSE receives significant exposure to scientific community in India and beyond. The vendors are requested to factor in the value of this exposure in to their quotes.

Being a user-facility puts additional technical burden on the tool. We need a tool that can tolerate heavy usage (at least 50 hours/week), has a high uptime, can be serviced and maintained for the foreseeable future (at least 5 years), and has a track record of reliability at comparable facilities in India and abroad.

Details of existing facilities and the user program can be gleaned from:

<http://nnfc.cense.iisc.ac.in/>

<http://www.mncf.cense.iisc.ac.in/>

<https://www.inup.cense.iisc.ac.in/>

Procedure

1. Vendors will be required to submit a technical proposal and a commercial proposal in **two separate sealed envelopes**. Quotes in violation of this will be rejected.
2. **The deadline for submission of proposals is the 15th of January 2019, 5:30 pm Indian Standard Time.** Proposals should arrive at the Main office, GF-15, Centre for Nano Science and Engineering, Indian Institute of Science, Bangalore 560012, India, by the above deadline.
3. The decision of the purchase committee is final.
4. The technical proposal should contain
 - a. Relevant technical datasheets. The committee reserves the right to cross-check the information in these datasheets with publicly available information.
 - b. A compliance table with 5 columns. The first column must list the technical requirement, in the order that they are given in the technical configuration below. The second column should describe the capability of the tool for that specific requirement. In case the technical requirement is a question, second column must provide a technical answer. Please be quantitative and consistent with the technical datasheets. Third column must specify whether the technical requirement is met with a "Yes", "No", or "Partially". If the response is "Partially" or "No" the third column, the fourth column must explain the extent of the deviation and, if possible, the reasons for the deviation. The fifth column is for other "Remarks". You can use it to compare your tool with that of your competitors or provide more details/justifications.
 - c. Technical capabilities of any *suggested* accessories/add-ons that may enhance the usability, capability, accuracy or reliability of the tool. Vendors are encouraged to quote for as many add-ons as their tool portfolio permits.

- d. Any additional capabilities or technical details that you would like to bring to the attention of the purchase committee. Vendors are encouraged to highlight the advantages of their tools over comparable tools from the competitors
5. The technical proposal will be evaluated against the technical requirement. Only vendors who meet the technical requirement will be considered for the commercial negotiation.
6. If multiple systems fulfill the requirements, vendors can offer multiple bids.
7. The commercial bid must contain:
 - a. Itemized cost of the system and *required* accessories, such as software, power supply, etc.
 - b. itemized cost, as an option, for any *suggested* accessories/add-ons that may enhance the usability, capability, accuracy or reliability of the tool. Vendors are encouraged to quote for as many add-ons as their tool portfolio permits.
 - c. The quotes should be CIF Bangalore, India. So please include cost of shipping to Bangalore. The quote does not need to account for Customs duties.
 - d. Please indicate the warranty provided with the tool. Warrant of 3 years of more is preferred.
 - e. Provide itemized cost for *required/expected* spares for 3 years of operation. For sake of this calculation, the vendor may assume active tool usage of 50 hours/week. This number will be used to estimate the life cycle cost of the tool.
 - f. The cost of annual maintenance contract. The details of AMC are given below. This number will be used to estimate the life cycle cost of the tool.
 - g. Length of time that the tools will be supported with service and spares from the date of installation. Our requirement is that the tools be supported for at least 5 years from the date of installation. To quote lowest price, vendors often quote for obsolete or soon-to-be obsolete equipment. This is NOT acceptable. For a user-facility like CeNSE, it is vital that the equipment be serviceable and supported for the foreseeable future. The length of guaranteed support will be used to estimate the life-cycles cost of the tool.
8. As an additional option, provide cost of an annual maintenance contract (AMC) for 3 years, post warranty. The AMC must
 - a. cover 1 scheduled and 1 emergency visit per year;
 - b. The emergency visit should be supported with a 48-hour response window.
 - c. clarify if maintenance will be done by a trained local (within India) engineer or a specialist from the OEM.
 - d. include an itemized list of spares (e.g. maintenance kits) that are essential for scheduled visits;
9. The commercial bids will be evaluated based on life-cycle cost of the tool. This includes the cost of purchase, maintenance, spares, etc.
10. The RFQ must include references of 3 previous installations, preferably in India. Please provide the names and contact addresses of the referees, so that the committee can contact them independently.
11. We encourage vendors to give technical presentations, physically or over Skype, so that we can better understand the technical capabilities of their tools and vendors can better understand the requirements. To schedule the presentations, the vendors can contact Dr. Suresha S J, GF-12, Centre for Nano Science and Engineering, Indian Institute of Science, Bangalore 560012, India. (sureshasj@iisc.ac.in).
Any technical questions can be directed to Dr. Suresha S J, GF-12, Centre for Nano Science and Engineering, Indian Institute of Science, Bangalore 560012, India. (sureshasj@iisc.ac.in).

Technical Requirements

1.	Primary application	The ion-beam thinning equipment should be capable of preparing transmission electron microscopy specimens (3 mm diameter) of both conducting and non-conducting semiconductor samples, such as Gallium Nitride, Gallium Arsenide, Silicon Carbide, Sapphire, Silicon, ceramics, multi-phase metals and composites etc. It should not induce artifacts in the specimen preparation. Also, it should result in large electron transparent regions for viewing in a TEM; both conventional and high resolution TEM modes. The construction and operation of the equipment should be user-friendly.
2.	Ion guns	<ul style="list-style-type: none"> • Two ion guns each with independently adjustable gas control utilizing mass flow controllers to permit either rapid milling or slow precise ion polishing. • Ion beam energy shall be continuously adjustable from 100eV to 8 keV or more. • 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. • Ion gun should produce narrow ion beam width at the sample (FWHM at the sample should be between 600-800µm throughout the energy range). Data supporting that should be included in the bid. • The milling angle shall be continuously variable from +10° to -10° or more and fully adjustable during operation. • Independently measurable current on each gun and should be variable from 0 to 100 micro Amps. • Operational Mode for preparing cross sectional samples for TEM analysis should be offered as standard.
3.	Specimen Stage	<ul style="list-style-type: none"> • 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 (~3-5minutes). • 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. • 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). • The Stage shall incorporate X, 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) or less in X and Y directions. Please note that it should be possible to load the sample

		in ion milling system & then use the CCD camera for X & Y Alignment while the sample is mounted in the chamber of the Ion milling system.
4.	Sample holder	<ul style="list-style-type: none"> • 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. Also they can be rapidly and easily transferred in to the ion beam thinning equipment. • Sample holder material options should include at minimum: graphite, molybdenum, and copper. • Specimen heating: A glue-type specimen holder shall be supplied to optimize heat dissipation. • The holder should have long lifetime and durability. They should be compatible for cooling the TEM specimens with liquid nitrogen during the ion milling.
5.	Cold Stage	<ul style="list-style-type: none"> • Cold stage shall offered as standard as per the following specifications: • 6-8 hour Dewar capacity • Sample temperature: -The specimen can be kept in user-defined temperature in the range of -160 °C to Room Temperature, during milling. A mechanism to measure the relevant temperature should be provided. The cooling/warm-up of the specimen's should be done rapidly (~30-45 minutes) and in-built mechanism for this operation should be provided. • Through transmission illumination of sample • Built in Dewar heater
6.	Specimen Viewing	<ul style="list-style-type: none"> • In-situ viewing: Any time without shutting down the ion guns or raising the sample into the airlock. • Shutter: An automatic shutter shall be incorporated to reduce window contamination when not viewing the specimen. • Sample illumination: Reflection and through transmission with the set intensity. • A digital CCD imaging system with a magnification of up to -2000x or above and also to record and display the sample images during ion milling on a desktop computer. • The operator should be able to start, stop, or pause the milling process from the system PC. • Possibility of remote access to ion milling system using network connectivity as an option
7.	Milling Termination	<ul style="list-style-type: none"> • Milling termination by elapsed timer or optional light operated Auto-Terminator.
8.	Vacuum System and vacuum reading	<ul style="list-style-type: none"> • The vacuum system shall be totally self-contained within the enclosure. • A totally oil-free vacuum system, pumping with turbo pump and oil free backing pump • Work chamber base pressure: ~1E -6 Torr • Operating pressure: ~ 1E -5 Torr.

		<ul style="list-style-type: none"> • Suitable gauges to monitor the vacuum levels in main chamber and baking pump. • Vacuum gauge should be present in the chamber area to read the vacuum in the specimen preparation area • Sample exchange through air lock
9.	User Interface	<ul style="list-style-type: none"> • User interface must be located on the front panel of the system for easy access and viewing. All system functions (gun settings, gas flow controls, stage movements, etc.) shall be controlled through this front panel. • Possibility of remote access to ion milling system using network connectivity as an option. The communication protocols will be used for monitoring the system's status, starting, pausing, and/or stopping the milling process.
10	Cooling	<ul style="list-style-type: none"> • Preferably air-cooled system.
11	Mandatory Accessories	<ul style="list-style-type: none"> • Specimen handling/loading tools, kit/stage tools, specimen holders, O-rings etc., which are essential to run the equipment during the warranty period.
12	Spares/ consumables	<ul style="list-style-type: none"> • 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.
13	Footprint & weight	<ul style="list-style-type: none"> • Please specify the total footprint in cm x cm, and weight. • All site requirements must be clearly mentioned.
14	Installation and Training	<ul style="list-style-type: none"> • Installation and training at customer site, by the experts should be part of the package. • 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. • During the installation the customer should verify all the specifications of the processes for acceptance. • If periodic maintenance can be done by the on-site engineer, please include the cost of training the engineer. • Pre-installation requirements such as room size, tolerable limits of EM field and vibration (mechanical), required power rating; utility requirements are to be stated clearly, and to be verified/surveyed by the supplier at the installation site. It is the supplier's responsibility to clearly provide details of the above-mentioned requirements before delivery of the equipment. • The operator should be not only trained in operating but also know the installation requirements for smooth uninterrupted functioning of the ion milling system
15	Power & utilities	<ul style="list-style-type: none"> • The instrument should work with Indian standards • Mention the power requirement. • Mention any utility requirement (gas, air, water, exhaust, etc.)

16	Safety	<ul style="list-style-type: none"> • Mention any special safety requirement of the tool • The tool must come with a complement of interlocks to prevent common user errors.
17	Recommendation	<ul style="list-style-type: none"> • The system must submit references from at least 3 previous installations • The names and contact addresses of the referees must be submitted with the proposal, so the purchase committee can contact them independently.
18	Warranty	<ul style="list-style-type: none"> • 12 month from the date of acceptance for all the above items. • 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.

Thanking you,

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