

July 9, 2018

## To Whom It May Concern

### Limited Tender for an ICP-RIE System

This is an RFQ (Request for Quote) for procurement of an ICP-RIE system as part of an limited 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 runs a program called Indian Nanoelectronics Users Program (INUP) which has allowed 4200 participants from more than 700 universities and institutes all over India to use the facilities at CeNSE. Consequently, any tool in CeNSE receives significant exposure to scientific community at IISc and beyond. The vendors are requested to factor in the value of this exposure in to their quotes. Details of existing facilities and INUP 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/>

Also, CeNSE hosts equipment on behalf of vendors, as a national standard or 'model' system. If the vendor is interested, CeNSE can consider working out a similar arrangement for the ICP-RIE system.

#### Procedure

1. Vendors will be required to submit a technical proposal and a commercial proposal in **two separate sealed envelopes**. Only vendors who meet the technical requirement will be considered for the commercial negotiation. The bundle envelop should have "**Quotation for ICP-RIE**" as title for identification.
2. **The deadline for submission of proposals is the 17<sup>th</sup> of July 2018, 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 purchase committee will be final.
4. The technical proposal should contain a compliance table with 5 columns. The first column must list the technical requirements, in the order that they are given in the technical configuration below. The second column should describe your compliance in a "Yes" or "No" response. If "No" the third column should provide



the extent of the deviation (please provide quantitative responses). The fourth column should state the reasons for the deviation, if any. The fourth column can be used to compare your tool with that of your competitors or provide details as requested in the technical requirements table below.

5. Any additional capabilities or technical details, that you would like to bring to the attention of the purchase committee, can be listed at the end of the technical table.
6. Vendors are encouraged to highlight the advantages of their tools over comparable tools from the competitors
7. If multiple systems can fulfill the requirements, vendors can submit multiple bids.
8. In the commercial bid, please provide itemized cost of the system and *required* accessories, such as software, power supply, etc.
9. As an option, please provide itemized cost 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.
10. The quotes should be CIF Bangalore, India. So please include cost of shipping.
11. Please indicate the warranty provided with the tool. Warrant of 3 years or more is preferred.
12. Provide itemized cost for *required* spares for 2 years of operation. For sake of this calculation, the vendor may assume active tool usage of 20 hours/ week. This number will be used to estimate the life cycle cost of the tool.
13. Clarify if periodic (preventive) maintenance be done by a trained on-site engineer or requires a specialist from the OEM.
14. If maintenance requires OEM, as an additional option, provide cost of an annual maintenance contract (AMC) for 3 years, post warranty. The AMC must cover 1 scheduled and 1 emergency visit per year. It must also indicate who will service the AMC, an Indian agent or the OEM. The AMC cost must also include an itemized list of spares that are essential for the scheduled visits.
15. The RFQ must include references of 3 previous installations, preferable in India. Please provide the names and contact addresses of the referees, so that the committee can contact them independently.
16. Any questions can be directed to Dr. Savitha P, GF-20, Centre for Nano Science and Engineering, Indian Institute of Science, Bangalore 560012, India.  
([savithap@iisc.ac.in](mailto:savithap@iisc.ac.in))

### Technical Requirements

1.	Primary application	<ul style="list-style-type: none"> <li>ICP-RIE for ETCH specify materials : PZT, AlN, TiN</li> <li>Resist/Polymer Ashing</li> <li>Must conform to some SEMI standard for ICP equipment manufacturing, e.g. SEMI <u>SEMI E6-0914</u>, SEMI <u>E15-0698E2</u>, SEMI <u>S21-1106E</u>, SEMI <u>S19-0311 (Reapproved 0816)</u>, etc.</li> </ul>
2.	Secondary application	<ul style="list-style-type: none"> <li>Etch SiO<sub>2</sub> and Si<sub>3</sub>N<sub>4</sub></li> <li>Shallow etches of Silicon (~100 micrometers)</li> </ul>
3.	Process capability	<ul style="list-style-type: none"> <li>Etching up to 1 micrometer of PZT, AlN and TiN with a surface non-uniformity of &lt;5% within wafer and &lt;3% wafer to wafer, with surface roughness &lt;2nm</li> <li>Etching capability down to less than 100nm feature size</li> <li>Ability to use both F<sub>2</sub> and Cl<sub>2</sub> based chemistries in the same chamber</li> <li>Ability to use sputter etches using Ar</li> <li>Anisotropic etch profile</li> <li>Please specify the highest aspect ratio that can be achieved</li> <li>Provide detailed technical literature for the system use, such as your prior experience and technical data on etch processes and tool <b>capabilities</b></li> </ul>
4.	Process recipes	<ul style="list-style-type: none"> <li>At the time of installation, all standard process recipes should be provided</li> </ul>
5.	Substrate details	<ul style="list-style-type: none"> <li>Processing of upto 6 inch wafers</li> <li>However, we need suitable substrate adapters to process 4 inch, 3 inch, 2 inch and cut pieces of substrates measuring more than 2cmx2cm</li> <li>Should be able to handle substrates other than Si, like Alumina, SiC, GaAs</li> </ul>
6.	Tool requirements	<ul style="list-style-type: none"> <li>Load lock chamber : software controlled load and unload options</li> <li>Wider matching network</li> <li>The roughing vacuum pump for main chamber and load lock chamber should be dry pumps (preferably Edwards) with appropriate pumping capacity. Turbomolecular pump with appropriate capacity for ensuring the required process vacuum.</li> <li>He substrate cooling</li> </ul>

7.	Substrate temperature	<ul style="list-style-type: none"> <li>Option to heat up to 200 °C. If this is an additional requirement, itemize cost</li> </ul>
8.	Power level	<ul style="list-style-type: none"> <li>Typical RF Power range 100W - 600W, with automatic power matching unit and with an option to bias the substrate (typical range of 100W - 600W)</li> </ul>
9.	Chuck configuration	<ul style="list-style-type: none"> <li>Electrostatic chuck with the provision to handle 6 inch wafers</li> <li>Give options for the use of 4 inch wafer as well</li> <li>Options to be given for manual chuck as well, with the pro and cons of using the same.</li> </ul>
10	End point detection	<ul style="list-style-type: none"> <li>Give all the options available, itemize cost</li> </ul>
11	Process gases lines required	<ol style="list-style-type: none"> <li><b>O<sub>2</sub></b></li> <li><b>Ar</b></li> <li><b>N<sub>2</sub></b></li> <li><b>SF<sub>6</sub></b></li> <li><b>CF<sub>4</sub></b></li> <li><b>CHF<sub>3</sub></b></li> <li><b>C<sub>4</sub>F<sub>8</sub></b></li> <li><b>BCl<sub>3</sub></b></li> <li><b>Cl<sub>2</sub></b></li> <li><b>Empty line</b></li> <li><b>Empty line</b></li> <li><b>Empty line</b></li> </ol>
12	Gas Manifold	<p>Gas manifold should have 12 lines.</p> <ul style="list-style-type: none"> <li>MFCs need to be installed only for the lines and gases specified. All the lines should have swagelok VCR fittings and welding if any should be orbital welding. The lines should be SS316L electro-polished suitable for corrosive and non corrosive gases used for the specific process. MFCs should be MKS make.</li> </ul>
13	Footprint & weight	<ul style="list-style-type: none"> <li>The system should compatible with better than class 1000 cleanroom environment. Please specify the total foot print in cm x cm, and weight.</li> </ul>
14	Process software	<ul style="list-style-type: none"> <li>Front panel displaying equipment and process status along with appropriate software to be supplied.</li> <li>The software must allow varying levels of instrument access. A simplified basic access for a user to a full access to an engineer.</li> <li>Interlock that can interface with the online reservation system, so that the tools can only be used by authorized users.</li> </ul>

		<ul style="list-style-type: none"> <li>• Complete logs of all the process and system parameters to be available and stored for future trouble shooting</li> <li>• Graphical representation of tool and process parameters</li> <li>• Provision to alert the user in case of emergencies and an option to integrate the alarm system to NNFC building monitoring software</li> <li>• Software need to be supported for the lifetime of the tool</li> </ul>
15	Periodic Maintenance	<ul style="list-style-type: none"> <li>• The system should require minimal maintenance.</li> <li>• Mention the recommended preventive maintenance schedule for the system. Any accessories needed for periodic preventive maintenance for 3 years e.g. O-rings, should be mentioned in separately the itemized quote.</li> <li>• Can the preventive maintenance be done by a trained on-site engineer or requires a specialist from the OEM? If the latter, please provide cost of a 3 year AMC with required kit/consumables.</li> <li>• The system should be supported by a trained local representative and should have a 48hour window of response</li> </ul>
16	Installation and Training	<ul style="list-style-type: none"> <li>• Installation and training at customer site, by the experts from principals should be part of the package.</li> <li>• During the installation all the specifications of the processes should be verified for acceptance by the customer.</li> <li>• If periodic maintenance can be done by the on-site engineer, please include the cost of training the engineer.</li> </ul>
17	Power & utilities	<ul style="list-style-type: none"> <li>• The instrument should work with Indian standards</li> <li>• Mention the power requirement.</li> <li>• Mention any utility requirement (water, air, exhaust, etc.)</li> </ul>
18	Gas abatement system	<ul style="list-style-type: none"> <li>• Specify the scrubbing system needed for treating exhaust gases from etching PZT and III-V semiconductors</li> <li>• Specify the exhaust system needed to do an open chamber clean after etching materials with toxic etch products</li> </ul>
19	Safety	<ul style="list-style-type: none"> <li>• Mention any special safety requirement of the tool</li> <li>• The tool must come with a complement of interlocks to prevent common user errors.</li> <li>• Sensors should be provided to detect ppb levels of gas leaks and utility failures including scrubber failure</li> <li>• Any malfunction should have an audible alarm system.</li> <li>• Flashing lights during emergencies should also be an option</li> </ul>



20	Recommendation	<ul style="list-style-type: none"><li>• The system must submit references from atleast 3 previous installations</li><li>• The names and contact addresses of the referees must be submitted with the proposal, so the purchase committee can contact them independently.</li></ul>
21	Pre-purchase testing	<ul style="list-style-type: none"><li>• To ensure the equipment conforms for specifications, the committee requires the vendor to perform some standard tests <i>before</i> the purchase process is complete. The validity of the tender will hinge on the successful and accurate measurement of these test samples.</li><li>• The vendor must conclude the testing and submit the data within 1 week of receipt of samples.</li></ul>
22	Acceptance tests	<ul style="list-style-type: none"><li>• Etching 1 micron thick PZT with 3 micron patterns with high selectivity to photoresist layer and 30% loading on the wafer</li><li>• Etching 1 micron AlN with high selectivity to photoresist layer and etch stop at Pt layer</li><li>• Etching 100 nm wide trenches in SiO<sub>2</sub> on Si to the highest aspect ratios possible and with high selectivity to Si</li><li>• Demonstrate working of all the accessories including endpoint detector.</li></ul>

Thanking you,

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