

## **Global Tender Enquiry: Supply and Installation of X-ray Photoelectron Spectroscope (XPS)**

**(Tender date: 22<sup>nd</sup> April 2024)**

Tenders are invited to supply and install a state-of-the-art X-ray Photoelectron Spectroscope (XPS), also known as Electron Spectroscopy for Chemical Analysis (ESCA). The XPS system should be capable of characterising the chemical state of matter with high precision and accuracy. The system will be utilised for various research and analytical purposes across multiple disciplines. The equipment will be installed in Micro-Nano Characterization facility at 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 more than 100 faculty members from various disciplines at IISc. CeNSE also runs a program called Indian Nano electronics Users Program (INUP) which has allowed 8000 participants and 1500 faculty from more than 700 universities and institutes all over India to use the facilities at CeNSE. Consequently, any utility/facility at CeNSE receives significant exposure to scientific community at IISc and beyond. The vendors are requested to factor in the value of this exposure into their quotes. Details of existing facilities are available at:

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

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

### The Process

1. **This order is open to all global Original Equipment Manufacturer (OEM) or their Indian authorized distributor".**
2. 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.
3. **The deadline for submission of proposals is May 13<sup>th</sup> 2024, 5:30 pm Indian Standard Time.** Proposals should arrive at the CeNSE office, GF-15, Centre for Nano Science and Engineering, Indian Institute of Science, Bangalore 560012, India, by the above deadline. Please mention **"Tender for XPS"** on the envelopes.
4. The technical proposal should have:
  - 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 below. The second column should describe the capability of the tool for that specific requirement. Please be quantitative and consistent with the technical datasheets. In case the technical requirement is a text, second column must provide a technical answer. In case the requirement is a number, please provide a number. 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, which 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
8. If multiple systems fulfil the requirement, vendors can offer multiple bids.
  9. The technical proposal will be evaluated against the technical requirement. Only vendors who meet the technical requirement will be considered for the commercial comparison and negotiation.
  10. The lowest bid L1 will be calculated based on the total price of all items tendered for Basic equipment along with accessories selected for installation, selected optional items, recommended spares and warranty.
  11. The commercial bid must conform to the following:
    - a. The quotations should be CIP Bangalore.
    - b. Mention itemized cost of the system, optional items and *required* accessories, such as software, power supply, etc.
    - c. Mention 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.
    - d. Mention the warranty provided with the tool.
      - i. Comprehensive Warranty of 3 years or more.
      - ii. All electronics and instrumentation must be covered under the warranty. clearly indicate any part that is not included in the warranty. Clearly indicate any part that is not included in the warranty.
      - iii. Mention the cost of any mandatory spares that must be replaced during regular maintenance, even in the warranty period.
      - iv. Provide yearly cost of AMC for 3 years beyond the warranty period. The AMC must satisfy the following:
    - e. Provide itemized cost for *required/expected* spares for operation during the AMC period.
      - i. Cover 2 scheduled preventive maintenance and 1 emergency visits per year.
      - ii. The emergency visit should be supported with a 24-hour response window.

- iii. In case the OEM is foreign, clarify if maintenance will be done by a trained local engineer (OEM representative within India) or a specialist from abroad.
    - iv. Cost of AMC must include an itemized list of spares (e.g., maintenance kits) that are essential for preventive maintenance.
  - f. Mention the 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 10 years from the date of installation. To reach a lower 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.
5. The decision of the purchase committee on the execution and evaluation of the tender, is absolute and final.
6. The RFQ must include references of 5 previous installations, preferably in India. Please provide the names and contact addresses of the referees, so that the committee can contact them independently.
7. We encourage vendors to give technical presentations, physically or online, so that we can better understand the technical capabilities of their tools and vendors can better understand the requirements.
8. To schedule the presentations or for technical questions, please contact Dr. Suresha, COO Micro and Nano Characterization Facility (MNCf), Centre for Nano Science and Engineering, Indian Institute of Science, Bangalore 560012, India.  
([sureshasj@iisc.ac.in](mailto:sureshasj@iisc.ac.in))

#### **Technical Specifications:**

1. The supplied XPS system should be fully automatic with automatic sample transfer for high sample throughput analysis.
2. The XPS system must be capable of performing X-ray and UV photoelectron spectroscopy with Spherical and hemispherical analyser.
3. The electron energy analyser must have  $\geq 150$  mm or large mean radius with full 180-degree hemispherical analyser.
4. Dual anode monochromated Al/Ag, Al/Cr or equivalent X-ray source should be supplied.
5. X-ray power should be 300W or more.
6. XPS imaging for spatial information with a spatial resolution of  $< 3$   $\mu\text{m}$  or better.
7. The supplied XPS system should be fully automatic with automatic sample transfer for high sample throughput analysis.
8. Ion Source: An Ar ion source for depth profiling and cleaning should be included.

9. Angle-resolved detection for modulating surface selectivity. Angle should be runnable between zero to 90 degree or more from normal. The system should automatically adjust the sample stage such that the data is not affected by the position of the sample on the sample stage.
10. Plug and play system, which seamlessly integrates all accessories in one software, suitable for a multi-user facility.
11. The vacuum system must consist of an analysis chamber and load lock (or sample entry chamber). Both chambers should be evacuated by turbo molecular pumps (TMP) with suitable backing pumps. Base pressure after baking and cooling must be  $5 \times 10^{-10}$  mBar or better in the analysis chamber.
12. The sample movement between the two chambers must be robotic, not manual.
13. Safety interlocks should be installed to prevent inappropriate operation of valves and pumps.
14. A mechanism for automated beam alignment and focus should be provided.
15. Sample viewing option: optical microscope for the sample viewing in the analysis chamber with an optical zoom of 10X or more
16. Charge Compensation: Charge compensation for insulating samples should be included. Charge neutralization should be possible during depth profiling.
17. Sample Holder: Automatic sample transfer mechanism in X, Y, and tilt directions should be provided. A 4-or more-axis sample stage should be included.
18. Sample holder should be able to accommodate large size samples of size  $\geq 50$  mm diameter or  $\geq 1000$  mm<sup>2</sup> area with option to place 15 or more samples at a time.
19. Minimum of 2 or more different type of sample holders to be provided.
20. UV Photon Spectroscopy (UPS): He (I) and He (II) UV PES should be provided.
  - a. The system must be provided with a high intensity UPS source (UV lamp) producing He I / He II for valence band spectroscopy and work function measurement.
  - b. UPS performance must be demonstrated on a clean silver sample. Under identical spectroscopic conditions, a count rate of  $\geq 1$  Mcps or better must be demonstrated when the resolution at the Fermi edge is  $\leq 120$  meV for He (I) or better
  - c. All differential pumping, gas handling and source operation must be automated, so that it can be operated from the data system and used within complex experiments such as depth profiles.
21. Analyzer and Detector: Hemispherical analyser with an energy resolution of  $< 10$  meV (FWHM) should be included.
22. The system must have 128 channel detectors for high resolution spectroscopy (XPS, AES, UPS, etc) as well as high resolution spatial imaging mode.
23. Pass energy should be adjustable from 1 eV To 150 eV or better

24. A high signal-to-noise ratio is needed. For a standard Ag sample, the 3d peak should get at least 400 KCPS @ 0.5 eV or better counts at peak power
25. **Calibration Standard:** Standard samples (Ag, Au, Cu and PET) must be provided to check the system calibration, resolution, sensitivity, etc. A phosphorescent sample for X-ray spot alignment should be included.

**26. Software:**

- a. Spectrometer control and analysis software should be included.
- b. The supplier must provide license software for the complete XPS operation, including options to make changes manually.
- c. The system must have the capability to be controlled remotely via the internet/network.
- d. There must be at least 10 numbers of data processing software user licenses (or dongles) for XPS spectra analysis through peak identification using the library and peak fitting.
- e. The latest version of the software must be provided with a free update. The hardware should also be the latest window-based system.
- f. XPS library must be provided.
- g. Database of relative sensitivity factors for both Al and Ag sources must be provided.
- h. The Handbook of XPS analysis (hard copy) is necessary and should be provided along with the instrument supply.
- i. The vendor must commit to supporting the software and control computer for at least 10 years from the date of installation.

27. **Footprint: The system should fit in a footprint of 3 m length, 2 m width, 2,5 m height or smaller**

**28. Optional Items (Quoted Separately):**

- a. Auger Electron Spectroscopy
- b. Gas cluster ion source
- c. Sample holder capable of heating up to 750°C and cooling to –100 °C. Ion Source: An Ar ion source for depth profiling and cleaning should be included.
- d. Inverse photo emission spectroscopy
- e. Mg/Al twin anode X-ray source.

**29. Warranty and Installation**

- a. A comprehensive warranty of three years and installation by trained personnel on-site should be provided.
- b. Service response must be within 48 hr. If the service engineer fails to attend to the complaint within 15 days, the warranty of the machine will automatically be extended for the same number of days.
- c. The cost for an additional TWO years of warranty and/or AMC after three years of warranty should be mentioned.

- d. A complete set of instructions and service manuals must be provided along with the system. The wiring and circuit diagrams should also be provided. Installation and training
- e. After installation of the system by the engineers, the system performance must be demonstrated to the customer's satisfaction as per the specifications detailed here.
- f. The supplier must provide basic training to the users for at least five days after installation is completed.

**30. Service support.**

- a. The firm must guarantee technical support for the entire system and supply of spares for a minimum period of 10 years or more from the installation date.
- b. Service response time must be <48 hours.
- c. Provision for online remote diagnosis of faults.