



**INDIAN INSTITUTE OF TECHNOLOGY BOMBAY**  
**MATERIALS MANAGEMENT DIVISION**  
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**PR No. 1000018339 (Rfx No. 6100000930)**

**Detailed Technical Specifications for X-Ray Photoelectron Spectroscopy(XPS) Upgrades**

**1. Key Generic Requirements:**

- a. The tenderer must provide an installation scheme showing the physical space (footprint) of the item(s) as well as space required for routine access and all installations including related accessories
- b. The vendor should have installed atleast 2 similar types of systems in centrally funded technical institutes or government research labs. Purchase order (PO) and user list should be provided as supporting evidence
- c. The compliance sheet should be provided by the vendor. The absence of the compliance sheet may result in the cancellation of the purchase order
- d. For each compliance, supporting evidence such as manuals and other necessary and supporting documents needs to be provided
- e. The vendor should have an Indian representative which can take care of the urgent troubleshooting or any queries on an urgent basis
- f. Installation and training of the system should be demonstrated

**2. Technical Specifications (Generic):**

- a. The primary purpose of the upgrade to the XPS system (Versaprobe-II from Physical Electronics) is to measure the unoccupied electronic states of solid materials to obtain the entire band structure of semiconductor films

- b. The system should have the ability to measure the kinetic energy of the Auger electrons emitted from the sample surface and provide quantitative elemental and chemical state information from surfaces of solid materials
- c. The system should have a heater and thermocouple-integrated sample holder for temperature control, and also contain 4 contacts for in-situ electrochemical experiments
- d. The system should have the latest instrument control software and upgraded versions of the analysis software

### **3. Technical Specifications (Specific):**

#### **A. Low Energy Inverse Photoemission Spectroscopy (LEIPS)**

- a. The LEIPS option should allow for in-situ characterization of the unoccupied electronic states of solid materials analysis
- b. A low energy electron source to preserve sample chemical structure during analysis
- c. Two optical filters 254 + 300 nm (4.88 eV) and 260 nm (4.78 eV)
- d. New electron neutralizer assembly with BaO cathode
- e. New CCD camera for analysis chamber

#### **B. Scanning Auger Electron Spectroscopy**

- a. 10 keV electron gun for Auger Electron Spectroscopy (AES) and imaging with better spatial resolution than XPS
- b. Scanning secondary electron detection and imaging
- c. Scanning Auger spectra, images, line scans, depth profiles and maps
- d. Digitally controlled and fully integrated into SmartSoft
- e. Beam size performance ( $\leq 100$  nm)
- f. REELS capability In FAT mode, Elastic Peak spectrometer resolution  $< 0.5$  eV FWHM at 1 kV electron beam on a clean gold standard sample
- g. Relocation and rework of the UV lamp

#### **C. 4 Contacts Hot and Cold Stage**

- a. Temperature range of -120 °C to 500 °C with a single 25 mm 4 contacts sample holder
- b. Heater and thermocouple integrated in the sample holder for enhanced reliability and temperature control
- c. 4 contacts with sample holder for in-situ electrochemical experiments
- d. All stage motions maintained including compucentric Zalar Rotation and compucentric tilt

#### **D. Heating Sample Holder**

- a. Temperature range – ambient to 800 °C

#### **E. Vacuum Transfer Vessel**

- a. Compatible with the sample holders
- b. Inert gas transfer from controlled atmosphere glove box to PHI analytical systems
- c. Enable sample transfer between PHI analytical systems

#### **F. Intro Ion Gauge**

- a. Pirani/BA hot cathode gauge with pressure measurement up to  $4 \times 10^{-8}$  Pa
- b. Pressure readout on instrument computer
- c. User selectable pressure setting software option for sample introduction

#### **G. Computer and Software**

##### **1. Windows 10 for VersaProbe II**

- a. State-of-the-art 64-bit computer with Windows 10 O.S. with 24" Color LCD Monitor
- b. New hardware including USB 3.0, COMM 16 PORT, and PCI card
- c. Latest SmartSoft-VP instrument control software for Windows 10 64-bits
  - Enhanced queuing for automated analysis functionality:

- Create automated analysis queues combining survey, high resolution scans, depth profiles, maps and more
- View and modify existing queue items while queue is running
- Queue validation feature before starting the queue
- New sidebar dashboard for easy access to common acquisition control functions and settings
- Supports all options on VersaProbe II and III
- d. New intro camera Windows 10 compatible

## **2. StrataPHI Thin Film Structure Analysis Software (2 nos.)**

- a. Software to allow for the structure estimation of thin film stacks using single angle spectral data and angle dependent profile data
- b. To calculate thickness for thin film structures composed of discrete layers

## **3. Latest version of Multi-pak Software (2 copies)**

### **H. Other components**

- a. Filter for LEIPS (280nm, 10nm)
- b. Filter for LEIPS (285 nm,14nm)
- c. Filter for LEIPS (355nm, 7nm)

### **I. Acceptance criterion**

- a. Complete on-site installation, training of all upgrades
- b. Demonstration of LEIPS and Auger data measurement on standard samples as per specs
- c. Demonstrate 4 contact stage operation over entire temperature range, with rotation and electrical bias
- d. Demonstrate functional intro ion gauge

### **J. Installation, training, warranty and maintenance**

- a. Supplier should complete installation on-site, provide a minimum of 1 year warranty post installation and on-site training of upto 4 people
- b. Necessary spare/consumables parts for 5 years beyond the warranty period should be quoted with the system (see list below)
- c. Supplier should demonstrate measurement and analysis techniques of the upgraded system
- d. Include standards to be used for calibration of tool parameters
- e. A set of basic tools required for performing routine maintenance. A tool cart that can be locked and that can accommodate these tools should be provided
- f. The payment terms will be specified in the commercial proposal and is subject to negotiation
- g. Please provide details of the number of trained personnel in India, number in the western region or in Mumbai who can service the machine
- h. Please provide references both in India and abroad
- i. Please list a set of acceptance tests for on-site (vendor) inspection and after installation at IIT Bombay
- j. All facilities requirements such as compressed air/N<sub>2</sub>/He and chilled water should be specified

#### **K. Required parts**

- a. PLATE-CHANNEL, 50MMOD, T0.48MM (2 Nos.)
- b. ASSY-PCB, ANODE 32CH, VP3 (1 No.)
- c. ASSY-IONIZER, MOD 06-350, Q2K (3 Nos.)
- d. ASSY-FIL, LAB6, Q2K (1 No.)
- e. KIT-ANODE, SERVICE FXS (1 No.)
- f. ASSY-NEUT, BAO CATH, VP111 (2 No.)
- g. GASKET-CU, 4.62 FLG, CLN (3 Nos.)
- h. GASKET-2VCR, CU-2-VCR-2 (10 Nos.)
- i. GASKET-CU 362MM OD FLANGE (10 Nos.)
- j. KIT-GASKET, 1.33 OD FLG, (10) (10 Nos.)
- k. GASKET RET ASSY-SS4VCR2GR (10 Nos.)

- l. GASKET RET ASSY-CU4VCR2GR (10 Nos.)
- m. FILTER-OIL MIST, KF25, ALCATEL (4 Nos.)
- n. Filter-Exhaust, Vac Pump, KF-16 (4 Nos.)
- o. Rough Pump-Oil Mist Filter-Copper Sieve, 4" (2 Nos.)
- p. Rough Pump Oil-(Ulvac Pump)-4 liter (2 Nos.)
- q. OIL RSVR, HiPace80 PM143740-T (5 Nos.)
- r. VP SAM - GASKET-CU, 4.5 FLG,2.86ID, OVSZ (2 Nos.)
- s. VP SAM - ASSY-FIL, LAB6, AES (1 No.)
- t. VP SAM - CRYSTAL PHOTOTUBE, 12 X 160 (1 No.)
- u. VP SAM - TIP-SCINTILLATOR, 12M, 200NM (1 No.)
- v. LEIPS- OPT FILTER, MERCURY-LINE,254NM, T65,D25 (1 No.)
- w. LEIPS- OPT FILTER-BLOCK,300-650NM, D25 (1 No.)
- x. LEIPS- OPT FILTER-SINGLE,260NM,16NM, T55, D25 (1 No.)
- y. LEIPS- STORAGE BOX, OPT FILTER, D25,12SLOTS (1 No.)
- z. INTRO GAUGE -PBR260-DN40CF (1 No.)
- aa. Improved Image registration software should be quoted
- bb. Electronic Rack (1 No.)