

**Punjab Engineering College (Deemed to be University),
Chandigarh
Sector 12, Chandigarh 160012**



Inviting of Expression of Interest (Non- Committal)

For

**Purchase of
Multipurpose Versatile X-ray Diffractometer**

At

Department of Applied Sciences

SECTION I: INVITATION FOR EXPRESSION OF INTEREST

FOR PURCHASE OF MULTIPURPOSE VERSATILE X-RAY DIFFRACTOMETER

1. The Punjab Engineering College (Deemed to be University), Chandigarh invites expression of interest from Manufactures/ Suppliers of Multipurpose Versatile X-ray Diffractometer as per Schedule of requirement.
2. Interested Manufacturers/authorized suppliers may obtain further information from Dept. of Applied Sciences, Punjab Engineering College (Deemed to be University), Sector 12, Chandigarh 160012, India.
3. The EOI document can be downloadable from institute website <http://www.pec.ac.in/tenders>

TABLE – 1

<u>Name of the Equipment</u>
Multipurpose Versatile X-ray Diffractometer

TABLE-2 Time Schedule

I.	Date of submission of EOI document (hard copy)	Start date: 04.02.2022 10.00 AM End date: 25.02.2022 03.00 PM
II.	Opening of EOI	Date: 28.02.2022 03.00 PM
III.	Place of opening of bids	Head Dept. of Applied Sciences Punjab Engineering College (Deemed to be University), Sector 12, Chandigarh 160012
IV.	Address for communication	Head, Dept. of Applied Sciences Punjab Engineering College (Deemed to be University), Sector 12, Chandigarh 160012

Director,
Punjab Engineering College (Deemed to be
University), Sector-12, Chandigarh

TABLE 3 SCHEDULE OF REQUIREMENT

Specifications of Multipurpose Versatile XRD System		Qty	Delivery Schedule
<p>The system must be having following facilities/capabilities:</p> <ul style="list-style-type: none"> a) Powder Diffraction b) Phi-scan measurements c) Thin Film Glancing Angle X-ray Diffraction d) Texture and Residual Stress Measurements e) Non-Ambient High Temperature measurement f) Small Angle X-ray Scattering <p>With following detailed specifications:</p>		01	120 days
S. No.	Description		
01	Multipurpose Versatile XRD System		
	X-Ray Generator		
	a) Output power: ≥ 3 kW or better		
	b) Maximum Voltage: ≥ 50 kV or better		
	c) Maximum Anode Current: ≥ 60 mA or better		
	d) Control: Fully controlled through software		
	e) Stability: 0.01% per $\pm 10\%$ variation of main voltage or better at 50 Hz		
	f) Voltage increment: 1 kV		
	g) Current increment: 1 mA		
	Goniometer		
	a) Type: Higher resolution Theta/Theta or Theta/2-Theta		
	b) Scan: θ/θ coupled and θ/θ decoupled. The Goniometer should be with independent θ and 2θ drives for accurate positioning		
	c) 2θ range : Lower limit $\leq -90^\circ$, upper limit $\geq 165^\circ$		
	d) Minimum step size: $\leq 0.0001^\circ$		
	e) Angular reproducibility: $\pm 0.0001^\circ$ or lower		

f	Goniometer radius: ≥ 220 mm
g	Angular uncertainty from gear backlash should be avoided using appropriate optical encoders
X-Ray Tube	
a)	Target: Cu Anode
b)	Power ≥ 1.8 kW or better
d)	Focus: Long fine focus (LFF) X-ray tube. Tube should have the facility to rotate from LFF to true point focus and vice versa without affecting the alignment of the Instrument as well as disconnecting electrical and water connections.
e)	Insulation: Sealed X-ray tube should have Ceramic Insulation
Sample stage/platform/holder, changer	
<p>a) Standard sample stages for powder, solid flat sample.</p> <p>b) Accessories for sample stage such as zero background sample holders, beam knife, and suitable sample holders for Reflection and transmission measurements should be provided.</p> <p>c) Stage to do SAXS measurements. Cradle for texture, stress, and reflectivity measurements with motorized tilt, motorized Z movement, etc.</p> <p>d) Quote Variable Temperature Sample stage from ≤ -190 °C to ≥ 600 °C with auto-height alignment and temperature compensation facility of the sample.</p>	
Optics	
<p>Optics should include necessary/appropriate soller slits, divergence slits, anti-scatter slits, receiving slits and Beta filters</p> <ul style="list-style-type: none"> • Geometries: Bragg Brentano (BB) and Parallel Beam (PB) optics for powder as well as polycrystalline thin Film samples. • Filters: Suitable $K\beta$-filters for Cu radiation • Optics to minimize/eliminate $K\alpha_2$ • Easy change of optics without the need of alignment from Bragg-Brentano to Parallel Beam. • Soller slits and Soller collimators • Monochromator to reduce the fluorescence from the sample. 	

The optics must be such that the system has ability to carry out texture, residual stress, thin film GIXRD and Small Angle X-ray Scattering and Grazing Incidence SAXS such as X-ray mirror optics. Different optical geometries including primary, secondary and sample stages should be easily exchangeable by the user when switching between various modes.

X-ray detector

2D detector for Ultrafast and small spot diffraction

Maintenance free suitable solid state (semiconductor) detector with high degree of linearity (i.e., 97% in the range of 0 to 10^9 CPS and very less background noise at least 0.5cps). The detector should be compatible/suitable for most of the X-ray application work, i.e., powder analysis, solid samples, nanomaterial/nanoparticle etc.

- a) The Detector should be capable of working with samples which yield fluorescence.
- b) Functioning of detector in both scanning and static mode.
- c) The 2D detector should capable of working in 0D, 1D as well as true 2D mode.
 - Static mode 2 D coverage of 3 degrees or more.
- d) Minimum 250 x 250 pixels matrix

Standards

- a) Fluorescent screen for positioning the X-ray beam,
- b) Silicon standard sample for checking the accuracy of the peak position,
- c) Polycrystalline Thin Film for checking TF optics

Software

- a) Licensed version of the software for XRD instrument control, system diagnosis software, data collection, data evaluation, qualitative and quantitative analysis software, search match, dedicated SAXS application software for analysis of Nanoparticle has to be offered.
- b) Database for peak search and peak fitting database/ database also be offered with the basic system. Suitable Crystal Structure database
- c) Rietveld based standardless quantification refinement package with Structure analysis, profile fitting, lattice parameter refinement, stripping of $K\alpha_2$ peak, and crystallite size determination software package should be offered. Facility to determine accurate quantitative phase analysis of samples with complex geological matrix by RIR and Rietveld technique as well as

amorphous content also to be quantified by the software.

- d) Software for texture and residual stress analysis, pole figure analysis including orientation distribution function etc.
- e) Licenses to minimum 3 users for all the software must be provided.

Computer and printer: State-of-the-art computer for control of the system for various measurement options. One heavy duty color printer should be provided.

Safety:

- a) Provision for detection of abnormal cooling water flow, pressure and temperature, abnormal generator overload and shutter malfunction detection.
- b) The XRD instrument should be complied as per International Safety Standards and regulation norms, pertaining to X-ray Radiation and other hazards.

Spares and consumables:

- a) Essential and most required spares and consumables for general maintenance and smooth operation of the system should be included in the offer for the period of at least 5 (five) years.

Manuals:

All the operational manual, application manual as well as service manual along with schematic in English are to be provided. Test Reports for all the modes of operation to be provided.

Cooling system:

A suitable external water chiller compatible with the main instrument whose Make and detailed specifications to be provided with the installation requirements. Should preferably be domestically procured. External filter/traps should be provided for minimizing the dust settlements from the chiller to the target area.

Uninterrupted power supply: To be quoted separately

Suitable UPS (off line) of appropriate power (KVA) to provide sufficient power to run the: XRD system and complete chiller including pump and cooling circuit compressor. Minimum 30 minutes required. The UPS to be supplied with stand for batteries.

Other mandatory requirements

- The vendor must have atleast five installations of the offered model of XRD within last three years in India. Necessary installation certificates to be enclosed.
- **After sales service will be a component for technical evaluation of the equipment.**
- All pre-installation requirements such as room size, mechanical vibration and required power rating for the XRD as well as for water chiller to be provided.
- The supplier may visit the University and see the site where the equipment is to be installed and may offer his advice and render assistance to the university in the preparation of the site and other pre- installation requirements.
- Supplier should clearly mention about their service set up in India (preferably in Northern part of India) for prompt service support along with contact details of service engineers specially trained on the offered system.

Training at Site:

The vendor should provide operational training and application training for minimum of 2 working weeks for x-ray diffraction at site comprises of Data collection, measurements and data analysis of Standard Powder diffraction, Texture, residual stress, Grazing Incidence Diffraction (GID) etc. This training should be given after successful installation and commissioning of the XRD system. The total training period can be divided can be suitably distributed in two parts with the gap of 2 weeks.

Warranty: Vendor must provide minimum 60 months warranty after the successful installation, commissioning and testing of the equipment.

TABLE 4 INSTRUCTIONS TO PARTICIPANTS

1. Name of the firm/organization & address Contact person name and telephone/ Mob. No./Fax. No./ on letter pad of the company/firm.
2. The participant should have regularly manufactured/ supplied the product having value more than Rs.1.5 Cr. with same or higher specification in the last three financial years and the product should be in successful operation.
3. Bidder should have a minimum annual turnover of at least Rs.2.5 Crores in each of the last three financial years i.e. 2018-19, 2019-20 and 2020-21.
4. Self-attested copies of PAN/TAN Card/GST Registration no.
5. Manufacturer authorization certificate.
6. Registration Certificate of the company issued by the competent authority
7. List of Users of said equipment.
8. The participants should provide the details of after sales support as well as product support and also specify the policy regarding CAMC and freezing of rates of consumables, if required.
9. After submission selected participants may be called for presentation in online or offline mode, if required. The details of which will be shared in due course of time.