

Tender Specification for completely automated 2D area detector based high resolution small and wide angle X-ray scattering system (SAXS/WAXS) with GI SAXS

Overview

IISER, Mohali is inviting **sealed two bid system** tenders from reputed manufacturers for a high resolution small angle, wide angle X-ray scattering system (SAXS/WAXS) with GI SAXS (complete automation) for the analysis of liquid crystals, thin films, fibers, nano-phase separated block copolymers in terms of shape, size, particle size distribution, core-shell structure morphology, crystallinity, porosities, internal structure and orientation. The first part should include the technical bid and the second part should include the financial bid. Both envelopes must be clearly labeled as **Technical Bid** or **Financial Bid** appropriately. The deadline to receive these tenders is **Mar 14th 2014 by 1:00 p. m** at our Stores & Purchase Office. Please use Speed Post in advance.

Technical Specifications

1. High frequency micro-focus X-ray generator with following specifications

- X-ray source using a micro-focus sealed tube with Cu anode having high flux of $> 1 \times 10^8$ photons/s or better.
- High degree of electrical stability with $< 0.01\%$ or better for 10% variation in line voltage
- Micro-focus sealed tube with water cooling circuit and cables, safety shutter etc.
- All necessary control parameters should be displayed with prominent X-ray ON indicator. Failsafe switch, alarm and malfunctions indicator for overloading, tube current, cooling water, line voltage, target cooling etc. Maximum safety to the user must be ensured with proper inbuilt protection features like interlocking of the instrument doors.
- Diagnosis feature from remote to operate from a PC.
- Chiller should be quoted for the X-ray tube with external filler traps to minimize the dust settlements from the chiller to target area.
- Required suitable UPS for the entire system that include generator, detector and all associated electronics.
- Whole system should be housed in radiation safe enclosure.
- Multilayer single reflection optics suitable for high flux (should remain constant over long distances), with highly collimated geometry (beam divergence ≤ 0.4 mrad in both planes)
- The optics should be coupled with a continuously variable aperture collimation.
- Integrated flux density should be greater than 10^8 photons/sec.
- Flux density at a distance of 70 cm from source, with 1 mm^2 diameter should be $> 5 \times 10^7$ photons/sec.
- Scatter-less slits collimation or three pin hole collimation to overcome parasitic noise.
- X-ray tube Power: 30W/30 μ m or better
- Voltage and current: 50KV, 0.6mA or better
- Highly monochromatic $\text{CuK}_{\alpha 1}$ X-ray beam (Spectral purity $>95\%$)
- The above system should work at 50Hz, 220 V single phase / 440V three phase.

2. Goniometer and sample holders for various samples

- Suitable horizontal/vertical transmission mode goniometer with adequate space should be quoted. XYZ sample stage with plug & play sample holder
Specifications for the stage:
 - Travel range for X axis (horizontal and perpendicular to beam axis) = 45 mm (+/- 22.5 mm)

- Travel range for Y axis (parallel to beam axis) = 12mm (+/- 6 mm)
 - Travel range for Z axis (vertical and perpendicular to beam axis) = 25 mm (+/- 12, 5 mm)
 - Position accuracy <math><1\mu\text{m}</math>
- A CCD camera also to be attached with the system to align the sample in beam path.
 - Option should be available to place the attachments for variable angle and grazing incidence sample stage.
 - Multi capillary (0.1mm to 2 mm ID) holder, thin film holder and a motorized sample holder should be quoted for single capillary (0.1mm to 0.5mm) rotation.

3. Coverage of d-range required

- Simultaneous angular coverage corresponding to 2.8-103Å (or better) without changing sample to detector distance is required. The system should be able to achieve a d-spacing range from $800\text{Å} > d > 1.5\text{Å}$ ($0.0078 \text{Å}^{-1} \geq q \geq 4.1 \text{Å}^{-1}$) by changing sample to detector distance or better. Angular resolution should be $0.004^\circ/\text{pixel}$ or better.

4. Temperature Range:

- Linkam cell HFSX350 or similar heating and cooling device (stage) for liquid and solid sample holder (customized for the quoted instrument) and GISAXS measurements with temperature range from 80K to 600 K (**Quote separately**).
- Oxford Cryosystem Plus operating between 80K and 500K (**Quote separately**).

5. Detector

- Latest fast 2D array detector for direct detection in single photon counting mode should be quoted.
- The detector should not require any gas for operation and should be provided with its own closed loop water cooling system if required.
- Large active area in the range of $84 \times 33 \text{ mm}^2$ or better
- High resolution (pixel size $\leq 172\mu\text{m}$)
- Dark noise (0.1 cps)
- Dynamic range ≥ 1 million count or better
- Read out time ≤ 4 ms or better.

6. Software

The provided software must be able to perform a complete set of automatic measurements and data analyses on a standard PC working on MS windows platform or linux with both graphical user interface and macro scripting mode.

Periodic updates of the software should be provided free of cost for a period of at least ten years.

7. Standard Sample:

The quantification of the different specifications must be substantiated by enclosing the data for a NIST standard such as silver behenate, LaB6 etc., obtained under conditions possible with the equipment to be supplied and demonstrated at the time of installation. A sample of the standard used should be provided free of cost.

8. Data treatment

Fast and simple data reduction software has to be provided. It should convert 2D X-ray diffraction images into ID profile with-Automatic data process templates.

9. GISAXS Stage

High-precision sample stage for GI-SAXS measurements of large samples (up to 4" wafers)

X-Y-Z-Translation

Horizontal GISAXS module of two motorized rotation stages Rx and Ry to allow dynamic flattening of sample and a automated micrometer controlled z stage to accommodate sample thickness (0 to 5mm with 1 μ m precision).

Specifications of motorized rotation stages: Rx: $\pm 5^\circ$, Ry: $\pm 5^\circ$.

Travel range for Z-axis (vertical and perpendicular to beam axis): 25 mm

Omega stage, on top of Z stage (rotation around Y) Ω : $\pm 6^\circ$, precision= $1e-4^\circ$

Phi stage, on top of Omega (rotation around Z): Φ : -91° to $+91^\circ$, precision= 0.01°

10. Computer and Printer

(1) A branded computer with Intel® i5 or better processor, 8 GB RAM, 1TB HDD with DVD writer, 22" wide screen LCD monitor should come from the manufacturer of the XRD system with factory loaded software for the data collection and data process.

(2) It should be equipped with the latest licensed Windows operating system Required graphic adaptor card should be supplied. Branded high quality color laser printer (600 dpi or better) should be provided.

11. General requirements:

(1) **Warranty:** The entire system including should be warranted for a period of 36 months from the date of installation along with regular (half yearly) maintenance check-up at free of charge.

(2) A 3 year Annual Maintenance Contract (AMC) after the expiry of warranty (i.e., after 3 years) **should be quoted separately.**

Any variation in warranty terms may lead to rejection of the tender as it would have cost implications.

12. Manuals/ Circuit-Diagrams and Instruction Sheets:

All the manuals including circuit diagrams and instruction sheets (X-ray diffractometer system, chiller, UPS and others) must be supplied in English for the purpose of in house service engineer's reference.

13. Pre-Installation requirement:

Necessary pre-installation advice, room plan, electrical requirements and other site essential details should be sent immediately after the placement of the order.

14. Installation in India:

List of Indian users of the quoted model of the equipment along with their complete contact details and date of supply of the instrument should be provided.

15. Supplier must specify the upgradeability conditions for the hardware and software parts of the system

Conditions

The equipment supplier should

1. The vendor must undertake to deliver and install the system at the shortest possible time after the placement of the purchase order.

2. Should certify that every component supplied is brand new and not refurbished.

3. Installation, commissioning and Application Training:

Free of cost installation at the site and user training at the site for a minimum of 5 working days for a group of scientists/technical staff/students for operating the instrument.

Service facility in India:

Supplier should clearly mention about their service set up in India for prompt service support along with number of service engineers specially trained on the quoted instrument.