

High Resolution Real time X-Ray Diffraction system

IIT-Madras is looking for High Resolution X-Ray powder Diffraction for phase identification & crystal structure determination in Reflection & Transmission X-Ray measurement. The following technical specifications should be met, to qualify the technical bid. A detailed compliance statement should be provided and it should be supported by the manufacturer's product brochure or website. Information provided in the supplier/redistributor/vendor/reseller's brochure or website cannot be considered as supporting document. Technical bids without proper compliance statement will not be considered. The bidder should be an Original Equipment Manufacturer or their authorized vendors/dealers/partners. If vendors/dealers/partners are participating in the bidding, an authorization certificate should be provided.

1. X-Ray generator

- Power: 3000 Watts or more
- Voltage: 55KV or above.
- Current: 45mA or above.
- Voltage and current stability: +/- 0.01% against +/- 10% mains fluctuations
- Safety features : abnormal cooling water flow and pressure detection, abnormal generator overload detection, abnormal tube voltage detection, emergency stop switch, leak current breaker, operation of X-Ray tube automatically shut Off if any failure in the safety device / tripping / failure to operate.

2. X-Ray enclosure

- Type: door / window with X-ray leak proof and fail-safe control
- X-Ray shutter unit: electromagnetic shutter interlocked with the radiation enclosure
- Warning light: to be located on the radiation enclosure
- X-Ray radiation < 1 μ Sv at 10 cm from the XRD instrument

3. X-Ray tube and tube shield

- X-Ray tube shield with single linear and integrated shutter
- Copper anode sealed water cooled X-Ray tube, long fine focus, maximum power: 2200 Watts

4. Water chiller.

- Air cooled compact chiller for cooling the X-Ray source
- Cooling Power: 3000 Watts or more

5. X-Ray goniometer

- Type: Vertical asymmetric geometry
- Goniometer radius of 250 mm
- Angular fixing range $\geq 120^\circ$ or above in 2θ
- Manual adjustment for the sample incidence in θ
- Sample interface for reflection & transmission mode

- Tube shield mounting holder with adjustment

6. X-Ray Optical device

- Pre-aligned optic and fixtures for various wavelengths like Copper and Cobalt
- Parallel beam optic
- Primary X-Ray Germanium Monochromator for Cu, Co radiation.
- High resolution optic for acquisition in $K\alpha_1$
- $K\alpha_2$, $K\beta$ separation by Optics, No β filter should be used.
- Beam pipe with crossed micrometric X/Y slits to limit beam size 0.1mm to 10mm.

7. Ultra-fast 1D detector

- Real time detection over 120° or more in 2θ range for simultaneously visualization of all diffraction peaks
- Detection electronic and data acquisition module with data acquired by integrated software
- Protection against X-Ray direct beam but no deteriorated of detector channel due to direct beam testing in later.

8. Sample holder

- Fixed sample holder for powder and small bulk in reflection mode, delivered with minimum 2 sample cup.
- Spinning sample holder for reflection and transmission mode, should be delivered with minimum 5 sample cup for reflection mode, 2 sample cup for transmission mode and 1 zero(Low) background sample cup.

9. Power requirements for XRD instrument

- As per the requirements of the quoted machine.

10. Accessories and standard sample for calibration and adjustment

11. A wide variety of temperature and environment controlled sample holder attachments should be available (list below) for the quoted machine for future upgradation.

- a. A low temperature sample holder that can operate between -150 deg C and room temperature should be added as an optional component
- b. A high temperature sample holder that can operate from room temperature to 1000 deg C should be as an optional component
- c. A sample holder to carry out XRD in the inert gas atmospheres.

12. Computer and software

- Software for instrument control, parameter setting and data acquisition in real time, and the hardwares like display & computer should be provided.

- Software / Programmation module should be included & activated for High / low temperature environmental chamber & Thin layer sample stage for GIXRD (Environmental Chamber for in-situ measurement & Thin layer stage for GIXRD will be added as optional attachment at later stage).
- Software for complete phase identification, lattice parameter determination, refinement, phase quantification, Rietveld analysis, and other data analysis.
- Data processing for automatic and manual peak searching, raw data smoothing, background subtraction, and other processing.
- Proposition of software based on Rietveld algorithm
- Search match with free user crystallographic database

13. Warranty: 12 months warranty for all the components of XRD system and additional two year service contract charges should be included.

14. Installation and training: The instrument should be installed, commissioned at site by representative of supplier and should provide adequate training for minimum three days.

15. Proof of local service.

16. Two separate performance certificate from two clients.