

## **Detailed Specifications of Global/Open Tender Notice No: 12/2014**

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**Technical Specifications for Multipurpose High resolution powder X-Ray Diffractometer with Thin Films and SAXS attachment**

S.No.	Component	Specification
<b>X-Ray Diffraction &amp; Small angle X-ray scattering (SAXS) system for analysis of powder, nanomaterials as well as thin film samples with necessary hardware and software</b>		
		<b>Option -I</b>
1	<b>X-Ray Generator</b>	Fully Microprocessor controlled X-ray generator with sealed X-Ray tube compatibility (i) Voltage range 20-60 KV or better. (ii) Current range 20-50 mA or better. (iii) Power rating 3 kW
2	<b>X-Ray Tube</b>	(i) Appropriate sealed Cu target based glass/Ceramic X-ray tube with line/ fine and point focus.
		<b>Option -II</b>
		Fully Microprocessor controlled X-ray generator with sealed X-Ray tube compatibility (i) Voltage range 20-50 KV or higher . (ii) Current range 20-50 mA or higher. (iii) Power rating 1 kW or higher (i) Appropriate sealed Cu target based glass/Ceramic X-ray tube with line/ fine and point focus.
3	<b>Goniometer</b>	(i) Vertical Goniometer with theta-theta or theta-2theta geometry with independent movements of each arm controlled by computer. (ii) Two theta range: Minimum - (-3 to 145 deg.) or better. (iii) Angular reproducibility: +/- 0.001 deg. or better. (iv) Minimum step size should be 0.0001 deg or better. (v) Goniometer diameter: Minimum 475 mm or above.
4	<b>Sample Stage</b>	(i) Standard Sample stage for flat, powder and capillary samples. (ii) SAXS stage with all necessary accessories
5	<b>Detector</b>	(i) 1D solid state detector based on Si strip (iv) Standard Sample stage for flat, powder and capillary samples. (v) SAXS stage with all necessary accessories (iv) 1D solid state detector based on Si strip

		<p>technology should be quoted in the main instrument</p> <p>(ii) Detector should work in both scanning and fixed mode</p> <p>(iii) Detector should have minimum 150 or more detection channel and maximum performance guarantee for detector.</p> <p>Suitable beam optics for powder, thin film and capillary samples and SAXS measurements.</p> <p>X-ray radiation ensuring negligible radiation outside the cabinet with less than 1 microsievert/10cm distance.</p>	<p>technology should be quoted in the main instrument</p> <p>(v) Detector should work in both scanning and fixed mode</p> <p>(vi) Detector should have minimum 150 or more detection channel and maximum performance guarantee for detector.</p> <p>Suitable beam optics for powder, thin film and capillary samples and SAXS measurements.</p> <p>X-ray radiation ensuring negligible radiation outside the cabinet with less than 1 microsievert/10cm distance.</p>
6	<b>Beam Optics</b>	<p>Suitable beam optics for powder, thin film and capillary samples and SAXS measurements.</p> <p>X-ray radiation ensuring negligible radiation outside the cabinet with less than 1 microsievert/10cm distance.</p>	<p>Suitable beam optics for powder, thin film and capillary samples and SAXS measurements.</p> <p>X-ray radiation ensuring negligible radiation outside the cabinet with less than 1 microsievert/10cm distance.</p>
8	<b>Software</b>	<p>Data acquisition and processing:</p> <p>(i) Fully automatic profile fitting with Rietveld analysis</p> <p>(ii) Integrated intensity calculation</p> <p>(iii) Background subtraction and smoothing</p> <p>(iv) <math>K\alpha_2</math> elimination and peak search</p> <p>(v) ICDD, ICSD &amp; crystallography open database access</p> <p>(vi) <math>\theta</math> or <math>2\theta</math> correction</p> <p>(vii) Pattern simulation from d-I list</p> <p>(viii) 3D multiple pattern display</p> <p>(ix) Crystal structure data input and output</p> <p>(x) 3D crystal structure display</p> <p>(xi) Reference intensity ratio (RIR) quantitative analysis</p> <p>(xii) SAXS analysis</p> <p>NIST traceable XRD standard: Corundum/Silicon.</p>	<p>Data acquisition and processing:</p> <p>(xiii) Fully automatic profile fitting with Rietveld analysis</p> <p>(xiv) Integrated intensity calculation</p> <p>(xv) Background subtraction and smoothing</p> <p>(xvi) <math>K\alpha_2</math> elimination and peak search</p> <p>(xvii) ICDD, ICSD &amp; crystallography open database access</p> <p>(xviii) <math>\theta</math> or <math>2\theta</math> correction</p> <p>(xix) Pattern simulation from d-I list</p> <p>(xx) 3D multiple pattern display</p> <p>(xxi) Crystal structure data input and output</p> <p>(xxii) 3D crystal structure display</p> <p>(xxiii) Reference intensity ratio (RIR) quantitative analysis</p> <p>(xxiv) SAXS analysis</p> <p>NIST traceable XRD standard: Corundum/Silicon.</p>
9	<b>Calibration</b>	<p>NIST traceable XRD standard: Corundum/Silicon.</p>	<p>NIST traceable XRD standard: Corundum/Silicon.</p>

	<b>Standards</b>	
10	<b>Chiller Unit</b>	Suitable compact indoor chiller unit for smooth running of XRD must be offered from an ISO certified company. If chiller is not required then complete cooling specification must be clearly mentioned.
11	<b>Documentation</b>	The documentation should be provided in Hardcopy and Softcopy.
12	<b>Computer</b>	Compatible computer with minimum 8 GB RAM DDR3 and extendable, 1TB Hard Disk, Microsoft Window 7 or 8.1 (Compatible with software supplied with the XRD), two 21" Color LED Monitor, DVD writer, wireless Mouse / Keyboard Control and Colour printer.
13	<b>Installation &amp; Commissioning</b>	The instrument to be installed, tested and commissioned by principal or Indian authorized representative of manufacturer.
14	<b>Training</b>	Training for Operation, Software, Handling of Optics / X-Ray Tube / Detector and Maintenance at the site of installation at least for one week or more should be provided.
15	<b>Warranty</b>	The vendor should give warranty for complete system for minimum <b>12 months</b> after successful installation/commissioning with no cost for any repair work/part replacement during this period.
16	<b>UPS</b>	Suitable UPS (Min. <b>10</b> KVA) with 30 min. backup as per the need of XRD system
17	<b>Supply Under Warranty</b>	Supply of the failure part under warranty period is must by the supplier. No duties, handling and transport charges or

	<p>or any other charges will be bearable by the institute.</p> <p>(i) Reflection &amp; Transmission Spinning stage with complete transmission setup including transmission sample holder &amp; foil Transmission setup in Horizontal and Vertical mode.  (ii) Scintillation detector with counting system  (iii) Additional sealed glass/ceramic X-ray Tube  (iv) Additional warranty for 2<sup>nd</sup> year should quote separately.  (v) Recommended spares for future maintenance.</p>	<p>any other charges will be bearable by the institute.</p> <p>(i) Reflection &amp; Transmission Spinning stage with complete transmission setup including transmission sample holder &amp; foil Transmission setup in Horizontal and Vertical mode.  (ii) Scintillation detector with counting system  (iii) Additional sealed glass/ceramic X-ray Tube  (iv) Additional warranty for 2<sup>nd</sup> year should quote separately.  (v) Recommended spares for future maintenance.</p>
<p><b>Optional</b></p>	<p>(i) Reflection &amp; Transmission Spinning stage with complete transmission setup including transmission sample holder &amp; foil Transmission setup in Horizontal and Vertical mode.  (ii) Scintillation detector with counting system  (iii) Additional sealed glass/ceramic X-ray Tube  (iv) Additional warranty for 2<sup>nd</sup> year should quote separately.  (v) Recommended spares for future maintenance.</p>	<p>(i) Reflection &amp; Transmission Spinning stage with complete transmission setup including transmission sample holder &amp; foil Transmission setup in Horizontal and Vertical mode.  (ii) Scintillation detector with counting system  (iii) Additional sealed glass/ceramic X-ray Tube  (iv) Additional warranty for 2<sup>nd</sup> year should quote separately.  (v) Recommended spares for future maintenance.</p>
<p>18</p>	<p>(i) Reflection &amp; Transmission Spinning stage with complete transmission setup including transmission sample holder &amp; foil Transmission setup in Horizontal and Vertical mode.  (ii) Scintillation detector with counting system  (iii) Additional sealed glass/ceramic X-ray Tube  (iv) Additional warranty for 2<sup>nd</sup> year should quote separately.  (v) Recommended spares for future maintenance.</p>	<p>(i) Reflection &amp; Transmission Spinning stage with complete transmission setup including transmission sample holder &amp; foil Transmission setup in Horizontal and Vertical mode.  (ii) Scintillation detector with counting system  (iii) Additional sealed glass/ceramic X-ray Tube  (iv) Additional warranty for 2<sup>nd</sup> year should quote separately.  (v) Recommended spares for future maintenance.</p>

**NOTE:-**

**\*\* All vendors must quote their most advanced version and certify in the quotation that the quoted model is the latest and with highest capabilities. Spares availability of the said model to be supplied for next 10 years. Offer may be rejected if latest & Best available model will not be quoted.**

**\*\* Critical components/accessories extended guarantee/warranty will be welcome and important for NPL Order finalization.**

**\*\*Final selection of option for the tendered equipment will be the discretion of NPL.**

**SPECIFICATION OF Gas Chromatograph (GC)**

1	<b>General</b>	(a)	Gaseous Ambient volatile Organic Compounds (VOC) collected in Canisters. Analysis of C <sub>2</sub> -C <sub>12</sub> in the ambient air.
		(b)	Retention time repeatability ≤ 0.15% RSD
		(c)	Area Repeatability ≤ 5% RSD
2	<b>Injector</b>	(a)	Type Spilt/Splitless = 2 Nos
		(b)	Temperature (Max) ≥ 350°C
		(c)	Carrier Flow setting Range 0-100 ml/min or better
		(d)	Pressure settable range 0-50 PSI or higher
		(e)	Carrier flow range 0-50 ml/min or better
3	<b>Column</b>		Suitable column for detection of non-polar and polar volatile organic compounds (C <sub>2</sub> -C <sub>12</sub> )
4	<b>Column oven</b>	(a)	Temperature Range (1) Ambient : 15°C to 350°C or better (2) Liquid N <sub>2</sub> (sub ambient) -80°C to 350°C or better
		(b)	Temperature Set point Resolution ≤ 1°C
5	<b>Detectors</b>	(a)	Flame ionization Detectors =2 Nos
		(b)	Detection Limit ≤ 3 pgC/sec
		(c)	Temperature (Max) ≥ 350°C
		(d)	Dynamic Range ≤ 10 <sup>5</sup>
6	<b>Sample pre-concentrator and injection System</b>	(a)	Thermal Desorption system or equivalent
		(b)	Transmission of air samples from canisters and injection to GC for detection and quantification of Volatile Organic Compounds.  Appropriate number of channels for sequencing between samples, zero and standard air/gas streams during unattended analysis of the samples should be provided.
		(c)	Suitable Cold trap or cryofocussing trapping system with cryogenically or Thermo Electrically cooled for pre-concentration of sample to detect and quantify Volatile Organic Compounds
		(d)	Suitable arrangement for the removal of H <sub>2</sub> O from air samples without disturbing polar molecules.
		(e)	The system should be synchronized with GC for operation
7	<b>Power</b>	(a)	230±10% VAC, 50±5% Hz
8	<b>Spares and accessories</b>	(a)	All the necessary spare parts, accessories and consumables required for installation and commissioning must be provided by the bidder.  Item wise quote should be provided
9	<b>Software/ Data handling/ Manuals</b>	(a)	Operating and service manuals
		(b)	Required software for instrument control, data acquisition, data processing and data analysis, report generation, file processing, hardware functions, network compatibility, maintenance guide, additional diagnostics tests built in for hardware fault detection
		(c)	Software should be capable of running all channels simultaneously and synchronization of the sample pre-concentration and injection system with GC
10	<b>Warranty</b>		One year
11	<b>Training</b>	(a)	Onsite training on operation of GC should be provided

12	Optional	<p>(a) Performance evaluation for instrument quantification (IQ), performance quantification (PQ), Operation Quantification (OQ) during installation and commissioning</p> <p>(b) Annual Maintenance Contract for three years after the warranty period</p> <p>(c) Branded 5 KVA UPS for power backup of 30 minutes for GC</p> <p>(d) Price may be quoted for the following columns:</p> <ul style="list-style-type: none"> <li>➤ Hayesep-A (12 feet, 1/8" OD, 80/100 mesh) –One No</li> <li>➤ HayeSep-D (12 feet, 1/8" OD, 100/120 mesh)- One No</li> <li>➤ Molecular Sieve 13X (10 feet, 1/8" OD, 80.100 mesh) One No</li> <li>➤ Capillary –GC Alumina (0.53 mm, 30 m) One No</li> <li>➤ DB1- (0.032 mm, 60m) –One No</li> <li>➤ Capillary PLOT Alumina/KCL (0.32 mm 50 m)- One No</li> </ul> <p>(e) Necessary spare parts, accessories and consumables for three years trouble free operations after warranty period</p> <p>(f) Hydrocarbon gas mixture of calibration gases for volatile organic compounds (VOC) traceable to a National Metrology Institute (NMI) in cylinder of 10L water capacity</p> <p>(g) Latest branded PC with 21" TFT monitor or better and Laser Printer with preloaded licensed version operating System (OS) software for data processing</p>
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