Central Glass & Ceramic Research Institute
KOLKATA (WEST BENGAL) INDIA

CORRIGENDUM

REFERENCE NO. :- P/NC/06/SB/DB/GTE/24-25

DATE: 19/06/2024

NAME OF ITEM: "HIGH RESOLUTION TRANSMISSION ELECTRON MICROSCOPE WITH FIELD EMISSION GUN (FEG-HRTEM) AND STEM EDS ETC. -1 NO."

CONSEQUENT TO THE PRE-BID MEETING HELD ON 12/06/2024 AGAINST OUR TENDER ENQUIRY No. P/NC/06/SB/DB/GTE/24-25 DT. 03/06/2024, the revised technical specifications are given in Annexure-1 of this Corrigendum.

Bidders are requested to submit their offers based on the revised technical specifications given in Annexure-1 of this Corrigendum.

19.06.2024

(Anjani Kr. Pandey)
Stores & Purchase Officer

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ANNEXURE – 1

Name of the Equipment:

High Resolution Transmission Electron Microscope with Field-Emission Gun (FEG-HRTEM) and STEM–EDS

Scope of work: Supply, installation and commissioning of FEG-HRTEM with STEM-EDS.

Indented use: Microstructural and atomic imaging, diffraction, and composition analysis of metallic, ceramic and semiconductor materials using Energy Dispersive X-ray Spectroscopy (EDS)

Technical Specifications:-

Sl. No.	Features	Specifications
1.	Electron Source / Gun	• High Brightness Field-Emission Gun (FEG) • Energy spread of $\leq$ 0.8 eV • Highly stable electron source • Probe current: 0.5 nA or higher at 1 nm probe size at 200 kV
2.	Vacuum of Electron-Gun area	Vacuum pump for Electron-Gun vacuum: Ion-Pumps FEG gun area vacuum: $\leq 1 \times 10^{-7}$ Pascal
3.	Accelerating Voltage	Selectable range: 80kV or lower to 200 kV or higher, in steps. (Pre-aligned at 80 kV and 200 kV)
4.	Operation Modes	HRTEM, TEM, BF, DF, HAADF, Diffraction, CBED, SAED, STEM, EDS. Fully digital microprocessor controlled TEM.
5.	Image Resolution	HRTEM image resolution: • Point resolution: $\leq$0.25 nm, • Lattice resolution: $\leq$0.12 nm
		STEM-HAADF Image resolution: $\leq$ 0.2 nm
6.	TEM Magnification	50x to 1,000,000x or, greater range (variable in steps)
7.	Camera Length for Diffraction	≤200 mm to ≥1500 mm

8.	**Image rotation-free Electron-optical Lens system**	i) The electron-optical lens system should be Image rotation-free at least within 20,000x - 400,000x magnification range or, higher in TEM mode. ii) Suitable Condenser, Objective, Intermediate, Projector Lens configurations to achieve the best possible resolution. iii) Capable of BF, DF, SAD, CBED, micro/nano-Diffraction imaging. iv) Automated alignment and astigmatism correction for the pre-aligned configurations.
9.	**Apertures of different selectable sizes**	• Condenser apertures of at least 4 different selectable sizes including those suitable for CBED, micro- and nano-diffraction • Objective apertures of at least 4 different selectable sizes for high-contrast BF and HREM images • Diffraction apertures of at least 4 different selectable sizes. The smallest size should be able to select 100 nm diameter of image area
10.	**Image recording / Camera system**	i) Bottom mounted retractable High resolution CMOS camera of at least 16 megapixel (4K x 4K) with detector active area of at least 36mm x 36mm, or larger with Live Drift correction with at least 20 frames per second (fps) at 4k x 4k readout and capable of recording both image and diffraction pattern. ii) Digital imaging system usable over the entire voltage range (80KV to 200kV or higher) iii) Automated tomography data collection
11.	**STEM Magnification**	Up to 1,000,000x or, more (variable in steps)
12.	**STEM imaging detectors**	i) High-Angle Annular Dark-Field (HAADF) ii) Annular Dark-Field (ADF) iii) Bright-Field (BF) iv) Dark-Field (DF)
13.	**Goniometer Specimen Stage**	• Side-entry eucentric specimen stage with liquid-Nitrogen cooled anti-contamination device • Piezo-driven / motorized goniometer specimen stage for jerk-free precise specimen translation movements with nanometer scale precision along X, Y, Z directions. Specimen tilt angle backlash should be less than 0.2 degrees. • Specimen movement range : -1mm to +1mm (or, wider range) along both the X- & Y- axes, and -0.2mm to + 0.2m (or, wider range) along Z axis. Goniometer specimen tilt-angle range: -30° to +30° or greater range.
14.	**Specimen Anti-contamination Device**	• The Dewar of Anti-contamination Device, once filled, should be capable of retaining Liquid-Nitrogen for at least 9 hours or, more.

15.	**Energy Dispersive X-ray Spectrometer (EDS)**	• Liquid N_2-free Silicon Drift Detector (SDD). • The detector active area should be at least **100 mm²** or larger for handling high count rates, and should be sensitive to detect weak x-ray signals. • Solid Angle of collection: 0.9 steradian or, more • Capability to detect elements of atomic number ≥ 5 (i.e. from Boron onwards) • Spectrum Resolution <130 eV at Mn-Kα. • The detector should be capable of handling a count rate of at least 100,000 cps or, higher. • Acquisition and analysis software with the following features: o Quantitative elemental composition through EDS point analysis o Elemental mapping & saving of Quantitative colour maps of elements o Drift correction for prolonged acquisition of map and line-scan
16.	**Specimen Holders**	• **Two (02)** numbers of low-background double-tilt specimen holders with tilt-angle ('y-tilt' or, 'beta-tilt) range: -30° to +30° or, more and compatible with EDS analysis • **One (01)** number of tomography holder, EDS compatible.
17.	*System Control*	i. Windows-based complete software (licensed) package for TEM control, data acquisition, analysis and display ii. Software should be capable of image processing, EDX analysis; electron based imaging and SAED, CBED. iii. Diffraction analysis software with two off-line licenses of lifetime validity iv. With provision for future up-gradation PC Control System: electron-optical system, evacuation system, electron gun, goniometer stage, etc.
18.	*Computer hardware and software*	• Branded (HP/IBM/DELL) PC /server : Windows 10 or, higher with the latest hardware and software Configuration. • SDD/HDD 4.0 TB of minimum storage capacity • Suitable Server/computer for EDS spectroscopy and analysis • All softwares used for operation of the instrument, acquire and process the data should be based on 64-bit Windows platform or, compatible. • CD/DVD reader and writer combo • 24" or larger. display monitor. • Separate PC similar to above configuration for EDX and data analysis • All control, data acquisition, analysis and diagnostics software must be loaded and tested on the computer. • Automated data collection and 3D reconstruction software must be provided for tomography • Diffraction Simulation Software
16	**EMI Shielding**	The complete system, including accessories and control units, must be properly shielded from EMI interference.
17	**Oil-free Silent Air Compressor**	The compressor, which is used for operating the pneumatic valves, should be noise-free and oil-free

18	**Water Recirculating Chiller**	The water chiller for circulating cold water should be able to maintain the desired water temperature within ±0.5°C /hr or less on full load.
19	**Uninterrupted Power Supply (UPS): 2 Nos.**	• **1no. Branded online UPS systems** (3phase-Input, 1phase-Output) of adequate rating to support the TEM and all its accessories and supporting systems, with batteries of reputed brand with One Hour back-up. • 1no. UPS of appropriate Wattage separately for supporting the Chillers and Microscope for at least with One Hour back-up.
20	**Power Supply available at purchaser's site**	• 3phase, 50Hz, 400V ±8% • 1phase, 50 Hz, 230-250 volts. • All power supplies must comply with Indian standard
21	**Gas system**	1. **Must include SF_6 gas Cylinder and regulator with pipeline and manifold** 2. **Must include Regulator for N_2** gas cylinder with pipeline and manifold
22	**Spare-parts Kit, and consumables**	• Standard **Copper Grids**, Center-Marked Grids, 300 mesh, 3.0mm O.D. with Carbon film support: **500 Nos** • Standard **Copper Grids**, Center-Marked Grids, 300 mesh, 3.0mm O.D. with Ultra-thin Carbon film support: **500 Nos** • **5-post FIB M-Grids:** 200 Nos. • Vacuum tweezer – 1 no. and titanium tweezers: 5 Nos.
23	**Calibration Standards**	The following TEM sample calibration standard should be given: a) Nanocrystalline gold Resolution and magnification calibration standard grating replica sample b) Rotation Calibration Standard MoO_3 sample c) Single and Multi-element standards for EDS. d) STEM standard: Si 110 dumbbells for STEM resolution.
Warranty, Installation, Training and Services		
24	**Warranty**	➢ **One-year standard comprehensive warranty including Electron Gun and Spares & all accessories** ➢ **Three years extended comprehensive warranty including Electron Gun and Spares & all accessories (after one-year standard Company warranty)**
25	**AMC Requirement**	➢ **The total AMC Charges for 3-years period after completion of the three-year extended warranty must be quoted.**

26	**Utilities and installation Environment**	➢ Pre-installation requirements such as room size, tolerable limits of EM field and vibration (mechanical), required power-rating, utility requirements are to be stated clearly, and to be verified / surveyed by the supplier at the installation site. ➢ Environmental requirements such as temperature, humidity etc., for smooth operation of the FEG-TEM-EDS system should be clearly provided.
27	**Installation, commissioning & Demonstration**	➢ Installation, complete interfacing of the system with its sub-systems, and commissioning to be carried out by the vendor's factory trained engineers, followed by a demonstration of the system's performance fully in accordance with the specifications and equipment capabilities.
28	**Acceptance and Performance**	➢ Demonstration of resolution value of HRTEM and STEM images with standard sample ➢ Demonstration of EDS resolution with standard EDS sample (Standards are to be supplied along with TEM)
29	**Training**	➢ Comprehensive training by experienced and qualified engineers on the operation, basic maintenance of the system (for both the hardware and software) and trouble-shooting must be provided on-site for **3-4 persons at CSIR-CGCRI**.
30	**Compliance Statement**	➢ **Written Certificate** from the Principals must be provided guarantying **at least 10 years of service, support and availability of spare parts** including TEM hardware and accessories from the date of Installation & commissioning. ➢ The supplier must submit technical brochures and proper application notes adequately explaining and confirming the availability of the features in the offered model of the equipment. All necessary supporting documents for supporting specification given in the offer must be submitted along with the bid. ➢ The supplier must submit with the bid a technical compliance statement in tabular form indicating the compliance of the technical specification of the bid against each technical specification provided in the tender. ➢ Features not matching – must be clearly indicated. ➢ Additional features offered which are better than the indented specification must be clearly mentioned.
31	**User List & After Sales Service**	➢ The supplier must submit a comprehensive list of users of similar instruments in India for the last five years along with contact details.
32	**Vibration proof structure and anti-vibration platform**	The FEG-HRTEM equipment should have vibration proof structure. In addition, anti-vibration platform must be provided.

The above amendments shall amount to amendments of the relevant terms of our Bid Document for CGCRI Tender No. **P/NC/06/SB/DB/GTE/24-25 DT. 03/06/2024.**
All the other Tender terms remain unchanged.

19.06.2024

(Anjani Kr. Pandey)
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