

Specifications for High Resolution Transmission Electron Microscope

General:

High Resolution PC controlled Analytical 200 KV Transmission Electron Microscope with CCD camera, STEM with bright field and dark field imaging, and Energy dispersive X-Ray Micro analysis system. The TEM should allow up gradation to allow an Energy loss spectrometer for elemental analysis with mapping to be added at a later date.

TEM:

Resolution:

Point resolution: 0.19nm or better (It should be better than this)

Lattice resolution: 0.14nm or better

Optics:

Focal length: 1.9mm

Cs: 0.5mm

Cc: 1.1mm

Focus step: 1.mm minimum

Acceleration voltage: As appropriate with minimum step level of 50V

Magnification: x50-1,500,000 or higher

Specimen Stage:

Type: side entry eucentric goniometer with motorized movements

XV Movement: 2mm or more

Tilt (XIV): $\pm 25^\circ/\pm 25^\circ$

Essential features

- Pre-centered single crystal LaB6 cathode
- Anti-contamination device
- Peizo Controlled stage movement
- Minimum dose system for imaging beam sensitive specimens
- Anti vibration air mount for the column
- Optimized optical settings to carry out TEM, EDS, Convergent beam diffraction and Nano beam diffraction should be available at a click of a button. The choice to select these modes manually and through the software must be available.
- Minimum Spot Size: 20nm ϕ or less at TEM mode, 0.5nm or less at EDS, CBD and NBD mode
- Stability for Accelerating Voltage: 2 ppm/min. (peak to peak) or better
- Convergent Angle for CBED: 1.5 to 20 mrad or more
- Acceptance Angle for CBED: $\pm 10^\circ$ or more
- Aperture to protect EDS detector from scattered X-ray, reducing system noise and enhancing P-B ratio

STEM Attachment

Digital STEM with Bright field and High Angle Annular Dark Field Imaging is needed. The STEM specifications are as follows:

Resolution STEM image : 1.0nm
Acceleration voltage : 80, 100, 120, 160, 200, kV

Magnification Low Mag:

Low Mag : 100x to 15,000x
Mag: : 20,000x to 2,000,000x

Scanning system

Scanning modes: Digital scan
Image scan
Line scan
Spot
Externally controlled scan

Image display

Image display method: Frame memory (digital)
Image observation device: TEM basic unit monitor
Image recording device: TEM basic unit PC hard disk

Detector: Transmitted electron detector,
Scintillator and PMT
(Photomultiplier tube)

The following accessories should be quoted as standard with the system:

- A low background Beryllium holder
- A specimen cooling holder for low dose or beam sensitive specimen samples like polymers
- CCD Camera: A CCD Camera should be offered. However, the camera must be such so as to allow simultaneous installation of EELS at a later date.
- Beam selection feasibility
- SAED option
- HAADF option

EDS Microanalyser System.

EDS system with 50mm² EDS Detector with LN₂ alternatively with 80mm² LN₂ free detector.

50mm² detector with LN₂

- The EDS detector has Si(Li) crystal having 50mm² area for higher throughput at lower beam currents. The EDS detector resolution is 138eV or better and it is thermally recyclable. The EDS detector window allows detection from Boron upward

- The EDS detector has Automatic software controlled crystal conditioning to remove ice to maintain performance for low atomic no. elements. The EDS detector monitors LN2 level all the time to provide safety against LN2 dry-ups.
- The EDS detector and it's associated electronics ensures < 1 eV shift in peak position at higher count rates.
- The EDS system software allows elemental analysis and elemental mapping facility. The EDS system is supplied with hardware for mapping applications, in case TEM don't have Beam scanning capability. (STEM Unit).
- The system software has a facility to track and correct the image shift during longer acquisition time required for critical mapping applications.

Appropriate column control has to be provided for

The camera specifications have to be indicated clearly

The installation details have to be provided for the instrument arrives

The necessary site specifications have to be spelt out clearly

Site preparation and inspection should be carried out at appropriate time

The warranty must be at least for 3years and the instrument has to be maintained even after the warranty period.

For the initial period of 2 years the instrument should be operated by a trained person from the supplier and also train our personnel.

Please add all other accessories necessary for optimal operation of the system. Main TEM and all options should be quoted separately. The offer should be two bid system with technical and financial bids sealed in separate cover and both put in a single sealed cover and addressed to Special Officer Project Purchase, ICSR, IITM, Chennai-600036.