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Technical specifications for contract provision of a Dual beam scanning electron microscope with advanced microanalysis capabilities.

By submitting a tender, the participating bidders accept the technical specifications established herein, which are considered the minimum compulsory requirements.

Any proposal that does not comply with the minimum requirements set out in these technical specifications will be excluded from the procurement procedure.

1. Subject of the contract or need of the contracting authority

The purpose of these technical specifications is to establish the particular conditions that will govern the provision of a Focused Ion Beam Microscope with advanced microanalysis capabilities

2. Activities and functions of participating bidders

Bidders must take on the following functions:

- Provide a field emission scanning electron microscope with focused ion beam (FIB FESEM) as detailed:
- Include in the FIB FESEM, at least: one Tof-Sims, one EDS, one EBSD, one WDS, one STEM and one nanomanipulator as detailed in the technical requirements.
- Include in the FIB FESEM, at least: software to acquire automatically and simultaneously 3D topography, EBSD and EDS for their posterior reconstruction, software to acquire automatically and simultaneously images and EDS of large areas for their posterior automatic stitching, software for FIB cutting tomography and lamella preparation, software for sectioning and three-dimensional reconstruction of structures (tomography) and composition (compositional tomography) and include a specific software for Automatic Mineralogy Analysis.



- Provide a scanning electron microscope (SEM) to house a nanoindentation instrument as detailed in the technical requirements.
- Provide a magnetic field compensator to protect the FIB FESEM.
- Install both microscopes in the Microscopy Service of the Materials Science and Engineering Department of UPC.
- Provide training in use of the instruments and detectors

The tenders submitted by participating bidders must cover all the activities and functions mentioned in these technical specifications and in the special conditions for public contracts, all of which are compulsory for a tender to be admitted.

3. Compulsory general technical requirements of the provision and/or performance criteria or functional requirements of the provision

Bidders must have the sufficient technical, material and qualitative means and human resources to carry out the tasks that are the subject of this contract.

The service regulated in these specifications must meet, at a minimum, the following technical requirements, without prejudice to the award criteria:

FIB FESEM

Chamber and stage

- Include a high vacuum sample chamber with the size and availability of proper ports to host simultaneously EDX, EBSD, ToF SIMS, WDS, STEM and room temperature nanomanipulator.
- Reproducibility of the sample stage of at least 2µm at full range travel.
- Include a Secondary Electron (SE) detector in the chamber.
- Include a Backscatter Electron (BSE) detector in the chamber.
- Include a Standalone Low Energy BSE with 0,1 Z resolution, in the chamber.
- Include a Scanning Transmission Electron detector (STEM) with bright field, annular dark field, high angle annular dark field.



- Include a necessary set of sample holders.
- Include an integrated plasma cleaner.
- Include an integrated active anti vibration system
- Include a gas injection system fully controlled by microscope software to allow automatic procedure.
- Nanomanipulator with a closed loop linear piezo movement with at least a resolution of 5 nm and 100 nm of omnidirectional repeatability.

Electron column

- Electron beam landing energy at the sample in the range of 50eV-30keV at least.
- Resolution at least 1,2 nm at 1 kV.
- Continuously adjustable beam current, at least, from 2pA to 300 nA.
- Include a Secondary Electrons (SE) detector in the column.
- Include a Backscattered Electrons (BSE) detector in the column.
- Column without any mechanical centering element to allow fully column automatic setup and alignment.
- Availability of stage bias mode.
- Magnification range, at least 2 x - 1.000.000 x
- Field of View: 7 mm at Working Distance (WD) = 6 mm and more than 50 mm at maximum WD.
- Effortless and precise SEM navigation on the sample at magnifications as low as 2× without the need for an additional optical navigation camera.
- Include a fully motorized 5-axis sample stage,compucentric in focus after rotation and tilt.

Automated and Semi-Automated Routines

- FESEM and FIB emission control.
- Electron gun and column alignment.
- Contrast and brightness, autofocus.
- Electron beam spot optimization.
- Ion beam spot profile optimization.
- FIB-FESEM intersection finder.
- GIS nozzle positioning and temperature control.



FIB column

- Gallium liquid metal ion source FIB ion column with 2,5 nm resolution.
- Ion beam energy range: 500 eV–30 keV
- Probe current: < 1 pA–100 nA.
- Piezo-motorized apertures and electrostatic beam blanker with integrated Faraday cup.

Microanalysis detectors

The main instrument has to include the following microanalysis detectors with the following requirements:

- EDS with large area analytical silicon drift detector with at least 100mm² of area window.
- EBDS with high speed, high resolution and high throughput.
- WDS high resolution.
- ToF SIMS: Time of Flight Secondary Ions Mass Spectroscopy spectrometer.
- The instrument has to make 3D compositional topography of EDS and EBDS using static 3D EDS and 3D EBDS method, where the sample remain at a fixed static position method for detection for highest speed and highest precision. Also it has to make automatically and simultaneously the acquisition of large areas of images and EDS for their posterior automatic stitching.

Software

- Full software integration of the room temperature nanomanipulator in the microscope control software.
- The instrument has to have the capacity to acquire 8 channels simultaneously with the SEM control software
- Apparatus and computer application necessary to control and operate the microscope.
- Software to acquire automatically and simultaneously 3D topography, EBSD and EDS for their posterior reconstruction.
- Software to acquire automatically and simultaneously images and EDS of large areas for their posterior automatic stitching.
- Software for FIB cutting tomography and lamella preparation.
- Software for sectioning and three-dimensional reconstruction of structures (tomography) and composition (compositional tomography).
- The instrument has to include a specific software for Automatic Mineralogy Analysis.
- Automation and programming interface.
- Remote control software for diagnosis or application support.



The instruments (main and nanoindenter complementary SEM) should include a double realtime crash protection functionalities:

Integrated pA meter with touch alarm function

o 3D Collision Model with 3D CAD real time simulation of all detectors and sample size dimensions and position to prevent collisions.

SEM

Scanning electron microscope (SEM) with vacuum sample chamber with the size and availability to install a nanoindentation instrument with the capacity to work up to 800°C.

4. Work program

A work program must be delivered right after the outcome of the tender, and must include a complete schedule with all activities and their execution times.

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Barcelona, digitally signed