THE FIFTH GENERATION ELECTRON PROBE MICRO ANALYSER SX FIVE from CAMECA(France) in CRF, ISM

The **Central Research Facility (CRF)** of Indian School of Mines, Dhanbad has installed Fifth Generation Electron Probe Micro Analyser **SX Five** from **CAMECA** France equipped with five Wave length dispersive Spectrometers, BSE Detectors, SE Detectors, cathodoluminance and sophisticated visible light optics providing image magnification ranging from 40 to 400,000.

Detail of the specifications of EPMA is as follows:

SX- Five with W Column

Maximum Accelerating Voltage: 30KV
Beam Diameter in Analytical Mode: 600 nm @ 15 KV, 100nA
: 400 nm @ 10 KV, 10nA
Maximum Beam Current: Up to 10 uA
Beam Stability: +-0.5% per hour @ 20kV, 20nA

SX- Five with LaB6 Column

Maximum Accelerating Voltage: 30KV
Beam Diameter in Analytical Mode: 100 nm @ 20 KV, 10nA
: 200 nm @ 10 KV, 10nA
Maximum Beam Current: Up to 1 uA
Beam Stability: +-0.2% per hour @ 20kV, 10nA

For analysis rates and getting slot please see the indent form and rules in Page 3 and 4.

Introduction to EPMA

Qualitative and Quantitative Elemental Micro-Analysis

EPMA works by bombarding a micro-volume of a sample with a focused electron beam (typical energy = 5-30 keV) and collecting the X-ray photons thereby emitted by the various elemental species. Because the wavelengths of these X-rays are characteristic of the emitting species, the sample composition can be easily identified by recording WDS spectra (Wavelength Dispersive Spectroscopy). WDS spectrometers are based on the Bragg's law and use various moveable, shaped monocrystals as monochromators.

- EPMA is a fully qualitative and quantitative method of **non-destructive elemental analysis of micron-sized volumes** at the surface of materials, with sensitivity at the level of ppm. Routine quantification to 1% reproducibility is obtained over several days. It is the most precise and accurate micro-analysis technique available and **all elements from B to U and above** can be analyzed.
- EPMA is fully compatible with routine analysis sessions, with easy and direct interpretation of the results.
- EPMA instruments are equipped with a complete kit of built-in microscopy tools that allow **simultaneous X-ray (WDS), SEM and BSE imaging**, plus sophisticated visible light optics; they provide very flexible sample inspection with image magnification ranging from 40 to 400,000.
- Determination of thickness and elemental composition from nm to mm thick layers in stratified materials is possible.

Major applications are found in geochemistry, mineralogy, geochronology, physical metallurgy, nuclear metallurgy, materials science including glass, ceramics, superconductors, cements, microelectronics, biochemistry...

EPMA provides much better results than standard SEM/EDS systems. Because of the internal properties of WDS, the general sensitivity, analysis of light elements and risks of erroneous interpretation of qualitative spectra are all superior with EPMA. Spectral resolution and detector dead time are much better than EDS (Energy Dispersive Spectroscopy).
The excitation beam regulation system and sophisticated sample stage capabilities guarantee that this technique provides outstanding stability and measurement repeatability.

Indent Serial No. Date:

ELECTRON PROBE MICRO ANALYZER (EPMA) LABORATORY
CENTRAL RESEARCH FACILITY
INDIAN SCHOOL OF MINES, DHANBAD – 826004

[Please read the information given overleaf before filling up this form and put a tick (√) in appropriate box]

I wish to get ___ in words ( ) number of samples be examined/analyzed. The nature of samples is Metallic ( ), *Ceramic ( ), *Semiconductor ( ), *ICs ( ), *Composites ( ), *Geological samples ( ) or *others ( ).

[*All the samples must be in solid form and well polished. Samples in powder form are not analyzed by EPMA*].

(If others please elaborate: _____)

I wish to study the sample for (1) Imaging: BSE Z [ ], BSE T [ ], ABS e^- [ ], SE [ ], CL[ ]

(2) Quantitative analysis for Silicates [ ], Sulfides [ ], Monazite [ ] (3) Accurate Quantification of Traces such as REE, PGE etc [ ], (3) Line Profile [ ], (4) X-ray Map [ ], (5) Quantitative Mapping [ ], (6) Monazite dating [ ] (7) Age Map [ ].

[*: Carbon Coating necessary]

I need /carbon coating (Yes/No) _____ (For non-conducting samples)

_____

Please allot me slots of ……..hour/s (each slot is l hour), the estimated charge for the work is ₹_____

User's Name (block letter): _____ Name of Supervisor _____

Dept./Centre _____ Lab Phone No. _____ Cell No: _____

Signature of HOD/HOC/Guide/PI/Prof.-in-Charge Signature of the user

_____

Detail of amount deposited for the analysis

₹_____ (in wards _____) has been deposited through #DD_____ (DD number)/#cash payment in the ISM Cash counter_____(Receipt No.) on _____(date).

#(Please provide the original DD/ copy of cash receipt along with this form).

Signature of the user

_____

Please allot time and complete the work.

Signature of the Laboratory In-Charge

_____

The above work has been done satisfactorily on_____(Date) within _____number/s of slot and generated data has been delivered to me.

Signature of the Operator Signature of the user

INFORMATION FOR USERS

The charges for the Imaging (BSE Z , BSE T , ABS e^- , SE , CL), Quantitative analysis (Silicates, Sulfides, PGE and REE), Line Profile , X-ray Mapping, Quantitative Mapping, Monazite dating, and Age mapping are as follows (per hour long slot) in ₹:

Users	Rs (₹)Per Hour
For users of ISM (Students/Research Scholars/ Faculty)	500/-
ISM Consultancy	1000/-
For Students/Research Scholars outside ISM	1000/-
Educational and Govt R&D Labs (Faculty/Scientists)	1500/-
For Industry*	3000/-

(No TAX is required for users of ISM)

*The charges are excluding TAX. TAX may be calculated as 12.36%.

#User must come with prepared samples in the form of Thin polished sections (Size: 4.5Cm×3.5Cm) or cylindrical shaped polished slabs (Size: 2.5Cm Dia/ maximum 2cm thick or less). Samples in powder form are not analyzed by EPMA.

Booking Rules for EPMA

1) The EPMA instrument is available for booking every week as follows: Total 10 halves / sessions in 5 working days (Monday - Friday). Each session is for three hours or 3 slots (including sample mounting, sample insertion, venting and data collection time). At any given point of time, two thin polished sections slides or four polished slabs can be inserted to the instrument but only one of them can be analyzed.
2) Magnetic samples may be declared properly.
3) Samples require C coating or not must be mentioned in the booking form clearly.
4) Moisture within the sample is not allowed for study. Hydrated samples must be dried properly before run.
5) Deadline for submission of slot booking forms is Thursday (up to 3 PM) of the previous week.
6) Allotment of slot will be notified at 4 PM on the next day (i.e. Friday).
7) One can get a maximum of 2 consecutive slots at a time (approximately two hours). Users who could not obtain a booking in the preceding fortnight will be given preference.
8) All payment must be made prior to booking of the slot and true copy of the payment slip (for deposit in ISM cash counter in the head of **CRF-EPMA**) or original DD (must be drawn in favor of **Registrar, ISM**) must be provided with booking form.
9) All forms must be forwarded through the concerned HOD, HOC, PI, Guide or Prof.-in-Charge etc. and to be submitted in the EPMA Laboratory.
10) In case of power shut down or unforeseen disturbances, any unutilized slot will be subsequently compensated for in the next round of booking.
11) All users should inform composition and sample details to the operator and leave a copy of the photographs/results in the laboratory for internal records (log book).
12) Generated data will be provided to the user only through the new unused blank CD. No request will be entertain for providing generated data by e-mail, pen drive, external hard disk or any other means. Thus user may bring a new CD for collection of their data.
13) All users are sincerely requested to inform the laboratory if any of the results obtained from EPMA receive special recognition (publication, award, journal-cover-page, special citation etc.) and leave a copy of their reprint, photograph or award copy with the EPMA lab for internal documentation.