



TENDER NOTICE

Sealed proposal on single stage two envelope basis (technical & financial proposals) are hereby invited by the University of Engineering and Technology, Lahore from the authorized dealers/distributors or suppliers etc, in accordance with the specification attached with Tender Document for supply of the following equipment on C&F Basis.

The proposals/Tender documents can be obtained from the day of publishing of advertisement on PPRA Website from the office of the undersigned during office hours (08:00 am to 04:00 pm) on production of tender fee receipt of **Rs. 3500/-** (Non-Refundable) deposited in the University Main Account No. **553-33** maintained with Habib Bank Ltd., Engineering University Branch Lahore, copy of the bidding documents is available for information and can also be downloaded from the university website. In case the bidding documents are downloaded from website, the required cost of the bidding documents shall be paid/deposited in UET Account No. **553-33** with HBL, Engineering University Branch Lahore at the time of submission of bids.

LIST OF EQUIPMENT

| | | |
|--|--|---|
| 1. Focused Ion Beam Scanning Electron Microscope (FIB-SEM) | 6. Ion Beam Milling Machine (IBM) | 10. Low Speed Precision Saw |
| 2. High-Resolution Transmission Electron Microscope (HR-TEM) | 7. Twin Jet Electrolytic Polisher | 11. Abrasive Cut off Machine |
| 3. Scanning Electron Microscope (E-SEM) | 8. Nano Indenter/Atomic Force Microscope (AFM) | 12. Mounting Press |
| 4. Optical Microscopes | 8. Chemical Vapor Deposition (CVD) | 13. Grinding and polishing Machines (Twin disk) |
| 5. X-Ray Diffractometer (XRD) | 9. Thermal Evaporator with Glove Box | |

The Bid security/earnest Money @ 2% of the estimated cost in shape of call deposit receipt in the name of Treasurer, UET Lahore is required to be submitted along with the Proposal/Tender, otherwise the offer shall be rejected for being non-responsive.

The last date for submission of tenders is **26-03-2018** at **10:00 AM**. The Proposals/Tenders will be opened on same day at **10:30 AM** in the Conference Hall adjacent to Vice Chancellor Office by the Central Procurement Cell in the presence of the bidders or their authorized agent who may wish to attend.

- The registered firms/companies under GST and of good repute are eligible to participate.
- No telephonic/telegraphic/email/faxed tender is acceptable.
- Procurement shall be governed by the **PPRA Rules-2014 (amended up to 2018)**

DIRECTOR

Center for Nanotechnology & Advanced
Materials Research (CNAMR)

UET, Lahore.

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UNIVERSITY OF ENGINEERING & TECHNOLOGY, LAHORE



TENDER DOCUMENT

FOR THE PURCHASE OF

LAB EQUIPMENT
ON C&F BASE

For

CENTER FOR NANOTECHNOLOGY AND ADVANCED MATERIALS
RESEARCH
UNIVERSITY OF ENGINEERING & TECHNOLOGY, GT ROAD,
LAHORE

REQUEST FOR PROPOSAL-2018

TENDER PRICE: Rs. 3,500/-

Issue date: / / 2018

Last date of submission: 26 / 03 / 2018 till 10:00 AM

FOR OFFICE USE ONLY

| | | |
|----------------------|------------------------|------------|
| Serial No. _____ | | |
| Sold to: - M/S _____ | | |
| _____ | | |
| Date of Sale _____ | Bank Challan No. _____ | Date _____ |

**CENTER FOR NANOTECHNOLOGY AND ADVANCED MATERIALS
RESEARCH
UNIVERSITY OF ENGINEERING & TECHNOLOGY, GT ROAD,
LAHORE**

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1 Invitation to Bid:

University of Engineering and Technology (UET), Lahore intends to purchase & deploy the equipment in the “**Center for Nanotechnology and Advanced Materials Research**”. UET invites the bids for the equipment from registered Firms responsible for delivery & installation of equipment at university of Engineering and Technology, Lahore according to the specifications given in the Lots as follows:

| | | |
|----------------|---|--------------|
| Lot 1: | Focused Ion Beam-Scanning Electron Microscope (FIB-SEM) | (Annexure A) |
| Lot 2: | High-Resolution Transmission Electron Microscope (HR-TEM) | (Annexure B) |
| Lot 3: | Scanning Electron Microscope (E-SEM) | (Annexure C) |
| Lot 4: | Optical Microscopes | (Annexure D) |
| Lot 5: | X-Ray Diffractometer (XRD) | (Annexure E) |
| Lot 6: | Ion Beam Milling Machine | (Annexure F) |
| Lot 7: | Twin Jet Electrolytic Polisher | (Annexure G) |
| LOT 8: | Nano Indenter/Atomic Force Microscope (AFM) | (Annexure H) |
| LOT 9: | Chemical Vapor Deposition (CVD) Equipment | (Annexure I) |
| LOT 10: | Thermal Evaporator with Glove Box | (Annexure J) |
| LOT 11: | Metallographic Sample Preparation Equipment | (Annexure K) |

- i). The Single Stage – Two Envelope Bidding Procedure shall be followed.
- ii). Responding organizations shall deliver sealed envelopes of the “FINANCIAL & TECHNICAL PROPOSALS” before or on **26-03-2018 at 10:00 AM and will be opened by the Central Procurement Cell (CPC), UET, Lahore at 10:30 AM.** The Proposals after the due date & time will not be accepted. The proposal shall be delivered to UET, Lahore before time.
- iii). The procedure for single stage two envelopes shall be as follows:
 - a) The bid shall be a single package consisting of two separate sealed and packed envelopes, clearly labeled as Technical Bid & Financial Bid.
 - b) In the first instance, the “**Technical Proposal**” shall be opened and the envelope marked as “Financial Proposal” shall be retained unopened in the custody of the CPC, UET, Lahore.
 - c) The Central Procurement Cell (CPC), UET, Lahore shall evaluate the technical proposal in the manner prescribed in the bidding document, without reference to the price and may reject any proposal, which does not conform to the specified requirements.
 - d) During the technical evaluation, no amendments in the technical proposal shall be permitted by CPC, UET, Lahore.
 - e) After the evaluation and approval of the technical proposals, the CPC, UET, Lahore shall open the financial proposal of the technically accepted bids, publically at a time, date and venue announced and communicated to the bidders in advance.

- f) The financial bids of the bidders found technically non-responsive shall be returned unopened to the respective bidders; against a written request by the technically disqualified bidder and adopting the following procedure:
- If technically disqualified bidder states that he is agreed with the decision of CPC, UET, Lahore and disqualified bidder is not filing any grievance against the decision of CPC, UET, Lahore.
 - If the bidder files grievance petition and the same is rejected by the UET, Lahore's grievance redressal committee.
 - The time for filing the grievance has lapsed.
 - The contract has been signed by UET, Lahore with the lowest evaluated bidder.
- iv). Bids for individual or multiple lots may be submitted. However, the bid for separate items from a lot will not be acceptable.

2 Instructions to Bidders:

- i). It is a sole responsibility of the bidder to examine the Tender Document, reading all instructions and terms and conditions carefully.
- ii). A tender must be accompanied by **2%** of the **estimated cost as Earnest Money** in the shape of Deposit-at-call in the name of Treasurer, University of Engineering and Technology, Lahore without which Financial Bid will not be entertained. The estimated cost for all equipment is **392.50 Million PKR**. No Bank Guarantee or any other document will be accepted.
- iii). Queries of the Bidders (if any) for seeking clarifications regarding the bidding documents of the equipment must be received in writing to the university till **13-03-2018** during office hours. Any query received after said date will not be entertained.
- iv). The Bidder should be fully and completely responsible for all the deliveries and deliverables to the University.
- v). The Primary & Secondary Contact for all correspondence in relation to this bid is as follows:

Primary Contact:

Name: Dr. Adnan Maqbool

E-Mail: adnanmaqbool@uet.edu.pk

Phone # : **042-99029207**

Secondary Contact:

Name: Dr. Asif Hussain

E-Mail: asif.hussain@uet.edu.pk

Phone # : **042-99029207**

- vi). Bidders should communicate with the Primary Contact via email only. In the case of an urgent situation where the Primary Contact cannot be contacted, the bidder may alternatively direct their enquiries via email to the Secondary Contact.
- vii). Bidders are also required to clearly mention the below in their proposals:

- a) The name & designation of the authorized representative with whom all correspondence will be carried out.
 - b) Contact Details (landline, mobile, fax, email).
- viii).** Bidders should **clearly indicate the Name and Full Address of their Principals** in favor of which L.C. shall be opened. Also a certificate in original is required showing that bidder is an authorized dealer (preferably sole agent) for the bidding equipment.
- ix).** The bidders must submit Performa invoice in original form/shape from their principals duly signed and clearly indicating:
- a) The complete specifications of each item as per tender document,
 - b) The name of the manufacturer and country of origin along-with a certificate (as under) authorizing them to quote on their behalf.
- “This is to certify that M/s _____ have obtained quotation from us against invitation to tender due on _____ and we have agreed to supply/manufacture the equipment strictly in accordance with the specifications laid down in the said invitation to tender”.*
- x).** Bidders must attach attested **Photocopies of their NTN, GST and other related certificates** with the tender.
- xi).** The tenders received through fax and e-mail shall not be acceptable.
- xii).** Country of Origin, Model, and date of manufacturing and launching / assembly of all equipment should be mentioned.
- xiii).** The equipment quoted must be from indicated country of origin, having operational as well as instructional manuals and technical drawings in English, etc.
- xiv).** Bidders must provide the list of references for installations in Pakistan / out of Pakistan for similar equipment (contact details: telephone number, email id etc.)
- xv).** UET reserves the rights to confirm the performance of supplier independently from the references in Pakistan and in the region.
- xvi).** Pre-bid meeting will be scheduled on **14-03-2018 at 12:05** pm with the bidders in conference room adjacent to VC, office.
- xvii).** Successful Bidders will provide following items:
- a) Supplier’s signed invoice should show separate value of each item duly signed in ink bearing the Bidder’s stamp.
 - b) Signed & stamped packing list should show measurement, quantity and weight of packages & their numbers.
 - c) Freight memo.

3 Terms and Conditions:

- i).** All procurements shall be governed by the PPRA Rule, 2014.(amended up to 2018).
- ii).** Bidders are advised not to quote different options for a single item (only one option is to be quoted).
- iii).** Letter of Credit will be arranged by the UET, Lahore. Insurance for transportation from the Lahore Dry Port to UET, Lahore premises will be arranged by UET, Lahore.
- iv).** The prices should be coated in foreign currency on C&F base dry port

Lahore. Exchange rates will be considered for evaluation as on the date of opening of the tenders.

- v). Custom Duties and other taxes, if any, levied by the Govt. of Pakistan shall be paid by the UET, Lahore and should not be included in the quoted prices.
- vi). The equipment must be **Brand New and Complete** with respect to all aspects bearing original packing of manufacturer, strictly conforming to the given specifications. Bidders are required to submit the following certificate along with their offer.

“It is certified that the prices quoted in the tender are final and are not in excess to the printed price list of the manufacturer. In case of any discrepancy noticed subsequently, bidder hereby undertakes to make compensation to the UET, Lahore.”

- vii). The University reserves the right at the time of award of contract to increase or decrease the quantity of equipment.
- viii). Any conditional, ambiguous, incomplete, supplementary or revised offer after the opening of tender shall not be entertained.
- ix). Any overwriting / crossing etc. appearing in the offer, may be properly signed by the person signing the tender. All pages of the tender must be properly signed.
- x). The Earnest Money shall be returned to the technically disqualified Bidders with their unopened/ sealed financial bid.
- xi). If the acceptance of tender issued during the validity period of the tender is not accepted by the bidder, the Earnest Money shall be forfeited and the equipment purchased will be at the risk and expense of the bidder.
- xii). In case the offer is withdrawn, amended or revised during the validity period of the tender, the Earnest Money shall be forfeited.
- xiii). In case, the bidder fails to execute the contract strictly in accordance with the terms and conditions laid down in the contract, the security deposited by the bidder shall be forfeited and the equipment purchased will be at bidder’s risk and expense.
- xiv). The university will get the equipment inspected at UET, Lahore, through an authorized surveyor and reject the equipment, if not found according to the given specifications.
- xv). **After Sale service and supply** of spare parts must be guaranteed for a **period of five years**.
- xvi). **Delivery period will be three months (90 days)** from the date of establishment of Letter of Credit. Suppliers may however, quote their best delivery period.
- xvii). Bidder shall be bound to provide installation/commissioning **Free of Cost on site (UET, Lahore)**.
- xviii). The technical training of such equipments shall be arranged by the company/bidder free of cost to nominated personals from UET, Lahore, onsite (mandatory) and on manufacturer site/application centre (if required).
- xix). In case of any material is found in non-conformity to the specifications provided in the tender, either on account of inferior quality, defective workmanship, faulty design, faulty packing; or is short supplied, wrongly supplied, the supplier is bound to replace such material free of charge or pay the full cost of replacement.

- xx). UET, Lahore, reserves the right to claim a penalty for compensation of losses caused by delay in the delivery of equipment that will be 0.05% per day of the total ordered cost.
- xxi). Within a week of receipt of contract, the successful bidder shall sign the contract and return it to the UET, Lahore.
- xxii). Complete specification of the equipment duly signed in ink and stamped.
- xxiii). The shipment against the contract must not take place on Indian or pro-Indian ship (Like Israel, etc.) or those ships which come to Pakistan after touching Israeli/Indian Ports.

4 Bidder's Eligibility and Qualification Criteria:

- i). Bidders must be Registered/ Incorporated under the laws of Pakistan.
- ii). Bidder's Business experience must be of at least four (4) years (Copy of work orders/contracts signed with parties in last 4 years must be provided).
- iii). Bidders must be registered for Sales Tax purposes and has valid National Tax Number (NTN).
- iv). Provides bank statements/ financial statements of last four years depicting sound financial strength.
- v). Bidder must submit bid for complete lot of equipment along with relevant bid security.
- vi). Bidder must not be blacklisted by any of Provincial or Federal Government Department, Agency, Organization or autonomous body or Private Sector Organization anywhere in Pakistan.
- vii). A letter from manufacturer or partner must be accompanied with the technical bid mentioning the bidder as sole agent/authorized partner/reseller/distributor of the product.
- viii). The bidders are required to submit the company profile including:
 - a) Technical and Engineering capabilities of the supplier (Must have trained technical experts/engineers with strong workshop backup and having at least four years experience of installation of same or similar equipment. The supporting documents are required in this regard)
 - b) Managerial capabilities of the supplier
 - c) After-sale service capabilities of the supplier

5 Tender Cost:

The Bidder shall bear all costs/expenses associated with the preparation and submission of the Tender(s) and the UET, Lahore shall in no case be responsible/liable for those costs/ expenses.

6 Preparation/Submission of Tender:

The Tender and all documents relating to the Tender, exchanged between the Bidder and UET, Lahore, shall be in English.

Technical Bid shall comprise of the followings:

- i). Covering letter duly signed in ink and stamped by authorized representative.

- ii). Submission of undertaking on legal valid and attested stamp paper that the firm is not blacklisted by any of Provincial or Federal Government Department, Agency, Organization or autonomous body or Private Sector Organization anywhere in Pakistan.
- iii). Certificate of Company/ Firm Registration/ Incorporation under the laws of Pakistan. Valid Certificate for Income Tax & General Sales Tax/Provincial Sales Tax
- iv). Evidence of eligibility of the bidders per section 4 above
- v). Performa invoice in original form/shape from their principals duly signed. List of complete specifications in the same order given in the Annexure of the equipment.
- vi). Proof of the 2% of the estimated cost as earnest money in the name of treasurer UET, Lahore must be submitted
- vii). A letter mentioning the country of origin, model, and date of manufacturing and launching / assembly of all equipment.
- viii). **NOTE:**
 - a) A presentation regarding equipment (for which bidder has applied) is mandatory preferably by the company expert.
 - b) The compliance must be provided with the submission of tender document regarding fulfillment of general terms and conditions and technical specifications in the same order as given in the Tender Document.

Financial Bid shall comprise of the followings:

- i) The prices of the equipment should be quoted in foreign currency on C&F base Lahore. Exchange rates shall be considered for evaluation as on the date of opening of tender.
- ii) The Earnest Money as discussed earlier in **Instructions to Bidders**.
- iii) Firm/Supplier should clearly indicate packing, handling, forwarding, documents charges, air freight etc.

7 Tender Validity:

The Tender shall have a minimum validity period of **ninety (90) days from the last date for submission** of the Tender. UET may solicit the Tenderer's consent to an extension of the validity period of the Tender. The request and the response shall be made in writing. If the Tenderer agrees to extension of validity period of the Tender, the validity period of the Bid Security shall also be suitably extended. The Tenderer may refuse extension of validity period of the Tender, without forfeiting the Bid security.

8 Rejection of the Bid:

UET may reject all bids or proposals at any time prior to the acceptance of a bid or proposal. UET will upon request communicate to any bidder, the grounds for its rejection of all bids or proposals, but will not be required to justify those grounds. UET shall incur no liability, solely, by virtue of rejection of bidders. However, bidders shall be promptly informed about the rejection of the bids, if any.

9 Award Criteria:

The bidder who is qualified, technically passed will be determined as the lowest evaluated bidder will have to fulfill below conditions as a necessary

requisite:

- a) The successful bidder shall have to deposit security, **10% as Performance Guarantee** in the shape of deposit at call of the total offer on acceptance of the tender.
- b) The successful Bidder shall arrange/deposit **Stamp Paper** of value @ 0.25% of issuance of supply order/contract.
- c) The Bid Security shall be returned to the successful Bidder after the completion of warranty period and successful installation. Warranty period will start when the equipment will be fully operational after complete installation.

10 Redressal of Grievances:

UET, Lahore has constituted a Grievance Redressal committee comprising of odd number of persons, with proper powers and authorizations, to address the complaints of bidders. For any grievance please contact Primary Contact, who will be responsible for scheduling the meeting of the Grievance Redressal committee.

Technical Specifications

FOCUSED ION BEAM-SCANNING ELECTRON MICROSCOPE (FIB-SEM) ATTACHED WITH ANALYTICAL AND DIGITAL FACILITIES

The minimum requirements of Branded FEG-SEM attached with Focused Ion Beam (FIB) analytical and digital attachments (All operations and functions should be fully PC controlled with software compatible to the Windows latest version) are given below. The quoted system specifications should be equal or better.

Specifications (Equivalent or Better)

1. Should have a Field Emission Gun-Scanning Electron Microscope (FEG-SEM), with a high brightness Schottky gun capable to provide stability of beam current better than 1% over 24h.
2. SEM accelerating voltage in the range at least 200V to 30 kV.
3. The SEM must provide an approximate resolution 1.6 nm 1 kV without beam deceleration or approx. 1.4 nm 1 kV with beam deceleration for high resolution imaging with high surface sensitivity. The available current must be from approx. 1 pA or less to 250nA.
4. Analytical working distance of SEM should be approx. 7 mm without deterioration at longer analytical Working Distance (WD). Please provide Au on C images at 1 kV, 7 mm WD for evaluation.
5. System should be capable to perform fully automated alignment of SEM column. System should be equipped with the following detectors:
Everhart-Thornley Secondary electron (ETSE) detector, In-lens/in-column detector(s) of Secondary electron (SE) and back scattered electron (BSE), Retractable backscatter detector, IR camera for live viewing samples/chamber, integrated beam current monitor. Simultaneously collect & display SE and BSE signals by the detectors in the lens and in the column.
6. Retractable backscatter detector should have up to 4 concentric rings. It also should be sensitive for the BSE signal at low accelerating/landing voltages down to 0.5 kV. Automatic shutdown of IR source illumination in BSE mode is required to allow the light sensitive BSE to work correctly.
7. Sample overview optical camera should be best (~6 Mpix), integrated in user interface and allow convenient navigation over the sample.
8. System must be equipped with a Ga FIB capable of approx. 3.0 nm resolutions at 30 kV.
9. The FIB should be capable of delivering up to 65 nA in a tight, perfectly round spot, and a high beam current density at 30 kV.
10. The FIB must guarantee accurate beam deflection, even at small dwell times, for precise high-speed patterning. The FIB must be capable to perform milling with approx. resolution 64k x 64k provided by pattern generator that is necessary for accurate and high-performance micro and nano patterning.
11. The FIB should operate in the range from 500 V to 30 kV acceleration voltage or larger. Deposition of platinum should be included in the system based on injection of gas and using ion beam or electron beam.



12. The microscope stage should have the following minimum specifications: Fully motorized high precision 5 axis motorized stage with approx. dimensions x,y = 110 mm, z = 65 mm, Tilt = -15° to +90°, Rotation = 360° continuous, Sample weight with approx. 1 kg available X and Y movements.
13. The sample holder(s) should be provided that allows mounting of approx. 15 pin stubs in horizontal and pre-tilted positions, as well as loading of TEM grids. A cross-sectional sample clamp holder is required.
14. Energy Dispersive X-Ray Spectroscopy (EDS) detector should be solid state Peltier-cooled (Liquid N₂ Free), sensitive up to beryllium.
15. EDS analysis software should have capabilities for quantitative calculations, background subtraction, peak deconvolution, drift compensation for polished and unpolished bulk samples.
16. The system should come with a fully integrated nanomanipulator for lifting out lamella prepared for TEM. Spare needles should be included in supply.
17. Microscope must have adjustments for image shift and to yield better image quality in case of charging and drifting. Microscope should have capability for charge neutralization during FIB milling of insulating samples using electron beam.
18. It should be possible to obtain images at up to 6144 x 4096 pixel resolution.
19. Plasma cleaner for a gentle cleaning of samples from carbon contamination using oxygen plasma should be included.
20. Vacuum/sample chamber should have at multiple configurable ports for standard and additional equipment.
21. The FIB-SEM must be supplied with a USB Manual User Interface (MUI) allowing adjustments of focus, contrast and brightness and stigmation.
22. The FIB-SEM system must be capable for complete cycle of TEM sample preparation including transfer of lamella from bulk sample to a grid holder by manipulator, thinning and polishing at low-kV and final control of lamella quality. All these operations should be done in microscope chamber without breaking vacuum.
23. TEM sample preparation process should be automated to a high level with preparation time less than 1 hour.
24. TEM grid holder with 3-6 grid positions should be provided.
25. Software user interface should be friendly, advanced and support customizable view. The system should be supplied with the additional (the second) PC capable for data storage and available for installation of software by user.
26. The FIB-SEM system must have uninterruptible power supply and backup time (UPS preferably true sine wave) should be compatible as per requirements of the quoted equipment.
27. Onsite technical installation and operational training should be provided, comprehensive manufacturer site training on FIB-SEM or application centre training for FIB-SEM.
28. Should have sputter coating unit including Carbon, Gold/Platinum etc targets for sample preparation.
29. Enabled with a Remote diagnostic support and online help mechanism.
30. After sale service should be easily available in Pakistan.
31. Companies who have already supplied similar equipment in the region with good technical/after sale-service repute will be given preference.
32. Standard warranty (1-2 years) is mandatory and a service contract of 3-5 years should be included as an option. The separate costing choice should be available for service contract for 5 years with parts and without parts. Warranty period will start when the equipment will be fully operational after complete free of cost installation.
33. Guaranty of replaceable accessories for the next five years.

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34. All the operational/technical drawings and instructions manuals/literature should be in English and provided along with the equipment.
35. Consumable items like oil, grease, O-rings, conducting tapes and standard samples for calibrations should be provided along with the equipment.

Quote above as a Main Unit. Following items must be quoted separately.

36. For in-situ measurements, tensile, heating, and cooling stages up to 500 °C
37. Electron back scattered diffraction (EBSD), WDS, Raman Attachments.
38. Ga ion gun and filaments should be provided.
39. Standard samples for calibrations should be provided.

Estimated Bid Price PKR 80.0 Million

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Technical Specifications

HIGH RESOLUTION TRANSMISSION ELECTRON MICROSCOPE (HR-TEM) ATTACHED WITH ANALYTICAL AND DIGITAL FACILITIES (STEM, EDS & other detectors)

The minimum requirement of Branded HR-TEM attached with latest analytical and digital attachments (All operations and functions should be fully PC controlled with software compatible to the Windows latest version) are given below. The quoted system specifications should be equal or better.

Specifications (Equivalent or Better)

1. Operating Voltage 300 kV, fast, multichannel, high resolution TEM imaging and precise compositional analysis Energy Dispersive X-Ray Spectroscopy (EDS).
2. Extreme Field Emission Gun (XFEG) source: offers reduced brightness of 7.5×10^7 A/m².sr.V, equivalent to the one of a Cold FEG source, but offering less than 1.5% absolute stability over a day, and showing more than 50 nA on the sample. Energy Resolution is shown to approx. 0.2eV over 1 sec acquisition time at 300 kV, and approx. 0.13 over 1 sec at 60 kV.
3. Integrated Differential approximate Phase Contrast: Dedicated 4-segment STEM detector, TEM 300 kV should capable of generating Differential Phase Contrast, for imaging of Electrical and /or magnetic fields, by simultaneously acquiring the 4 different segments and differentiating them two by two (\Rightarrow X and Y direction), and when integrated over the full collection angle of the Annular Dark Field (ADF) detector, can offer unrivaled imaging of the local potential, and thus highlight atomic column positions of both light and heavy elements. In this way, it shows much better S/N ratio than any other technique like annular bright-field (ABF), and higher sensitivity for beam sensitive samples like soft materials and other Zeolites. Capable of Selective Area Electron Diffraction (SAED) patterns to provide crystallographic information from selected regions of the sample from the micron to the ~100nm scale.
4. TEM with combination of constant power lens, 3-lens condenser system, and approx. 5 mm pole piece gap, $\pm 90^\circ$ stage tilt range (max. tilt angle double tilt holder $\pm 30^\circ$) and large stage Z height adjustment to allow for more space to run tomography or in-situ experiments, and still allows to easily shoot respectively spatial resolution of approx. 60pm in Cs Probe Corrected STEM and information limit of less than 60pm in Cs Image Corrected TEM. TEM information limit should be approx. 0.12 nm, STEM magnification range approx. 330 Mx, TEM magnification range approx. 1.50 Mx, point resolution 0.23 nm.
5. System Enclosure: A standard feature of TEM which offers acoustic shielding, remote operation and enhanced control of thermal stability around the system. The result is less stringent environmental requirements on the operator control room which offers the ability to conduct experiments in the control room with multiple investigators in normal office conditions.
6. STEM: should be advanced and fully automated way to fine tune low order aberrations in the STEM, like focus, both 2-fold and 3-fold astigmatism, and also coma, combination of a dedicated script, and the help of the Probe corrector software. STEM+ uses fast low dose-

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rate STEM imaging to measure aberrations prior to full and very reproducible correction, and gives fast access to top quality HRSTEM data. STEM (lattice image resolution) approx. 0.2 nm HAADF unit.

7. Super-X EDS detector: made of four symmetrically positioned windowless SDD detectors, protected by pneumatic shutters when not in-use. The fixed, unique, “in-column” design mitigates the need for detector insertion and retraction which leads to unwanted beam displacements and optical aberrations. approx. 0.7srad effective collection angle at 0° tilt, unique and fully automated, quantifiable 3D EDX mapping capability and high sensitivity to light elements, down to Boron. It shows unrivaled Fiori number (peak to background ration on NiK α peak) of >4000 and easy access to sub-atomic chemical mapping on large areas (up to 2kx2k). System peaks are shown to be less than 1% (Fe, Co, Si etc.).
8. Fully integrated camera (~16 MP) for large field of view, instantly zoom, fast navigation from mesoscopic to atomic length scale.
9. Consumable items like oil, grease, O-rings and standard samples for calibrations should be provided along with the equipment. Holders/grids of different types should be provided and also quote the separate price of holders/grids.
10. Software user interface should be friendly, advanced and support customizable view. The system should be supplied with the additional (the second) PC capable for data storage and available for installation of software by user.
11. The system must have uninterruptible power supply and backup time (UPS preferably true sine wave) should be compatible as per requirements of the quoted equipment.
12. Onsite technical installation and operational training should be provided, comprehensive manufacturer site training on TEM or application centre training for TEM.
13. Should have sputter coating unit including Carbon and Gold/Platinum etc targets for sample preparation.
14. Enabled with a Remote diagnostic support and online help mechanism.
15. After sale service should be easily available in Pakistan.
16. Companies who have already supplied similar equipment in the region with good technical/after sale-service repute will be given preference.
17. Standard warranty (1-2 years) is mandatory and a service contract of 3-5 years should be included as an option. The separate costing choice should be available for service contract for 5 years with parts and without parts. Warranty period will start when the equipment will be fully operational after complete free of cost installation.
18. Guaranty of replaceable accessories for the next five years.
19. All the operational/technical drawings and instructions manuals/literature should be in English and provided along with the equipment.

Quote above as a Main Unit. Following items must be quoted separately.

Optional Attachments

20. For in-situ measurements, tensile, heating, and cooling stages up to 500 °C
21. Electron Energy Loss Spectroscopy (EELS) package.

Estimated Bid Price PKR 200 Million

A. Rahim

Technical Specifications

SCANNING ELECTRON MICROSCOPE (E-SEM) ATTACHED WITH ANALYTICAL AND DIGITAL FACILITIES

The minimum requirements of Branded SEM attached with latest analytical and digital attachments (All operations and functions should be fully PC controlled with software compatible to the Windows latest version) are given below. The quoted system specifications should be equal or better.

Specifications (Equivalent or Better)

1. Source: Tungsten thermal emission SEM column with dual-anode source emission geometry. The filament should be fully automatic switched to keep constant emission over the full high-tension range.
2. Voltage 200 V to 30 kV, Beam Current Up to 2 μ A.
3. The tungsten electron gun should have a multiple bias setting to improve low kV imaging.
4. High-vacuum mode (approx. $<6 \times 10^{-4}$ Pa) for imaging and microanalysis of conductive and/or conventionally prepared specimens.
5. Low-vacuum mode (approx. 10-130 Pa) for imaging and microanalysis of non-conductive specimens without preparation.
6. Environment vacuum mode (approx. 10-2600 Pa) for high-vacuum incompatible specimens.
7. Through lens differential pumping should be provided to keep the system clean in low vacuum operation.
8. Secondary electron image resolutions must meet the following minimum resolution at 30kV: 3 nm or better in high vacuum mod, 3 nm or better in low vacuum mode and 3 nm or better in environmental vacuum mode.
9. System should be equipped with the following detectors: Everhart-Thornley Secondary Electron Detector (SED), Large Field Gaseous SED (for low vacuum up to 133Pa), Gaseous SED (for very low vacuum up to 2600Pa), BSE, IR-CCD, EDS.
10. The system should be able to image fully hydrated or wet specimens with secondary electrons without any complications.
11. Stage movement should have fully computerized with following minimum specifications: 50x50 mm for X and Y stage movement, Z range at least 25 mm, 360 degree rotation in continuous motion, Tilt range: -15° - 75° .
12. EDS detector should be solid state Peltier-cooled (liquid N₂) up to beryllium.
13. Single or four-quadrant frame display of images from any combination of detectors: Secondary Electron (SE), Backscattered



- Secondary Electron (BSE), mixed signals, CCD. It should support observation of live images, line averaged, line integrated, frozen and frame-averaged digital images.
14. Microscope must also enable drift compensated frame integration to overlay frames with an offset to adjust for any sample or system instability (such as slight charge drift) to yield better images in case of charging or shifting sample. Scan settings presets and column presets should be available in user interface to facilitate efficient and convenient operation.
 15. The vacuum pumping system should be able to achieve high vacuum within 180 seconds or better.
 16. Software user interface should be friendly, advanced and support customizable view. The system should be supplied with the additional (the second) PC capable for data storage and available for installation of software by user.
 17. The SEM system must have uninterruptible power supply and backup time (UPS preferably true sine wave) should be compatible as per requirements of the quoted equipment.
 18. Onsite technical installation and operational training should be provided, comprehensive manufacturer site training on FIB-SEM or application centre training for FIB-SEM.
 19. Should have sputter coating unit including Carbon and Gold/Platinum etc targets for sample preparation.
 20. Enabled with a Remote diagnostic support and online help mechanism.
 21. After sale service should be easily available in Pakistan.
 22. Companies who have already supplied similar equipment in the region with good technical/after sale-service repute will be given preference.
 23. Standard warranty (1-2 years) is mandatory and a service contract of 3-5 years should be included as an option. The separate costing choice should be available for service contract for 5 years with parts and without parts. Warranty period will start when the equipment will be fully operational after complete free of cost installation.
 24. Guaranty of replaceable accessories for the next five years.
 25. All the operational/technical drawings and instructions manuals/literature should be in English and provided along with the equipment.
 26. Consumable items like oil, grease, O-rings, conducting tapes and standard samples for calibrations should be provided along with the equipment.

Quote above as a Main Unit. Following items must be quoted separately.

27. Optional Attachments
28. For in-situ measurements, tensile, heating, and cooling stages upto 500 °C
29. Electron back scattered diffraction (EBSD), WDS, Raman Attachments.

Estimated Bid Price PKR 20.0 Million

A. P. J.

TECHNICAL SPECIFICATIONS**OPTICAL MICROSCOPE WITH IMAGE ANALYSIS FACILITIES****Specifications (Equivalent or Better)**

1. Optical Microscope with Reflected and Transmitted Light modes.
2. LED illumination for both Reflection and Transmission modes.
3. Bright field, dark field, simple and cross polarization.
4. Fixed Stage manually controlled, with centering adjustment.
5. Manual, Coarse and Fine coaxial handle.
6. Manual operation: 6x for BF/DIC, 5x for BF/DF/DIC, 5x for BF with centering
Motorized operation: 6x for BF/DIC, 5x for BF/DF/DIC.
7. Attachment for conosopic and orthoscopic observation.
8. High-quality polarization direction is rotatable.
9. Coded reflected led light for bf/df/pol.
10. LED transmitted light, six position revolving nosepiece, Rotatable stage.
11. Mechanical stage, Swing-out condenser for pol, Polarizer, filter casset.
12. Green filter.
13. Eyepiece 10x fn22, focusable, 5x, 10x, 20x, 50x, 100x.
14. Digital camera & software, 3.1 MP digital camera with 0.5x c-mount adapter capable of measuring XY dimensions.
15. Analysis software for measuring the grain size, phase, pore size etc.
16. Free installation and onsite technical trainings for operation on microscope should be provided.
17. Should be supplied with a Compatible UPS (preferably true sine wave).
18. All the operational/technical drawings and instructions manuals/literature should be in English and provided along with the equipment.
19. Standard warranty (1-2 years) is mandatory and a service contract of 3-5 years should be included as an option. Warranty period will start when the equipment will be fully operational after complete free of cost installation.

Quantity: 03 (three)**Estimated Total Bid Price PKR 10.0 Million**

Technical Specifications**X-Ray Diffractometer (XRD)**

The minimum requirements of Branded X-Ray Diffractometer (XRD) attached with latest analytical and digital attachments (All operations and functions should be fully PC controlled with software compatible to the Windows latest version) are given below.

X-ray Diffractometer with hardware and software package should include: Phase identification and quantitative phase analysis, Residual stress analysis, X-ray Reflectometry (XRR), Texture analysis, grazing incidence diffraction (GID) and Small angle X-ray scattering (SAXS).

Specifications (Equivalent or Better)

1. Alignment-free switching of all beam path components incl. X-ray tube, all optical components, non-ambient sample holders, stage and all detectors.
2. X-ray Diffractometer with hardware and software package should include: Phase identification and quantitative phase analysis, Residual stress analysis, X-ray Reflectometry (XRR), Texture analysis, grazing incidence diffraction (GID) and Small angle X-ray scattering (SAXS).
3. The system should be true plug & play functionality by fully automatic, real-time component recognition and configuration as well as conflict detection for all beam path components incl. X-ray tube, all optical components, all ambient and non-ambient sample holders, and all detectors.
4. Failure-safe operation via automatic, real-time validation of replaced components.
5. Fully automatic, motorized switching between Bragg-Brentano and parallel beam geometry through software control.
6. Simultaneous variable counting time and variable step-size support.
7. The system must have all safety and interlocks for operator safety.
8. The system must display an up-to-date CE marking, accompanied by a correct EC Declaration of Conformity as well as all required documentation including but not limited to machinery Directive and Electromagnetic compatibility.
9. At installation, the instrument must pass a documented acceptance test based on an established instrument verification procedure in which instrument alignment should be approximately equal to $\pm 0.01^\circ 2\theta$ using standard reference material (should also be provided with the equipment).
10. 3KW X-ray generator with Stand-by mode.
11. The kV and mA settings must be continuously adjustable via software with automatic tube startup tube conditioning.
12. XRD must be compatible with ceramic, glass tubes, and 3rd party and tubes
13. The sealed X-ray tube shall be metal-ceramic type, with Cu, Cr (Silver as optional) anode. .
14. X-ray tube must be able to switch between line and point focus, without dis-connection and removal. The system shall have automatic focus direction recognition of x-ray tube.
15. THETA-THETA goniometer, maintenance free drive mechanism / gearings, with variable measurement circle diameter.
16. The goniometer shall have angular measurement range of $-110^\circ < 2\theta \leq 168^\circ$.
17. Angle positioning: Stepper motors with encoders for optimum scanning speed and positioning precision.



18. Minimum angular speed: 20°/s, minimum step size shall be 0.0001°.
19. The reproducibility shall be $\pm 0.0001^\circ$.
20. Switching amongst powder diffraction, grazing incidence diffraction or Reflectometry should be software-controlled.
21. Exchange of all optics shall be tool-free and alignment free using any snap-lock mechanism.
22. The system must have the following sample stages:
 - i). Motorized, fully software controlled, Eulerian cradle with Motorized, fully software controlled XYZ-stage
 - ii). Standard sample stage
23. All sample stages can be ex-changed without re-alignment.
24. The multiple sample stage/tray should also be provided.
Detector with Silicon-Strip technology, with all functional strips. Detector should be maintenance free with no external cooling or purging gas required, for Cr, Co, Cu, Mo and Ag radiation. For high-energy radiation (Mo, Ag) a specialized sensor should be offered to improve the detector efficiency. 0D/1D operation, selectable by software.
25. Complete and full functional with all software, hardware, computer with PDF-2 files
26. The measurement software shall have a graphical instrument representation for real-time display of the actual instrument configuration based on component recognition, real-time validation and conflict detection, and measurement planning (definition of instrument parameters such as slit settings, selection of optical components, and selection of diffractometer geometry. Variable counting time and variable step-size support.
27. Enabled with a Remote diagnostic support and online help mechanism
28. Include the latest Intel core-i7 or better PC with monitor.
29. The subscription of reference data base/library should be included.
30. Include onsite free of cost installation and training of our technical team.
31. Should be supplied with a Compatible UPS (preferably true sine wave).
32. After sale service should be easily available in Pakistan.
33. Companies who have already supplied similar equipment with good technical/after sale-service repute will be given preference.
34. Guaranty of replaceable accessories for the next five years.
35. Reference from within Pakistan from a similar offered XRD user is preferable.
36. All the operational/technical drawings and instructions manuals/literature should be in English and provided along with the equipment.
37. Standard warranty (1-2 years) is mandatory and a service contract of 3-5 years should be included as an option. The separate costing choice should be available for service contract for 5 years with parts and without parts. Warranty period will start when the equipment will be fully operational after complete free of cost installation.

Estimated Bid Price PKR 20.0 Million

A. P. Shahid

Technical Specifications**ION BEAM MILLING MACHINE**

(All operations and functions should be fully PC controlled with software compatible to the windows latest version)

Specifications (Equivalent or Better)

1. Should have two ion guns with rare earth magnets or other materials.
2. Milling angle should be adjustable to equal or better than $+10^{\circ}$ to -10° .
3. Ion Beam Energy should be 100eV to 6.0keV or equivalent.
4. Ion beam diameter should be controlled and adjustable (minimum 350 μm FWHM at 5keV).
5. Beam alignment should be controlled and adjustable.
6. Specimen size should be 3mm or 2.3mm with mounting facility.
7. The vacuum system should be quick, operating automatically and have lowest noise and clean (oil free) without contamination.
8. Base pressure should be 5×10^{-6} torr and 8×10^{-5} torr operating pressure or better.
9. Power voltage should be 220-240VAC with frequency of 50/60Hz.
10. Should be supplied with a Compatible UPS (preferably true sine wave).
11. Free installation and onsite training for operation of Ion Beam Milling Machine.
12. Thinning of both lateral/horizontal and a vertical edge of samples is required.
13. Standard warranty (1-2 years) is mandatory and a service contract of 3-5 years should be included as an option. Warranty period will start when the equipment will be fully operational after complete free of cost installation.
14. Consumable items like oil, grease etc should be provided along with the equipment.
15. All the operational/technical drawings and instructions manuals/literature should be in English and provided along with the equipment.

Estimated Bid Price PKR 8.0 Million

A. P. Shahip
J.

Technical Specifications**TWIN JET ELECTROLYTIC POLISHER****Specifications (Equivalent or Better)**

1. Specimen size should be 3mm or 2.3mm with mounting facility.
2. Polishing range should be 0 to 120 V DC; 0 to 100 mA or equal.
3. Power voltage should be 220-240VAC with frequency of 50/60Hz.
4. Standard recipes of etching agents should be provided.
5. Specimen punch/dimple to prepare disk samples.
6. An attachment for low temperature sample polishing.
7. The Backup time (UPS (preferably true sine wave) for all the equipment should be compatible as per requirements of the equipment.
8. Free installation and onsite technical trainings for twin jet electrolytic polisher.
9. All the operational/technical drawings and instructions manuals/literature should be in English and provided along with the equipment.
10. Standard warranty (1-2 years) is mandatory and a service contract of 3-5 years should be included as an option. Warranty period will start when the equipment will be fully operational after complete free of cost installation.
11. Consumable items like polishing media etc should be provided with the equipment. Separate cost of the consumable items should also be quoted

Estimated Bid Price PKR 8.0 Million

A. Rahim
J.

Technical Specifications**NANO INDENTER/ATOMIC FORCE MICROSCOPE (AFM)**

(All operations and functions should be fully PC controlled with software compatible to the Windows latest version)

Specifications (Equivalent or Better)

1. Applications: Metals, Alloys, Polymers, Bio-Materials, Thin films, Ceramics/glasses, Nano-structures.
2. Max Load = 5 N.
3. Tips = Berkovich.
Cube Corner and Flat punch (optional).
4. Wear Scanning.
5. Standard stage (without piezo-transducer).
6. Fast data acquisition rate
7. Optical Microscope:
Resolution = 1 micron
Objective = up to 40x
8. Vibration controlled
9. Acoustic and thermal isolation.
10. In-situ SPM/AFM imaging (optional).
11. Nano DMA (optional).
12. Include the latest Intel core-i7 or better PC with monitor.
13. Include Installation, onsite and manufacturer site training free of cost.
14. Guarantee of replaceable accessories for the next five years.
15. Should be supplied with a Compatible UPS (preferably true sine wave).
16. Standard warranty (1-2 years) is mandatory and a service contract of 3-5 years should be included as an option. The separate costing choice should be available for service contract for 5 years with parts and without parts. Warranty period will start when the equipment will be fully operational after complete free of cost installation.
17. After sale service should be easily available.
18. All the operational/technical drawings and instructions manuals/literature should be in English and provided along with the equipment.
19. Please quote the separate price for the tips berk rich, cube corner and flat punch.

Estimated Bid Price PKR 20.0 Million

A. P. Shahip
J.

Technical Specifications**CHEMICAL VAPOUR DEPOSITION (CVD) EQUIPMENT**

(All operations and functions should be fully PC controlled with software compatible to the Windows latest version)

Specifications (Equivalent or Better)

1. Substrate stage linear and azimuthally motion, Substrate heating and temperature control, mount table and touch panel control, Substrate linear motion is manually controlled, substrate rotation is DC motor controlled.
2. Plasma discharge electrode, Plasma discharge electrode linear motion.
3. Base pressure= 10^{-6} Pa or high.
4. Substrate heating temperature: RT-1000°C or more.
5. At least three working gas lines with mass flow.
6. Gas path, Gas mixing chamber, gas mass flow meter, needle valves, variable leak valve, cooling water pipe.
7. RF power supply (13.56MHz/500W) with rack and matching box.
8. Top flange can be lifted by motor, Substrate change easy, Viewport.
9. Vacuum pumps are Turbo Molecular Pump and rotary pump, Elbow to connect turbo molecular pump (TMP), Gate valve to connect TMP (CF150), TMP (700l/s), Rotary pump, Side pumping pipe, and Angle valve for side pumping (CF35).
10. Full range vacuum gauge, Leak valve, Solenoid valve, Bellows top pump connection, Vacuum assemblies.
11. One compatible UPS (preferably true sine wave) with back up time.
12. Free installation and onsite technical trainings for operation of CVD equipment
13. Supplier is responsible to provide complete hook up for the required gases which include H_2 , $C_2H_4O_2$, N_2 , Ar for solid source vapor delivery system, CH_4 Ar for water bubbler, gas lines and gas filled cylinders.
14. All the operational/technical drawings and instructions manuals/literature should be in English and provided along with the equipment.
15. Standard warranty (1-2 years) is mandatory and a service contract of 3-5 years should be included as an option. The separate costing choice should be available for service contract for 5 years with parts and without parts. Warranty period will start when the equipment will be fully operational after complete free of cost installation.
16. International standards will be followed & safety measures will be ensured in the laboratory where the equipment will be placed.
17. Consumable items like oil, grease, O-rings and gasses should be provided along with the equipment.

Estimated Bid Price PKR 13.0 Million

A. P. J.

Technical Specifications

THERMAL EVAPORATOR WITH GLOVE BOX

(All operations and functions should be fully PC controlled with software compatible to the Windows latest version)

Specifications (Equivalent or Better)

1. The system consists of one thermal evaporator High Vacuum (HV) system and one glove box.
2. Metal or organic film growth is done in the HV system, while the glove box is connected to the HV system to avoid sample exposure to atmosphere.
3. Sample linear and azimuthal rotation. Rotation is motor controlled.
4. Source temperature up to 1000 °C or more.
5. Evaporator boats nos. 6-12.
6. Quartz crystal microbalance for film thickness monitor.
7. TMP and rotary pump, vacuum gauge.
8. Touch panel operation.
9. Vacuum 10^{-6} Pa.
10. The Backup time (UPS preferably true sine wave) for all the equipment should be compatible as per requirements of the equipment.
11. Free installation and onsite technical trainings for operation of Thermal Evaporator with Glove Box.
12. All the operational/technical drawings and instructions manuals/literature should be in English and provided along with the equipment.
13. Standard warranty (1-2 years) is mandatory. Warranty period will start when the equipment will be fully operational after complete free of cost installation.
14. Spare boats and consumable evaporation sources should be provided with the equipment.

Estimated Bid Price PKR 10.0 Million

A. P. Shahip
J.

Technical Specifications**SAMPLE PREPARATION EQUIPMENT****1. Low Speed Precision Saw:**

- i. Voltage: 1 phase, 230 V, 50 Hz. AC
- ii. Power: 100 W DC Motor (Including installed Fuse)
- iii. Disc speed: Variable (0 to 1000 rpm)
- iv. Speed increment: Maximum 5 rpm
- v. Cutting capacity: Max. 50 mm thickness
- vi. Cutting method: Gravity feed
- vii. Optical shut-off sensor with adjustable stop to control depth of cut
- viii. Cutting wheels of standard size (Dia): 6" (150 mm)
- ix. Cutting wheel materials: Sintered diamond, resin bonded or metal bonded diamond
- x. Specimen Holder: Regular and Irregular specimen holder included
Counter-balanced holder with set of 3 weights.
Micrometer for lateral movement 0-25 mm.
Standard specimen holder provided.
- xi. Nature friendly and non-corrosive coolant
- xii. Complete unit with allied accessories
- xiii. Units with equivalent or better specs will also considered
- xiv. All the operational/technical drawings and instructions manuals/literature should be in English and provided along with the equipment.
- xv. Standard warranty (1-2 years) is mandatory. Warranty period will start when the equipment will be fully operational after complete free of cost installation.

Estimated Bid Price PKR 0.5 Million**2. Abrasive Cut off Machine:**

Abrasive Cutting Machine, with hand wheel driven chop cutting and table-feed cutting systems, manual positioning of the specimen in X and Y axis (X-axis for plane parallel cutting is optional), manual positioning of the cutting wheel in Z-axis, with:

- i. Compact cutting motor.
- ii. Up to 3000 rpm cutting speed, with electronic brake system.
- iii. Cutting capacity up to 110 mm solid stock, with cut-off wheels up to $\phi 300$ mm.
- iv. twin T-slotted clamping table made of stainless steel, bottom part as rugged alloy base casting,
- v. standard set of cutting consumables composed of;
 - a). An assortment of 20 cut-off wheels with 300 mm dia.
 - b). cooling fluid
- vi. All the operational/technical drawings and instructions manuals/literature should be in English and provided along with the equipment.

- vii. Standard warranty (1-2 years) is mandatory. Warranty period will start when the equipment will be fully operational after complete free of cost installation.

Estimated Bid Price PKR 0.5 Million

3. Mounting Press:

- i. Programmable Automatic Mounting Press with two cylinders.
- ii. touch screen control with program based mounting sequences.
- iii. Electro hydraulic pressure (requires no air).
- iv. Pressure upto 300 bar.
- v. Temperature upto 200 C.
- vi. Operation time upto 100 minutes.
- vii. Short cycle time.
- viii. Thermostatically controlled heating.
- ix. Selectable mould sizes from 25 mm to 50 mm.
 - x. Includes a standard set of mounting consumables composed of 3 different hot mounting compounds; 1 kg of each and a total of 3 kg.
- xi. All the operational/technical drawings and instructions manuals/literature should be in English and provided along with the equipment.
- xii. Standard warranty (1-2 years) is mandatory. Warranty period will start when the equipment will be fully operational after complete free of cost installation.

Estimated Bid Price PKR 0.5 Million

4. Grinding and Polishing Machines:

- i. Double wheel, suitable for approx. 200 mm and approx. 250 mm wheel size.
- ii. Programmable Automatic control unit. Base Unit with large approx. 0.75HP Motor.
- iii. Standard interface for automatic specimen mover.
- iv. Variable wheel speed 600 rpm, Quiet belt drive, Complementary or Contra rotational direction, Soft Start and Stop function, Retractable water hose, with water supply and drain tubes.
- v. Automatic Head, programmable sample preparation parameters, central and/or individual force application, steel mounting column, with variable specimen holder speed approx. 50 rpm, DC motor.
- vi. Complete and ready for operation. Without Specimen Holders.
- vii. 230 V, 1-phase, 50 Hz. Aluminium wheel and splash guard.
- viii. Includes the following standard set of consumables; Special Magnetic Foil, Thin Metal Plate, Magneto grinding, Variety of polishing cloths and Diamond suspensions, plus lubricant.
- ix. All the operational/technical drawings and instructions manuals/literature should be in English and provided along with the equipment.
- x. Standard warranty (1-2 years) is mandatory. Warranty period will start when the equipment will be fully operational after complete free of cost installation.

Quantity: 04 (Four)
Estimated Total Bid Price PKR 2.0 Million

A. Rahim