Institute of Physics

(An autonomous Research Institute of Dept. of Atomic Energy, Govt. of India)

P.O: Sainik School, Bhubaneswar, Orissa- 751 005, India

GLOBAL NOTICE NO. 07/2010-11

Last date of receipt of the sealed quotations: Upto 3 P.M. of 20/04/2011

Sealed quotations are invited from leading manufacturers and / or their accredited associates for supply, installation, testing & commissioning of

1. **Confocal Micro PL-Fluorescence System with LASER Excitation Source: – 01 Unit**
2. **Ion Beam Milling System: 01 Unit**
3. **Ultrasonic Disc Cutter : 01 Unit**
4. **Dimple Grinder : 01 Unit**
5. **Specimen grinder and hot mounting plate : 01 Unit**
6. **Plasma Cleaner with port for TEM Specimen holder : 01 Unit**
7. **Compact High Vacuum Coater for SEM and TEM specimen : 01 Unit**
8. **Electrical Transport Systems from Micro/ Nano structures : 01 Unit**
9. **Dehumidifier : 01 Unit**
10. **High Index single crystalline Silicon Wafers.**

Detailed technical specifications and other terms & conditions for supply of the above items/ equipments can be obtained by downloading the same from the Institute's official website: www.iopb.res.in . All quotations (except Sl. No.- 9 & 10) should be submitted in sealed envelopes in two parts separately, i.e. "Technical bid" (Part- A) & "Financial bid" (Part-B). Both the parts should be further sealed in an envelope super scribing the name of the Item. The price Bid of the only technically qualified bidders will be opened at a later date with prior intimation to the respective bidders.

The Institute reserves the right to accept or reject any or all quotations either in full or in part without assigning any reasons thereof.

DIRECTOR

TECHNICAL SPECIFICATIONS:

I. Confocal Micro PL-Fluorescence System with LASER Excitation Source

(A) SYSTEM SPECIFICATION

(1) Triple Spectrometer with Aberration corrected holographic gratings Provision for multiple entrance and exit ports. Proper holographic gratings, edge filters should be quoted.

2) Compatibility with UV-Vis laser Sources. Operation Range UV-Vis (200-800nm)

3) Viewer for Visible range with a viewing screen for viewing the image of the entrance slit on a screen for alignment of sample.

4) Interference filters for all laser lines.

5) Coupling optics for lasers and necessary grating, objectives

6) Half-wave plate and analyser for UV-visible range. Changing polarisation should be possible.

7) Broadband polarization rotators and analyzer in all wavelength range

8) The Laser entry attachment.

9) Confocal Microscope with 10X,50X and 100X Objectives. Open ended Configuration.

10) Long working distance needed.

11) Manual stage in Open configuration to accommodate large samples.

12) XYZ sample holder. Automated

13) Solid sample platform

14) Collection optics.

15) Peltier Cooled Multichannel Detector (CCD), (a) should have best sensitivity with UV-Vis laser with (b) best possible resolution. (c) CCD format: 1024x256 or better.

16) Necessary accessories, controller unit and power supply for CCD

17) Sample viewing camera and grabber card.

18) All necessary optics required to couple the Lasers to the Spectrometer

19) Laser Power meter/meters to measure laser power in whole operating range.

20) Computer (PC) based control of operations: data acquisition and data analysis.

21) (a) Acquisition and analysis software with proper Computer. (b) Latest configuration computer with (c) LCD monitor and (d) Laser printer.

(B) Excitation Laser Sources

22) Argon Ion Laser : (a) All SEVEN lines in visible argon ion Laser including Laser head, (b) Power supply (c) Remote control unit and prism assembly (d) Proper transformer to operate the argon ion Laser (e) Proper chilling system to operate the Laser (f) All the coupling to be provided so that laser sources can be coupled to the microscope as well as related options and accessories (g) All necessary accessories for operation.

23) He-Cd laser: All power supplies, attachments, couplings, transformers, accessories necessary for its operation.

24) Vibration Isolation table suitable for Raman Measurements

(C) Options and Accessories: Following should be quoted as optional items.

25) **Raman Micro setup** where (a) low frequency <10 cm^{-1} measurements are possible. (b)Scanning should be possible up to 4000cm^{-1} without any "stitching" of spectra together. Recording from as close to Rayleigh –line to as wide range as possible with necessary optical accessories. (c) Spectrometer should be able to work in Subtractive mode (d) spectrometer should work in Additive mode (e) Resolution to be better than : <=0.4 cm^{-1} (f) In Additive mode configuration higher resolution <=0.15 cm^{-1} (g) Rayleigh rejection ratio better than 10^{-14} (h) fast mapping possible (i) Sample holders for thin films and liquid samples for Micro arrangements. (j) All accessories to perform SERS and Resonance Raman spectroscopy.

26) **Raman Macro setup** for variable angle measurement from 90 deg to back scatter. (a) Easy change from Micro to Macro configuration. (b) Necessary sample holders and Liquid cell. (c) 1 ml quartz Cuvette

27) **Automated XY and Z stage** for Mapping area (a) with step size=0.2 ▪ m , (b) with step size 5nm or better

28) CRYOSTAT:

A) Temperature Stages: (a) Variable temperature stage/stages for -196 degC to 1500 degC

B) Cryogen free closed cycle refrigeration up to 4K.

29) **Operations in NIR region:** (a) Laser (Diode laser), (b) gratings, (c) detectors. (d) Detector capable of operating in all UV-Vis-NIR should also be quoted. (d) All necessary optics required to couple the Lasers to the Spectrometer. (e) All necessary accessories to operate lasers, detectors , system in NIR region.

30) **He -Ne laser (633 nm):** All power supplies, attachments, couplings, transformers, accessories necessary for its operation.

31) **Ar Ion laser with 3 visible lines** (514,488,457 nm): All power supplies, attachments, couplings, transformers, accessories necessary for its operation.

General terms and conditions:

(1) The technical bid should accompany a compliance chart.

(2) Enclose a pre-installation guide for the details on power and room plan.

(3) The quoted equipment should comply with Indian Power supply (220V, 50Hz) condition.

(4) Vendor should have sold at least 2 equipments in last 5 years in India (Enclose full list of users in India)

(5) Vendor should provide recent (last 6 months) purchase order execution copy of the same equipment in any central govt. (India) organisation.

(6) 3 years essential spare including all important control electronics should be provided. The detailed list of spares be enclosed

(7) One set of operating manual and service manual (in English) should be provided with the equipment.

(8) Routine training on principal's site for two weeks as well as training during installation at the site free of cost.

(9) Instrument should have up gradation features.

(10) Apart from the specifications given above, all the higher specifications, resolution, and advances in-built technology model will be preferred.

2. ION BEAM MILLING SYSTEM

- Low energy ion milling unit to be used for the FIB prepared specimen, to reduce carbon contamination and avoid further amorphization created by the FIB.

- The system should be equipped with appropriate ion sources (one or two numbers).

- Manual or fully computer controlled (computer control is an option).
- The energy range of ions produced by the ion source in the milling system should be variable between 150 eV – 2000eV (Optionally up to 10.0 keV): Current: 10 – 75 µA; Double or single tilt with 0° to 45°, adjustable with < 0.2° increments
- Ion current density (peak) : > 5 mA/cm^2
- Angle of ion incidence (milling angle) should be > 10° (higher value of milling angle is prefered)
- Sample size : 3 mm dia.
- Possibility of sample rotation and oscillation (with programmable pre-determined angle)
- Rotation speed of sample stage should be variable between 1 to 6 rpm.

Capability of real-time video monitoring of specimen preparation: both the binocular and CCD imaging system to view the sample (magnification: with binocular system: ≥ 40 X and in case of CCD≥ 400X.

- Load lock for fast sample exchange
- Automatic termination of milling process on perforation.
- Sample cooling facility during milling (Optional)
- Standard specimen holders, Optional - graphite holder
- Required consumables.
- Operating voltage 230 V/50 Hz
- Oil-free pumping system, high vacuum
- Appropriate vacuum gauges (Pirani and Penning heads)
- Closed-cycled cooling system (optional)
- High purity Ar or other gases (this needs to be part of the supply: But this can be supplied through local vendor, if necessary)

3. ULTRASONIC DISC CUTTER

- ▪ ▪ ▪ ▪ Cutting tools: 3.0 mm dia, rectangular sizes of 5 mm x 4 mm
- Sample thickness can range from 30µm to 5mm and the depth of cut should be continually displayed on a dial indicator (with 10µm or better resolution).
- Microscope (40X or above) with viewing lamp and X-Y positioning table, to ensure the centering of sample during disc cutting.
- ▪ ▪ ▪ ▪ Variable frequency.
- ▪ ▪ ▪ ▪ Spring loaded sample stage with x-y motion control.
- Slurry retaining ring.
- Operating voltage 230 V/50 Hz
- Required consumables.

Cross Sectioning Kit: Kit for preparing cross section TEM samples of semiconductor devices, thin films of various substrates and composites.

4. DIMPLE GRINDER

- For 3 mm dia and up to 1 mm thick specimens.
- Dimpling depth down to 10 microns or less.
- Stereo microscope 40x and above with viewing lamp for sample positioning.

- Automatic termination of the process for pre-set thickness.
- Digital and analog (dial readout) micrometer to indicate in-situ dimpling depth with a resolution of 1 micron.
- Having Controls for table rotation, grinding wheel rotation.
- Transmission light for sample color change observation.
- Three Pyrex specimen mounts, grinding wheels, felt polishing wheel and mounting wax.
- Other specimen mount, grinding and polishing wheels as options.
- Variable grinding speed.
- Operating voltage 230 V/50 Hz
- Required consumables.

5. SPECIMEN GRINDER AND HOT MOUNTING PLATE

Manual (or automatic) operation for 3 mm dia and other different dia specimens.

- Controllable Motor speed (maximum rpm > 500).
- Lapping fixture with digital and/or manual micrometer to set and monitor the thickness of material to be removed during lapping (Micrometer with graduations and resolution of 5 micron or better).
- Water nozzle hookup with container for water to provide a constant water supply for cooling and removing debris from the lapping surface with drain hose.
- Lapping plates and abrasive papers (SiC paper different grain sizes)
- Hot mounting plate (Hot Plate) reaching maximum of 300 ^{o}C with temperature indicator and control
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6. PLASMA CLEANER

A). Plasma Source

- Ready to accept TEM holders for all commercial TEM, STEM, and SEM
- The system shall have RF Source working at @13.56 MHz or similar high frequencies with effective and necessary shielding.
- The system shall have auto tuning to couple the source to the chamber and generator.

B). Vacuum System

- Vacuum pumping system shall consist of a two stage diaphragm pumping stack backing a 70 l/sec turbo molecular pump.
- The pumping system shall pump down the system in less than two minutes

C). Main Chamber.

- The chamber shall have two airlock ports to support all side entry TEM goniometers

- A third large entry port shall also be available for SEM holders, samples and other irregular shaped pieces.

D). Gas Control System

- The system should support a minimum of two gases these should include Argon and Oxygen.
- The gas flow should be controlled using MFCs.
- Should be capable of cleaning with minimal plasma damage.
- Should be capable to clean holey carbon grids without damaging them.

E). User Interface

- Recipes shall be available using mixtures of the three gases.
- The touch screen shall be configured to display multiple languages.

ACCESSORIES & SPARE PARTS:

All the necessary accessories and spare parts including (i) Targets, (ii) Specimen holders for the utilization of the system for a wide range of materials should be quoted separately and item wise. Required gases need to supply by the vendor.

POWER SUPPLY: 230V, 50Hz

INSTALLATION: The equipment to be installed by the company trained engineers. All the operational features should be demonstrated in details to the users.

7. COMPACT HIGH VACUUM COATER FOR SEM AND TEM SPECIMEN WITH VARIOUS METAL AND CARBON COATING FEASIBILITIES WITH THICKNESS MONITOR (THERMAL, SPUTTER AND E-BEAM)

- It should be compact and desk top design.
- High performance compact microprocessor controlled pumping station.
- Vacuum system optimized for both sputtering and evaporation techniques.
- Air cooled pumping system.
- Thermal evaporation for carbon and metals.
- DC magnetron sputtering for metals and alloys.
- E-Beam evaporation sources for carbon and low angle rotary shadowing (optional)

- High resolution film thickness measurement system (Optional).
- Rotary/Tilt and Rotary/Planetary/Tilt stages with variable speed.
- Feed through collar with standard KF40 flanges for easy port access.
- Lightweight stainless steel chamber with at least 2 large view port windows.

8. ELECTRICAL TRANSPORT SYSTEMS FROM MICRO/ NANO STRUCTURES: PROBES, HIBOND WAFER, LOCKIN-AMPLIFIER, CURRENT SOURCES AND VOLTAGE

General description

A Semiconductor Characterization System to perform device characterization, real-time plotting, and analysis with high precision and resolution, while remaining a highly integrated, flexible, upgradable and user-friendly package.

Features and functionality

The System must be integrated with all specified functionality encompassing all hardware modules within the same physical mainframe (provision of controls achieved through single software application / test executive). The System must include: (I) Two (2) DC source-measure channels (SMU), (II) One (1) multi-frequency CV meter as detailed below, (III) AC source and nanovoltmeter, (IV) Probe station and accessories, (V) Hibond Wafer and (VI) Lockin-amplifier.

I. DC Power source

A). Each DC channel SMU must be capable of sourcing and measuring in the following range:

Voltage

- Voltage Source : ± 100 nV to ± 1 V

- Voltage Measure: ± 100 nV to ± 1 V

Current

- Current Source: ± 5pA to ± 100m A or better with a resolution of 1pA

- Current Measure: ± 100fA to ± 100m A or better with current sensitivity of 10fA

B). Each DC channel must provide following forcing and measuring functions:

- Bias; Common; Sweep; List sweep (custom point-by-point user-defined sweep); Step

- Source read back (i.e. when programmed to sweep voltage, report back actual measured voltage values, instead of programmed).

II. Multi frequency CV meter

A). The multi-frequency CV module capable of supporting:

- Measuring parameters: Cp-G, Cp-D, Cs-Rs, Cs-D, R-jX, Z-theta
- Frequency range: 1 kHz to 10 MHz
- AC drive level: 10 mV to 100 mV
- DC drive level: -30 V to +30 V
- Programmable DC output modes: Bias, Sweep, List Sweep
- The software must include libraries for automatic extraction of CV parameter

B). The System must include PC operating capabilities as follows: (Optional)

- Standard operating system (e.g. Windows)
- User interface and data storage functionality
- Interactive point-and-click software for device characterization
- High-resolution LCD screen
- Keyboard and mouse control
- Built-in large capacity hard drive, CD/DVD drive,
- Built-in GPIB, Ethernet, USB and RS-232 ports
- VGA (video graphics array) port with support for external monitor.

III. AC Power source and nanovoltmeter

The system should be the combination of High precision AC current Source and a nanovoltmeter with current reversal facility with delta mode measurements through software. The specifications of instruments should be as under:

AC Current source with source & sink (programmable Load) 100fA to 100mA (or better), 10 ^{14} Ω input impedance (or better) for stable current sourcing into variable loads , Current sweep facility should be provided, AC current from 1pA to 100mA (or better), Built in standard arbitrary waveform generator with 1mHz to 100kHz or better frequency range. Programmable pulse width as short as 5µ sec, Built in RS232, IEEE and Ethernet interface.

Nanovoltmeter: Voltage range: 1nV to 100V (or better), 2 –channel measurements, Built in thermocouple realization and CJC. Current reversal facility. Built in IEEE and RS232 interface.

IV. Probe station and accessories

General Capabilities:

The Probe station should be capable of carrying out DC and RF application measurement for Semiconductor devices. The system should be compatible for On Wafer/Chip level and Assembled Devices Measurements. The chuck stage should be able to handle semiconductor wafers of diameter = 2”.

Detailed Specifications

1. Main System

The main system should feature

- Wafer size up to 2” diameter
- DC measurements
- RF measurements
- Base foot print dimension with fine lift
- Vibration Isolation table (optional).

A) Chuck stage

- X-Y manual control mechanism
- X-Y travel range of 50mm by 50mm
- Theta range & adjustment: +45, -90 deg
- Resolution: 1 µm
- Flatness : < 10 µm
- Temperature range: RT to 300°C (optional)

B) Platen Support

- Fine lift of 5.5 mm

C) Microscope and Accessories

- Video Ready StereoZoom Microscope Kit – 1 No.

INCLUDING:

- StereoZoom Microscope, with 40X optical zoom.

- 30X Eyepieces (pair)

- C Mount 0.63x camera adapter

- CCD colour camera with image capture and LCD monitor

- Long working distance solid state LED ring illuminator

- Illuminator control box & cables

-Operating voltage 230 V/50 Hz

D) Probes and Accessories ---- 4 Nos

- Four coaxial probes with following specifications:
  - Breakdown voltage: >500 V
  - Isolation resistance: > 1 x 10^{13} ohms
  - Frequency response (3 dB): 150 MHz
  - Characteristic impedance: 50 ohms
  - Tip material: Tungsten
  - Tip size : 0.3, 0.5 and 1 µm diameter.

E) Probe Positioners --- 4 nos.

- The Probe Micropositioner should be optimized for all IV and CV applications and should accept a variety of probes
- Magnetic Base or Vacuum Base (preferred)
- Movement(X-Y-Z) : 12mm◊12mm◊12mm, Linear Motion
- Lead Screw : 100 Thread / Inch
- Resolution : 1um

V. Hibond Wafer

- 100 Bond schedules programmable in non-volatile memory
- Selectable / adjustable reset heights (constant or adaptive)
- 1-2-2, 1-2-1 & 1-1-2 auto stitch or manual continuous stitch in manual & auto modes
- Sensor controlled bond actuation for variable bonding height
- 0.740 inch max. vertical bonding window
- Deep vertical access of 0.53" (1.34cm)
- Horizontal reach of 6.5" (16.51cm)
- Built-in digital temperature controller
- High / low power PLL ultrasonic generator
- Swing-away wire clamp assembly
- 0.5 and 2 inch spool mounts
- Z-axis movement controlled by footswitches or manipulator

VI. Lockin-amplifier

- 1 mHz to 102.4 kHz frequency range
- >100 dB dynamic reserve
- 5 ppm/°C stability
- 0.01 degree phase resolution
- Time constants from 10 µs to 30 ks (up to 24 dB/oct rolloff)
- Auto-gain, -phase, -reserve and -offset
- Synthesized reference source
- GPIB and RS-232 interfaces

General

- Vacuum pump and all the necessary tooling to use the probe station must be included
- The system should work on 230V, 50 Hz, Single Phase AC mains power supply.
- One set of Technical and operational manuals, in English, must be provided along with the system.

9. DEHUMIDIFIER

- To be of desiccant wheel type capable of continuous operation in ambient temperature ranging from 10°C to 50°C.
- To be of non-cyclic, rotary type working on the principle of continuous physical adsorption.
- The desiccant wheel rotor should be monolithic fabricated having high performance metal silicate and should be non-toxic and non-inflammable.
- The rotor should have robust internal structure with stainless steel perimeter flange for industrial quality.

- To be fabricated as a unitized body complete with reactivation heater, filters, motors, fans desiccant wheel drive unit and electrical controls with powder coated finish.
- To have seals with anti friction film to separate the process air and reactivation air streams and for minimizing air leakage.
- To have balancing dampers for regulating air flow.
- To have Power On, Heater On and fault status indicators.
- To have necessary inbuilt safety mechanism in the form of "high temperature safety thermostat cut-out (140°C to 160°C)" and "Reactivation cool down safety device (60°C to 70°C)".
- Electrical interlocking of fan motors, heaters and rotor drive.

The firm will have to carry out the satisfactory installation of the Unit, including all civil and electrical works, as well as give proper demonstration of humidity control by the unit, in the Institute premises

10. HIGH INDEX SINGLE CRYSTALLINE SILICON WAFERS

- Si(5512) – 1 unit contains 10 wafers
- Si(557) - 1 unit contains 10 wafers
- Si(337) – 1 Unit contains 10 wafers
- Si(113) - 1 unit contains 10 wafers

Commercial Terms & Conditions: -

1. **Price**: - The price should be quoted only on Ex-Works/ FCA basis separately, including export packing (Air worthy) charges (this does not include the applicable taxes). The validity of the quotations are required to be at least for six months.

2. **Destination**: - The consignment should be sent to **"**The Director, Institute of Physics, P.O. Sainik School, Bhubaneswar-751005, INDIA**"** on freight to pay (payable in Indian Currency) basis.

3. **Delivery**: - Delivery of the consignment should be made within ----------weeks from the date of issue of Letter of credit (L/C).

4. ****Payment**: - *The payment will be released against irrevocable Letter of Credit (LC). You are required to issue an order confirmation letter in order to establish the L/C. 90% of the L/C value will be released on delivery of the consignment & balance 10% will be released after successful installation & commissioning of the equipment against submission of Performance Bank*

Guaranty (PBG) of equivalent amount (10%) valid for the warranty period and acceptance protocol signed by both the parties (supplier / it's authourised representative & buyer (IOP)). All Bank Charges towards Confirmation of the LC, if required, will be borne by the supplier.

5. Bank Charges:- *All bank charges(except confirmation charges) inside India will be borne by the Institute & outside India will be borne by the supplier. If The LC confirmation is required by the supplier, the total confirmation charges will be borne by the beneficiary (supplier).*

6. **Bank Guaranty**: - You are required to submit a Performance Bank Guaranty equivalent to 10% of the equipment cost, valid for the entire warranty period issued by a nationalized Bank in favour of "Director, Institute of Physics, Bhubaneswar.

7. ****Details of the Consignment**: - You are required to submit the details of the consignment such as weight of the equipment, dimension of the packing & number of packets etc. at the time of order confirmation.

8. **Freight forwarder**: - The Institute will appoint the freight forwarder for forwarding & custom clearing of the consignment at the customs. The name of the freight forwarder will be intimated to the supplier at the time of opening of the L/C.

9. **Insurance**: - The transit Insurance of the consignment covering all risks and damages will be arranged by the Institute of Physics or its freight forwarder, duly authorized by the Institute.

10. **Warranty**: - The equipment should be warranted for a period of --------- months from the date of successful delivery / commissioning at Institute's site. The necessary warranty certificate in this effect should be furnished along with the supply/ commissioning of the equipment. Spare parts in warranty period are required to be replaced on DDP (Destination Duty Paid) basis.

11. **Documents**: - The despatch documents along with the signed invoice copy & the copy of the airway bill (2 copies each) should be despatched through courier / faxed to the Institute immediately after the equipment is handed over to the freight forwarder.

12. **Operational Manual**: - You are required to supply the operational manual of the equipment, circuitry diagrams etc. written in English only along with the consignment.

13. **Installation & training:- I**nstallation, personnel training & test measurement of the system at our site (Institute of Physics, Bhubaneswar) will be carried out by your trained engineers with your instruments, accessories, tools & tackles; deploying appropriate manpower as required, at your cost.

14. **Essential Spares/ consumables: -** Essential spares & Consumables along with the price list applicable for a period of 3/5/10 years are required to be supplied with the equipment & to be quoted separately.

15. **Shipment**: - Partial will not be strictly allowed.

16. **Agency Commission**: - No agency commission will be paid to any body / organization for this purchase.

17. **Banker**: - Our banker is Indian Overseas Bank, 121, New Station Square, Unit III, Bhubaneswar- 751001, INDIA. You are required to specify the Banking details such as A/c No, SWIFT code, Branch Code, name of the Bank etc. in order to release the payments.

18. **Training**: -

19. Service support: -

20. **Preventive Maintenance**: -

21. **Pre-Delivery Inspection:**

22. **Acceptance**: - If the terms & conditions mentioned above are acceptable to you, you are required to send the order confirmation letter along with a copy of this purchase order & details of consignment to the Institute within 02 weeks from the date of issue of the P.O. as a token of your acceptance.

DIRECTOR