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1. Description of the ITEM :

Glow Discharge Optical Emission Spectrometer for Elemental analysis with Depth Profiling of materials with built in interferometer or any other direct measurement

2. Detailed SPECIFICATIONS:

High resolution pulsed radio-frequency Glow Discharge Optical Emission Spectrometer (GD-OES) consisting of Polychromator and Monochromator for Elemental analysis and Depth Profiling of both thin and thick films as well as bulk materials, conductive and non-conductive (including polymers and ceramic) samples with the following detailed specifications.

I. Optical Spectrometer:

(A) Polychromator:

1. The optics of the spectrometer should be equipped with 47 analytical channels for the analysis of
   Al, Ag, As, Au, B, Ba, C, Ca, Cd, Ce, Cl, Co, Cr, Cu, F, Fe, H, Hf, In, K, La, Li, Mg, Mo, ,Mn, N, Na, Nb, Ni, O, P, Pb, Pr, Pt, S, Sb, Sn, Si, Sr, Ta, Te, Ti, V, W, Y, Zn, Zr and the number channels to be extendable for a maximum of 47+1 with monochromator option. The additional element is user selective.
2. Polyscan controlled primary slit movement for automatic scanning around all mounted channels should be provided.
3. A Paschen-Runge Mount with a focal length of 0.5 meter or better should be used.
4. A high performance holographic, ion-etched blazed diffraction grating with 2400 gr/mm or better should be used.
5. The gratings should cover the spectral range at least 110 – 620 nm
6. The optics of the grating used should be that of MgF_2.
7. Linear dispersion should be 0.27 nm/mm - 3^{rd} order; 0.41 nm/mm - 2^{nd} order; 0.83 nm/mm - 1^{st} order or better.
8. The optical system must be cleaned through purging with neutral gas and not merely evacuated.
9. Provision for nitrogen purge should be given so that analysis in the deep UV region is possible (inlet, outlet and recirculation pump should be provided)
10. Optical mask with more than 200 pre-etched secondary slits should be provided.
11. All channels should be equipped with high-dynamic range detectors (HDD) for real-time optimized sensitivity (dynamic range: 5×10^9 or better)

12. Optical Interface for collection and transition of the emitted light from the GD source directly to the spectrometers should be without optical fibers.
13. Optical lines needed to control the physical parameters of the discharge should be included in the offer and not considered as analytical lines.
14. Flat field polychromator should be provided for the analysis of Li, K and F with extended wavelength range up to 850 nm. It should be provided with blazed holographic grating with 1200 gr/mm or better.

(B) Monochromator:

1. Monochromator should be provided for full-wavelength range scanning and should allow simultaneous measurement of any "n+1" element within a depth-profile analysis and any sequence of elements in a bulk program.
2. Czerny-Turner optical mount should be provided
3. High performance holographic, ion-etched blazed diffraction grating with 2400 gr/mm or better should be provided
4. Focal length should be 640 mm or better
5. Controlled direct drive scanning mechanism should be provided.
6. It should include the full spectrum record, identification of elements and should be built in with data base of optical lines.

II. RF Excitation Source:

1. A pulsable radio frequency source should be provided with a frequency of 13.56 MHz and automatic matching in pulsed and non-pulsed mode and should be capable of analyzing both conductive and non-conductive samples without any change.
2. Spacious sample chamber should be provided for the analysis of large samples (should be able to analyze samples of minimum 10 x 10 mm and maximum of 40 cm diameter).
3. An automatic matching network with incidental and reflected power continuously monitored and corrected should be provided.
4. The source should be capable of fast sputtering of thick organic layers with the built in UFS system.
5. The depth resolution should be better than 1 nm.
6. The excitation source should have a protection system against leakage of the high frequency radiation for operator safety.

III. Glow Discharge Lamp:

The glow discharge lamp should have an anode and cathode with argon and vacuum circuits to measure vacuum.

1. The main anode diameter shall be approximately of 4 mm.
2. A pumping system with suitable two rotary vacuum pumps should be provided to get a vacuum of 10^{-3} torr or better in the lamp region for obtaining optimum crater shape.
3. The source should allow to prepare samples for SEM observation
4. The pressure of the gas should be kept constant in the lamp and should be monitored with suitable gages and controlled through software.
5. The parameters for the lamp should be controlled automatically.
6. Easy and simple sample loading with an automatic display of the sample status should be provided.
7. Electro-pneumatic pressure control valves, solenoid controls and safety circuits should be provided, wherever required.

IV. Depth Profiling

1. The GD-OES system should include a built-in interferometer or any direct measurement system for real time sputtering depth measurements. The depth resolution should be 1 nm or better
2. The instrument should be capable of performing both bulk (quantitative elemental) and quantitative depth profile analysis. The collected data should provide the composition in atomic and weight percents. Suitable library should be provided for regular calibration of the machine.

V. Data Acquisition and Processing System:

1. Ultra fast data acquisition module for both elemental and depth profiling analysis should be provided with a dynamic range of 10E9 mandatory for depth profile of ultra thin layers.
2. Data acquisition system should be of latest configuration and should be equipped with data transfer ports.
3. Software for bulk elemental analysis and depth profile within the same module should be provided.
4. The software should be capable of acquiring data, processing and displaying the results of elemental and surface analysis with the following salient features.
   a. Various operating modes (Real Power, Constant Vdc etc.)
   b. Calibration with bulk and possibly layered materials
   c. Automatic background correction
   d. Table of line interferences
   e. Storage of raw data and automatic re-calculation for quantitative and depth analysis
   f. High speed data acquisition
   g. Multiple (staged) acquisition for analysis of multiple layers with varying thickness
   h. Display of acquisition profile in real-time
   i. Built in Data Base of sputtering rates
   j. Quantitative surface analysis including IQ for depth profile analysis
   k. Calculation of Coating Weight/Thickness
   l. Special layer mode for easy calibration without Certified Reference Materials
   m. Automatic data transmission into standard or customized reporting formats
   n. Automatic storage of all results with raw data for further processing
5. Suitable laser jet based color recorder, toner cartridge and suitable USB interface cable should be provided.
6. All the software employed need to be duly licensed.

VI. Accessories: (quote separately)

The following essential accessories should be supplied along with the instrument

1. Complete kit for 2 mm anode (anode, ceramic insulation for anode, 1 red o-ring for ceramic, 1 black o-ring for anode/ceramic, centering tool, cleaning head and Teflon protecting finger).
2. Complete kit for 7 mm anode (anode, ceramic insulation for anode, o-ring for ceramic, black o-ring for anode/ceramic, centering tool, cleaning head, and Teflon protecting finger).

3. Small sample holder kit (include sample holder, o-ring and double face sticking Cu paper).
4. Indium kit (to embedded samples)
5. Special sample holder for analyzing curved surfaces
6. Suitable Nitrogen generator with compressor
7. Suitable chiller unit for cooling the RF source and cathode.
8. A general calibration kit consisting of 47 pure elements (NIST traceable standards) as in the specifications. Library for various elements, materials and alloys.

VII. Spare parts kit for 4 mm anode:

1. 4 mm DiP anodes: 3 Nos.
2. 2 mm DiP anode: 1 No
3. 7 mm DiP anode: 1 No.
4. Ceramic with small O-ring for 4 mm DiP anode: 3 Nos.
5. 8 mm O-ring for ceramic with small O-ring for 4 mm anode (Pack of 10 Nos.)– 15 Pkts.
6. 35 mm Black O-ring for anode/ceramic and ceramic/lamp (set of 2) – 5 sets.
7. Vacuum pump oil – 10 liters
8. Silicon wafer with SiO_2 should be provided for DIP usage – 1 No.
9. High pure aluminum (Al) plate should be provided for Daily checking the instrument – 1 No.

VIII. Necessary spares/consumables for trouble-free operation of the instrument for a period of 5 years to be quoted separately.

IX. AMC: After the expiry of warranty period, the supplier or their authorized Indian agents should enter into Annual maintenance contract for subsequent trouble-free operation and the charges for AMC for another 7 years may be quoted separately.

X. Electrical Requirements:

1. The instrument should be operable with 230 ± 10 V, Single Phase, 50 Hz.
2. Power regulation to compensate for fluctuations of in-line power supply up to ~ ± 10% should be provided.

XI. Acceptance Criteria:

1. The operational qualification of the instrument for qualitative and quantitative analysis to be checked by analyzing the elements in NIST traceable Certified Reference Materials (multi component metals, ceramics and polymers).
2. Depth profile capability of the instrument should be demonstrated by analyzing certified materials.

XII. Essentials

1. For imported equipment, there must be Indian company, with proven track record to provide after sales service
2. Comprehensive operation and maintenance manuals containing detailed circuit schematics of all the electronic systems must necessarily be provided in English along with the instrument. All the trouble shooting procedures should be described. Complete

mechanical assembly drawings of the instrument also to be provided along with the instrument.

3. The utilities required such as power, floor space, environment condition etc., should be clearly provided in the quotation. The equipment shall be guaranteed for a minimum period of five years from the date of commissioning. .
4. Necessary tools for operation and maintenance of all the systems should be supplied.
5. The GDOES system should be installed and commissioned at the purchaser's premises and capabilities of the instrument for smooth operation should be demonstrated by analyzing standard samples.
6. Training: A qualified application expert from OEM shall impart a 5 days training to engineers at customer's site on operation, programming, data analysis and routine maintenance of the GDOES system.
7. The system should be guaranteed for satisfactory performance against manufacturing defects and faulty workmanship for a period of 60 months from the date of commissioning and acceptance of the instrument.