	INDIAN INSTITUTE OF TECHNOLOGY BOMBAY **MATERIALS MANAGEMENT DIVISION** **Powai, Mumbai 400076.**

Ref. PR No. 1000051150 **Rfx. No. 6100002590**

Technical Description: Spectroscopic Ellipsometer (QTY : 01 NO).

Sr. No	Item Description	Detailed Technical Specification	Technical Compliance (Yes / No)	Additional Information (if any)
		The following proposal is for supply, installation & commissioning and demonstration of the Spectroscopic Ellipsometer System. The detailed specifications of individual modules are as per below:		
1	**Basic System Configuration**	A table top fully integrated Spectroscopic Ellipsometer System shall be a semi-automated non-contact based measurement system.		
1.1	Principle	Variable Angle based Spectroscopic Ellipsometry		
1.2	Configuration	The Spectroscopic Ellipsometer shall contain Light source, Stage, Polarizer and Analyser, Compensator, Detector, Data Acquisition Software & Visualization Camera connected to PC etc.		
2	**System Capability**			
2.1		Measurement		
		a. The system shall be a semi automatic with manual override for Thickness and Refractive Index (R.I) measurement of different thin films deposited over various substrates/wafers. To measure Ψ/Δ, Depolarization, Combine with fast CCD detection, Mueller Matrix b. Angle of incidence: 45°-90°, motorized		

		c. Any angle user selectable between 45°-90° d. Step Accuracy: ± 0.02° or better e. Any angle between 45-90° should be possible f. Repeatability: < 0.005° or better g. Horizontal sample mount h. Automated z-height i. Max sample size: 300 mm diameter j. Max substrate thickness: 18mm		
2.2	Measurement Area	System accepts sample sizes 10 mm to 300 mm diameter		
2.3	Film Thickness Measurement Capability	a. Thickness measurement Range: 1 nm - 5 µm b. transparent/partial transparent layers c. Accuracy: ≤ 1% () d. Repeatability: ≤ 0.03 nm		
2.4	Substrate/Wafer size	The system shall be able to handle substrates of sizes 10 mm x 10mm to 100mm x 100mm and upto 300 mm dia wafers having thickness up to 18 mm		
2.5	Measuring surface	a. The system should be able to detect low reflective, Transparent, Opaque, planar or textured surfaces. b. Measurable films can be of dielectrics, metals, nonmetals, semiconductors etc., c. The substrate can be metals, semiconductors, dielectrics, different types of glasses etc.,		
2.6	Number of thin film layers	The system shall be able to measure individual thickness measurements for minimum 20 layers.		
2.7	Calibration Standards & Certification	a. Four NIST traceable or equivalent standard calibrated samples covering the measurement range must be provided along with the system.		

		b. The necessary calibration standards & certification documents must be provided with the system.		
3.	**Sample Stage**			
3.1	Stage	a. X-Y stage to accommodate samples up to 200 x 200 mm and 300 mm dia. b. Automatic Z adjustment. Z (vertical) movement range of 18 mm with a resolution of 5 μm or better.		
3.2	Holding Mechanism	Appropriate vacuum chuck based substrate/wafer holding mechanism shall be provided along with the vacuum pump.		
4.	**Light Source Assembly**			
4.1	Source	Deuterium & Quartz Tungsten Halogen or Xe Lamp		
4.2	Polarizer	Computer controlled Polarizer with compensator shall be provided		
4.3	Spectral region	UV-VIS-NIR		
4.4	Spectral range	200 to 1700 +/- 10nm		
4.5	Spot size	**Nominal** 3 - 6 mm diameter, divergence <0.4^{o} < 300 micron diameter (with focusing probes)		
4.6	Lifetime	Minimum 1000 hours of operation time		
5.	**Detector Assembly**			
5.1	**Rotating Compensator Ellipsometer (RCE)**	a. Rotating Compensator Ellipsometer (RCE) configuration with capability to resolve as many elements as possible in the Muller Matrix b. All wavelengths are acquired simultaneously. c. Minimum data acquisition 0.3 seconds. d. Typical data acquisition times between 1-5 secs		
5.2	Detector	CCD Detector Range : Ψ = (0-90°) and Δ = (0-360°) Psi: 45° ± 0.03° Delta: 0° ± 0.08° Depolarization: 0% ± 0.5%		
5.3	Spectral Resolution	a. 1 nm wavelength spacing, < 2.5nm FWHM -UV-Visible Region		

		b. 2.5 nm wavelength spacing, < 3.5nm-FWHM NIR region		
5.4	Analyzer	a. The Computer controlled Analyzer with compensator shall be provided b. Dual Rotating Compensator		
5.5	Jones Matrix/Mueller Matrix	System must be capable of thoroughly characterizing optically anisotropic samples. A analysis certificate of a standard optically anisotropic material must be provided with the system		
6	**Analysis/Application software**			
6.1	Software	The control software shall have a graphical user interface. The capabilities desired from the controller/ software include: a. Source Selection b. Acquisition and analysis of data c. Standard materials library (Should include Silicon based Oxides/nitrides but not limited to) d. Data and Graphs shall be transferable to Standard Windows applications e. Extraction of Physical parameters: Thickness, Optical constants, etc., f. Suitable PC based licensed copies of latest Windows OS and control software along with their DVD backups shall be provided.		
7.	**Accessories**			
7.1a	Temperature Controller Using liquid Nitrogen	Temperature range: -70°C to 600°C Sample size: up to 22mm in diameter and 5mm thick. Enclosure with optical windows allows sample purge. Includes temperature controller and thermocouple built into the sample chuck to monitor sample temperature. Active cooling with Liquid Nitrogen (Dewar and pump included, customer supplies liquid N_2).		

		Enclosure restricts measurements at only 70° angle of incidence, variable angle capability without enclosure. Software control of temperature to coordinate measurements with temperature profile		
7.1b	Temperature controller without liquid Nitrogen	Room temperature to 200 °C range within +/- 1 °C tolerance Software control of temperature to coordinate measurements with temperature profile		
7.2	Focusing probe	Standard Focusing 120-300 microns in diameter Probe tip is 36 mm from center of stage rotation. Working distance* is 3 mm at 75° AOI		
7.3a	Transmission Mount	To Hold sample vertically in the path of light beam to allow normal incidence transmission measurements to record routine bandgap measurements in the spectral region. Transmission mount must enable measurements on samples upto 25 mm diameter or larger		
7.3b	Porosimetry	Porosimetry specifications The system should be capable of measuring porosity of thin films and coatings (Porosity range: 0 to 100%) deposited on any substrate. It should be possible to carry out. Average pore size measurement. There should be provision in the software package to display the volume fraction of material and void in terms of percentage (%). Should be supplied with porous chuck		
7.4	Backside reflection compensation	For film deposited on transparent substrates (like glass), a suitable mechanism/protocol must exist to prevent interference from the backside reflections.		
7.5	Standard samples for calibration	Si/SiO_2 standard wafers 4inch dia wafers with SiO2 thicknesses in range of 2 nm to 1000 nm.		
7.6	Spares	1 set of bulbs and fibers must be provided		
7.7	Vibration absorbing table and with racks	A vibration absorbing table to set up ellipsometer with dust-protection enclosure will be required. Racks must be provided to stack accompanying hardware (temperature control, power supply, spectrometer, etc.)		

7.8	Computer and control software	a. Operator Computer (i7 Intel processor, 16GB RAM, 250GB SSD, 24" monitor or better configuration) b. Multi-use License for the ellipsometer data acquisition and analysis software c. Supplied must provide all necessary drivers and control software.		
9.	Mains power supply	230 V ± 10 % single phase (1ϕ), 50 Hz		
10.	Foot print and weight	The system footprint and weight shall be provided.		
11.	Operation Manuals	The system should have one set of user manual		
12.	Warranty	3 year standard onsite warranty must be provided. Cost of annual comprehensive AMC charges post warranty also must be mentioned.		
13.	User List	A detailed list of existing customer base, references, and contact details may be submitted along with the quotation (At least 10 customers from leading govt/pvt labs like IIT, TIFR, NCL, CSIR labs, DAE, NIT,IISERS etc)		
14.	Spares/consumables support	Manufacturer to guarantee spares/consumables support for a period of not less than 10 years.		
15.	Training /Installation	Supplier shall provide necessary operational/ maintenance training to engineers/technicians on site without additional cost.		
16.	Technical Support	Supplier shall provide all necessary technical support in the timely manner (on-call support may be acceptable)		
17.	Compliance	All compliances shall be supported by technical leaflet or statement from manufacturer. Any blank left shall be taken as noncompliance. Supplier shall also bring out the reasons for deviations, all relevant standards or with better specifications along with explanations.		
17.1		Provision to mount this ellipsometer on vacuum chamber for in-situ growth and/or surface reactions studies is highly desired		
17.2		Diffused reflectance measurement on horizontally mounted sample will be preferable		
17.3		Spectroscopic Ellipsometer System shall measure the Refractive Index and thickness of		

		various thin films like Silicon Nitride, Silicon Dioxide, Silicon Oxynitride, Amorphous Silicon etc., deposited over different kind of substrates like glass, silicon, sapphire, etc. This tool helps in optimizing the thin film thickness to be deposited on various substrates in different processes for making electronic devices.		
17.4		A typical Spectroscopic Ellipsometer System consist of an Incident light source, a detector, substrate/wafer platform etc., It shall be provided with integrated controller, flat panel display and proper interface for computer and memory drives.		