



**INDIAN INSTITUTE OF TECHNOLOGY BOMBAY
MATERIALS MANAGEMENT DIVISION**

PR NO. 1000043234

Rfx No.: 6100001935

Technical Specifications for dual-beam ratio-measuring Advanced spectrophotometer system with wavelength range 175-3300 nm

| Sr.No. | Description | Value / Range | Technical Compliance (YES/NO) | Additional Information (if any) |
|--------|---|----------------------|-------------------------------|---------------------------------|
| 1 | Wavelength range a. 175-3300 nm for direct transmission. | 175-3300 nm | | |
| | b. 175-3300 nm for specular reflectance. Measurements: Optical spectrum measurements (absorbance, transmittance, diffuse and specular reflectance) Photometric analysis to determine the concentration of a substance in a sample Kinetics analysis. | 175-3300 nm | | |
| 2 | Detectors a. A 2 or 3 detector system with low noise and zero stitching error. PMT+PbS or PMT + PbS/InGaAs configuration to cover 175-3300 nm range | Required | | |
| 3 | Light sources a. Any, as long as the wavelength and noise criteria are met. | | | |
| 4 | Beam splitting system a. Chopper which measures a sample, dark, and reference signals per cycle. | | | |
| 5 | Wavelength accuracy a. UV-Visible | within ± 0.08 nm | | |
| | b. IR | within ± 0.3 nm | | |
| 6 | Wavelength reproducibility a. Std. deviation of peak separation in repetitive scanning | < 0.01 nm in UV-Vis | | |

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| | b. Std. deviation of peak separation in repetitive scanning | < 0.04 nm in NIR | | |
| 7 | Wavelength Resolution a. UV-vis | 0.05 nm or better | | |
| | b. NIR (Near-infrared) range | 0.2 nm or better | | |
| 8 | Photometric range a. UV- visible | 8 Abs | | |
| | b. NIR till 2500 nm | 8 Abs | | |
| | c. NIR beyond 2500 nm | 6 Abs | | |
| 9 | Photometric accuracy Any wavelength in the range. a. UV-Vis and NIR | 1 A < 0.003 Abs | | |
| 10 | Photometric linearity Tested using 2 nm slit and <1 second integration time. Any wavelength in the range. a. UV-Vis | 2 A < 0.0200 A | | |
| | b. NIR | 2 A < .0010 A | | |
| 11 | Photometric noise Tested at < 1 second integration time. Any wavelength in the range a. 4A UV-Vis | <0.0010 A | | |
| | b. 3A NIR | <0.0001 A | | |
| 12 | Baseline flatness Measured over the working range of 200 nm to 3000 nm. Measured with 2 nm slit and 2 second integration time. No smoothing a. < 0.0010 A | Required | | |
| | b. Stitching error should be absent/effectively nullified when detectors and/or filter changes happen, especially at ~800 nm. | Required | | |
| 13 | Stray light in % Transmittance a. At 220 nm, NaI ASTM method | 0.00007 or better | | |
| | b. At 1420 nm, H ₂ O, 1 cm pathlength | 0.0004 or better | | |
| 14 | Spectral Bandwidth a. UV-Vis: 0.05–5.00 nm in 0.01 nm | Required | | |

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| | increments | | | |
| | b. IR: 0.2–20 nm in 0.04 nm increments | Required | | |
| 15 | Signal averaging in seconds a. 0.05 – 60 | Required | | |
| 16 | Scan rate in nm/min a. Up to 2000 nm/min b. Must have the ability to average by repetitive scanning up to 100 times. | Required | | |
| 17 | Instrument operation a. 50 to 80% relative humidity, non-condensing. | 10 to 30 °C | | |
| | b. 240 VAC at 50Hz | Required | | |
| 18 | Life of optics a. The system must have ruggedized optics that will not degrade in the 10 years of “normal” use. Normal usage is ~ 20 hours/week | Required | | |
| | b. Please highlight strategies to achieve ruggedization, like protective coatings or ozone abatement. | Required | | |
| 19 | Nitrogen purging a. We need a system with can be purged with N2 for both optics and sample compartments. b. The purging loops for optics and sample compartments must be separate. c. The purging must only be needed during active use. No purging should be required in standby or power-off mode. | Required | | |
| 20 | Digital I/O a. Must communicate with external computer through USB or ethernet. | Required | | |
| | b. The control software must be fully functional for automated measurement and digitization of data. | Required | | |
| | c. OEM should provide a high-speed computer with Windows 11 Professional x 64-bit operating system; minimum 24” LED Monitor; i7, 14th generation Processor; 16 GB RAM; SSD – 500GB to 1 | Required | | |

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| | TB storage; High speed USB or CD/DVD burner for backup-storage of image data, USB Keyboard and USB mouse be provided | | | |
| 21 | Software Control software should be compatible with a standard Windows desktop. We will not accept a customized computer that must be purchased from OEM. a. Software must run on Windows 11. | Windows 11 | | |
| | b. OEM must provide a copy of the software for posterity | Required | | |
| | c. OEM must assure forward compatibility. Control software must run on a “supported” version of Windows for the next 10 years. If this requires updates, then those must be free. | 10years window support | | |
| | d. Appropriate software to perform kinetic, temperature-dependent and sequential measurements | Required | | |
| | e. original windows and software packages for restoration in case of computer crash. | Required | | |
| 22 | Sample size a. Diameter | 10 mm to 25 mm | | |
| | b. The primary issue with measuring small samples, without degradation in SNR, is control on the illuminated spot-size. The system must be designed in a way that apertures can be inserted in the optical path so that the spot-size is reduced. If this requires a mandatory accessory (not including the apertures themselves), please include it in the cost. | Required | | |
| | c. Include a set of apertures needed to measure small samples | 1set | | |
| 23 | Form-factor a. Seeking a table-top system | | | |
| | b. Volume | < 0.4 m3 | | |
| | c. Weight | < 120 kg | | |
| 24 | Training The quote should include cost of installation, acceptance tests, demonstrating | Required | | |

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| | performance, and operational training of 5 people. | | | |
| 25 | Documentation Complete product manual must be provided, that covers the operation, basic troubleshooting, calibration procedure, and maintenance. | | | |
| 26 | Warranty | 5 years mandatory | | |
| 27 | References The RFQ must include references of 3 previous installations, in a centralized characterization facility of similar size or bigger, preferably in India. Please provide the names and contact addresses of the referees, so that the committee can contact them independently. | Required | | |
| Accessories | | | | |
| 28 | 1. Powder cell holder | 2 | | |
| | 2. Cuvette holder | 2 | | |
| | 3. High-performance Integration sphere a. Dual-beam mode with reference b. Wavelength: 200-2500 nm. c. Support reflectance with specular included, reflectance with specular excluded, and transmission measurement d. With baffle f. 5 mm to 25 mm diameter | 2 units | | |
| | 4. Set of beam apertures | 1 set | | |
| | 5. General-purpose optical breadboard (GPOB) | 1 | | |
| | 6. GPOB that supports an external detector. | Required | | |
| | 7. Polarizer and depolarizer | 1 set | | |
| | 8. Holder for mounting samples as small as 5 mm diameter. | 1 | | |
| | 9. Any other specialized accessory that provides advanced information for liquid, solid samples, powder, and films. | | | |
| | 10. Calibration standard for a. Wavelength accuracy for Vis and NIR b. Photometric accuracy | Required | | |

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| | <p>c. Wavelength resolution for Vis and NIR</p> <p>d. Stray light for Vis and NIR</p> <p>e. Diffused reflectance</p> <p>f. Diffused transmission</p> | | | |
| | <p>11. Temperature dependence measurement sample holder: Temperature controlled 8 cell micro cell accessory (0-110 degrees C) for absorbance or transmission of liquids. 8 cell Peltier temperature-controlled cell holder capability to measure minimum 2 different temperature simultaneously.</p> | Required | | |
| | <p>12. Quartz Cuvettes with tight cap (lid) for temperature-dependent measurements: 10 x 10 mm (8 Nos) and 10 x 2 mm (4 Nos)</p> | Required | | |
| 29 | <p>Other requirements</p> <p>a. Availability of spare parts: The vendor has to guarantee that all the spares for the offered spectrophotometer and attachments will be available for at least the next 10 years</p> <p>b. Pre-installation requirement (electrical, humidity and gas, etc.): Should be mentioned along with the offer.</p> | <p>10 years</p> <p>Availability of spare parts</p> | | |
| 30 | <p>Acceptance tests</p> <p>The system performance will be verified with standard test/reference samples. The specification must be successfully demonstrated at our site.</p> <p>1. Wavelength accuracy and repeatability of the instrument should be performed by National Institute of Standards and Technology (NIST) traceable standards and by measuring the emission from a mercury lamp and deuterium lamp</p> | Required | | |
| | <p>2. Photometric accuracy of the instrument should be performed by National Institute of Standards and Technology (NIST) traceable standards</p> | Required | | |

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| | 3. Photometric Noise should be performed by National Institute of Standards and Technology (NIST) traceable standards | Required | | |
| | 4. The stray light of the instrument needs to be measured and should come within the limits of the instrument specification | Required | | |
| | 5. The baseline flatness of the instrument has to be demonstrated | Required | | |
| | 6. Absorbance zero stability needs to be demonstrated | Required | | |
| | 7. Demonstrate the step/stair values that occur during detector changeover, source changeover, and source changeover are within the limits of the instrument specification. Preferably 0.1T% in the UV VIS region | Required | | |
| | 8. Reflectance data accuracy should be demonstrated using the National Institute of Standards and Technology (NIST) traceable standards | Required | | |
| | 9. The NIR region wavelength accuracy test needs to be performed by National Institute of Standards and Technology (NIST) traceable standards and by measuring the emission from a mercury lamp and deuterium lamp | Required | | |
| | 10. Spectral bandwidth accuracy demonstration | Required | | |
| 31 | Power Supply + 3 kVA UPS a. Suitable UPS (true sinewave; online, one phaseout) for 1 hour of back up should be provided. All equipment should operate with 220 V, 50 Hz power supply. | Required | | |