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

Ref. PR No. 1000058103 Rfx. No. 6100003188

Item Description: **FT-IR Spectrometer with Catalytical Reaction Chamber**

Sr. No	Item Description	Detailed Technical Specification	Technical Compliance (Yes / No)	Additional Information (if any)
1.	Dimensions – H × W × L	NA		
2.	Device mass	NA		
STANDARD INSTRUMENT SPECIFICATIONS				
1	Working Pressure and other details	The spectrometer shall be a vacuum spectrometer capable of maintaining a working pressure of less than 5 mbar. For true vacuum operation, the housing of the spectrometer must be made of at least 1/4" cast aluminium		
2	Optics Details	The optics must be permanently mounted so that the optical alignments are maintained under both evacuated and non-evacuated operations.		
3	Interferometer and sample chambers details	The interferometer and sample chambers must be separately evacuable in order that the sample compartment may be brought up to atmospheric pressure without losing vacuum in the interferometer and detector chambers		

4	Operating Range details	Spectrometer should have standard operating range from 8000cm-1 to 350cm-1. System should have provision to expand the wavenumber region with suitable optics.		
5	Detector Details	Spectrometer should have facility to store up to two light sources, up to 7 detectors inside the spectrometer itself. The selection of sources and detectors should be controlled through software.		
6	Cooling Mode	The source should be air-cooled type.		
7	Input and output Ports	The optical bench must support two input ports and at least five computer controlled external beam output ports to accommodate future instrument expansion to interface the FT-IR with external sample compartments, TGA-IR interfaces, Infrared Microscopes, FT Photoluminescence attachment etc . For maximum accessibility the output ports should be located to the side, front and left of the optics bench.		
8	Resolution	Spectrometer must have resolution of 0.16cm-1		
9	Wavenumber	Wavenumber accuracy must be better than ≤ 0.005 cm-1 and repeatability also must better than ≤ 0.005 cm-1 for 10 repeated measurement.		
10	Signal to noise	The minimum signal to noise for a 5 second 100% line measurement should exceed 14000:1 peak-to-peak (or < 5.8*10-5 AU noise) at 4 cm-1 spectral resolution, Blackman Harris 3-Term apodization between 2200 to 2100 cm-1		

11	Photometric accuracy	Photometric accuracy - Better than 0.1% T	**Technical Compliance (Yes / No)**	**Additional Information (if any)**
12	Additional Details	The spectrometer must be FULLY digital, with the ADC converter integrated with the detector preamplifier. The systems A/D converter must have a *24 bit dynamic range* for accurate representation of spectra and best signal to noise. Equipment must be compatible with 220V/ 240 V power supply		
13	Scan Rate	The spectrometer must offer rapid scan rate of at least 20 spectra per second at 8 cm-1 optical resolution.		
14	Aperture wheel and position details	The instrument should include a software-controlled aperture wheel with 12 positions ranging from 0.25 up to 8 mm for optimization of throughput.		
15	Well functioning terms	Spectrometer components such as source, laser, detector, interferometer and automation units must be continuously monitored for operation within factory specifications . The operator must be immediately notified by system software if any of the factory specifications are not met. The software must offer detailed information about the nature of the failure and suggest possible remedies.		
16	Additional Details	1. The main sample compartment should have a center focus to accommodate the complete range of commercially available accessories and large customized accessories. 2. The FT-IR must incorporate a high throughput permanently aligned and wear-free high-stability interferometer. The		

		interferometer should be capable of acquiring data in both scanning directions to ensure the maximum signal-to-noise ratio in the shortest possible time. 3. The system must incorporate an automated internal instrument validation unit.		
17	Real Time display	The spectrometer must provide real time display of the infrared spectrum.		
18	System Communication	Communication between the spectrometer and controlling PC must be performed using an Ethernet protocol.		
19	Vacuum Pump	The spectrometer must include an oil-free dry vacuum pump with a capacity of 14 m3/h		
20	Aperture ratio	Aperture ratio should be f/2.75, nominal beam diameter 40 mm (1.57“)		
21	Additional cell	The system should include one demountable cell with KBr windows for transmission measurement of powder/ pellet sample along with the supply of main instrument		
CATALYTICAL REACTION CHAMBER				
1	Diffuse Reflectance and Sampling Area details	1.A high-performance Diffuse Reflectance Accessory with 20% diffuse reflection efficiency with QuickLock base plate. 2. “Diffuse Reflectance Infrared Fourier Transform Spectrometer” unit must have highly efficient collection system with capabilities of minimizing the detection of the specular component.		

		3. “Diffuse Reflectance Infrared Fourier Transform Spectrometer” unit must have Ellipsoids pivot to provide easy access to the sampling area.		
2	Temperature Unit	“Diffuse Reflectance Infrared Fourier Transform Spectrometer” unit must have high temperature unit upto 550 Deg C with suitable windows.		
3	High Pressure Dome	“Diffuse Reflectance Infrared Fourier Transform Spectrometer” unit must separately include a high pressure dome with suitable windows, that is suitable for high pressure operation (upto 30 atm) at high temperature (upto 450 deg C).		
4	Additional Hardware items	“Diffuse Reflectance Infrared Fourier Transform Spectrometer” unit must be supplied with all necessary hardware like alignment fixture, alignment post, 10mm and 3mm sampling cups, funnel and mating hardware and temperature controller.		
5	Chiller	It also must include suitable water cooler/chiller unit.		
SOFTWARE CAPABILTIES				
1	Software Capabilities	1. The full process of data acquisition, data processing, data evaluation and data visualization/reporting should be manageable by one single workstation software. 2. All results of one experiment should be stored in a single file including spectral data, images or 3D files, evaluation results, measurement parameters and history trail. 3. The software should provide a powerful macro engine, enabling users to program dedicated measurement and evaluation sequences themselves.		

		4. 3D data display, manipulation and evaluation within the operating software should be included 5. The software should be compatible with customized PYTHON scripts 6. The software must be a "all-in-one" software for data measurement, manipulation and evaluation.		
INSTALLATION AND SITE ACCEPTANCE CRITERIA: The supplier must demonstrate that the instrument meets the following technical specifications through on-site testing:				
1	**Wavenumber Accuracy and Repeatability**	1. Demonstrate a wavenumber accuracy of ≤0.005 cm−1. 2. Demonstrate wavenumber repeatability of ≤0.005 cm−1 over 10 repeated measurements. 3. Demonstrate accuracy using a Polystyrene standard with a maximum deviation of ≤0.50 cm−1.		
2	**Signal-to-Noise (S/N) Ratio**	Demonstrate a minimum peak-to-peak S/N ratio exceeding 14,000:1 for a 5-second measurement at 4 cm−1 resolution.		
3	**Spectral Resolution**	Demonstrate the ability to achieve a resolution of 0.16 cm−1		
4	**Baseline and Photometric Stability**	1. **Photometric Accuracy:** Demonstrate accuracy better than 0.1% T. 2. **100% Line Deviation:** Demonstrate a baseline stability with a maximum allowed deviation of 0.5. 3. **Y-Axis Reproducibility:** Demonstrate a maximum deviation of ≤0.8% over repeated tests.		
5	**Vacuum and Environmental Integrity**	**Vacuum Performance:** Demonstrate the system maintaining a working pressure of less than 5 mbar.		

6	**Scan Speed and Energy Distribution**	**Rapid Scan:** Demonstrate a scan rate of at least 20 spectra per second at 8 cm−1 resolution. **Interferogram Amplitude:** Demonstrate a minimum peak amplitude of 70%.		
7	**Reaction Chamber Performance**	1.Demonstrate the **Catalytical Reaction Chamber** reaching and maintaining a temperature of 550 **ºC**. 2. Verify the integration of all required hardware, including the water cooler/chiller unit and the temperature controller		
8	**Software and Operational Checks**	1.Verification of the automated instrument status monitoring and notification system for component failures. 2. Demonstrate the real-time display of the infrared spectrum and the "all-in-one" functionality for data acquisition and 3D visualization.		

Pre-Qualification Criteria:

1. Bidders should be the manufacturer/authorized dealer. Letter of Authorization from original equipment manufacturer (OEM) on the same and specific to the tender should be enclosed.
2. An undertaking from OEM is required stating that they would facilitate the bidder on a regular basis with technology/product updates & extend support for the warranty as well.
3. OEM should be Nationally/Internationally reputed branded company.
4. Non-compliance of tender terms, non-submission of required documents, lack of clarity of the specification, contradiction between bidder specification and supporting documents etc. may lead to rejection of the bid.
5. Manufacturers are requested to provide ISO certificate and Declaration on CE Conformity with minimum 3 valid directives. These documents need to be uploaded/submitted along with the offer.
6. Equipment offered must be a model from the current serial production range of the manufacturer. Customized or One-off Manufactured Model will not be

accepted. Offer should be supported with printed catalogue & depicted on company website.

7. Machine should come with minimum Three-year warranty from date of installation and two additional year AMC after end of warranty.
8. Bidders must submit factory-authenticated Operational Qualification (OQ) and Performance Qualification (PQ) reports for the specific instrument configuration offered at the time of bidding. These reports must be generated using the system's automated validation software and confirm compliance with the following core specs: Wavenumber Accuracy: ≤0.005 cm−1; Spectral Resolution: 0.16 cm−1; Signal-to-Noise Ratio: >14,000:1 (peak-to-peak, 5 sec measurement); Interferogram Peak Amplitude: ≥70%
9. Supplier should mention the details of service setup and man powers, responsible for after sales support. Response time should be 48-72 hrs after reporting the issue.
10. Suppliers to provide proof of "Supply of Goods" at least 3 similar orders in the last 5 years for any government institute.