ANNEXURE-I

Specifications for Physisorption and Chemisorption Analyzer

Bidder Eligibility Criteria-I

Sl. No	Bidder Eligibility Criteria-I	Complied / Not Complied	Reference Page No.	Remarks, If any
1	The bidder/OEM should have supplied similar items to IITs, NITs, IISERs, CSIR Labs or other Govt. R&D organizations in the last 5 years, PO copies or installation certificates along with contact details of end user need to be submitted as the proof of supply. IIT Madras reserves its right to verify the claims submitted by the bidder and the feedback from the previous customers will be part of technical evaluation.			
2	The bidder should provide local service engineer to attend service related issues			

Technical Specifications II

Applications/ Purpose: To perform physisorption and chemisorption analysis of solid samples including heterogeneous porous catalysts, carbon based materials, adsorbents, and other inorganics.

Compatibility: Single analyser system should be compatible with physisorption and chemisorption analysis of the various materials.

S.No	Sepcification	Complied / Not Complied	Reference Page No.
Features for analytical system			
1	Automatic in-situ sample preparation for volumetric chemisorption.		
	Ability to sequence multiple analyses on the same sample.		
	The system should have multiple programming modes using a target P/P0 or fixed volumes in multiple ranges.		
	The maximum P/P0 using N2/Ar should be 0.999.		
	The system must monitor the manifold temperature and pressure continuously.		
	Degassing: At least two degassing stations should be operated simultaneously using different degassing protocols. The equipment must be capable of performing degassing and analysis, simultaneously.		
	The system should have an automatic backfill facility from dedicated gas input or isolated under vacuum at the end of degassing.		
	Fully integrated built-in/external vacuum system using an oil-free turbo pump.		
	Degas station, software controlled degas system should allow multiple temperatures, ramp rates, and degas times to be programmed, performed, stored as part of analysis parameters, and displayed in results.		
	Five or more user definable analysis gas inlets.		

	The equipment must be fully automated, and supplied with all the accessories and features for sample preparation, as well as sample treatment.		
	Equipment software should be the latest Windows O/S compatible.		
	The software should have the capability to perform a range of analysis as given below: 1. **For physisorption**: Specific surface area using single and multi-point BET, Langmuir, t-plot, BJH/DH, Dubinin-Radushkevich methods; Mesopore/micropore size distribution calculated using BJH/DH, Horvath-Kawazoe methods; Micropore volume and total Pore volume using Dubinin-Radushkevich/Dubinin-Astakhov, α-s, BJH/DH methods; Adsorption energy computed using the Clausius-Clapeyron or Dubinin-Radushkevich methods.		
	2. **For chemisorption**: Parameters such as active metal surface area of metal, percent metal dispersion, and average crystallite size should be estimated accurately; heat of adsorption and monolayer capacity; Extrapolation, Langmuir, dissociative Langmuir, Freundlich, Temkin should be employed to estimate chemisorption parameters.		
	3. The software should have to capability to generate professional reports, and the data should be exported to conventional file formats.		
2. Operating Specifications:			
	Surface area range: 0.01 to 1200 m2/g or above		
	Pore size distribution: 3.5 to 5000 Å		
	Micropore volume: Detectable within 0.001 cc/g		
3.Gases for analysis:			
	Physisorption- N2, Ar		
	Chemisorption- CO2, CO, H2, NH3, O2		
4.Detailed specifications for			
	Physisorption- Continuous P0 monitoring		
	Pressure Accuracy: > 0.15% of reading		
	Pressure Measurement: 0 to 0.1 Torr		
	Degas System: Ambient to 350 °C or higher, with minimum 1 °C increment (with programmable ramp range)		
	System Capacity: 1 analysis, with minimum 2 degas ports.		
	Chemisorption- System Capacity: 1 analysis port		
	Furnace temperature: 1000 °C or more and with minimum 1 °C increment (with programmable ramp range)		
5	**The following standard accessories/consumables should be supplied**: Surface area reference materials, chemisorption reference materials. Sample cells for physisorption and chemisorption. Other general chemisorption operating and physisorption operating supplies should be included.		

6	**Training:** Comprehensive training should be provided to the users on method development, operation, troubleshooting the instrument while analysis of the materials.		
7	**Required feature:** The system should have the capability to be upgraded with a thermal conductivity detector with calibration loop option to perform TPR/TPD/TPO and pulse chemisorption.		
8	**Items to be quoted separately:** **a. Gases and gas cylinders (UHP He, O2, N2, H2 and CO) with regulators** **b. Desktop computer of standard configuration with the latest Windows O/S** **c. Online UPS with batteries of a standard kVA capacity** **d. Service AMC for instrument maintenance for 2 years** **e. 10 L liquid nitrogen Dewar tank** **f. Standard accessories/consumables like sample tubes, ferrules, O-rings, quartz wool**		

(Note: It is mandatory for the bidders to provide the compliance statement in tabular column format along with catalogue page number (comply/not comply) for the Above points with document proof as required. Failing which bidders will be technically disqualified)