

**NANOSCALE RESEARCH FACILITY
INDIAN INSTITUTE OF TECHNOLOGY – DELHI
HAUZ KHAS, NEW DELHI-110016**

17 Dec, 2012

NOTICE INVITING QUOTATIONS

Subject: Quotation for purchase of Fuel Cell Test Station from project no RP02395.

Sealed quotations in separate envelope of technical and commercial bid kept in one sealed outer envelope are invited for purchase of a **Fuel Cell Test Station** as per specifications given below. Sealed quotation should reach latest by Jan 10, 2012 to **Prof. Vikram Kumar, Block VI-116, Nano Research Facility, Indian Institute of Technology Delhi, Hauz Khas, New Delhi - 110016**. The quotation should be superscribed “**Quotation for Fuel Cell Test Station Due on Jan 10, 2012**”

Specifications for Fuel Cell Test Station with Accessories:

Fuel Cell Test Station with FRA, Potentiostat, Galvanostat(optional), high resolution data acquisition and software-driven computer controlled preferably through USB interface

1. Detailed specifications:

1.1. Fuel cell test station

a. Electronic load

Maximum load current	: 5 A
Maximum load power	: 100 W
Minimum load resistance	: < 2 mΩ
Current resolution	: < 1 mA for 5 A
Current accuracy	: < ±0.3 % of full scale current

b. Voltage measurement

Max. whole cell voltage	: 20 V
Max. reference electrode voltage	: 9.999 V
Voltage resolution	: < 1 mV
Voltage accuracy	: < ±3 mV or < ±0.3 % of the reading

c. Fuel flow controls

Anode side	: Liquid fuels (Glucose, Ethanol, Methanol) Flow rates from 0.3 µl/min to 30 ml/min. Software controlled flow. Automatic N ₂ purge valve.
Cathode side	: Liquid fuels (Glucose, Ethanol, Methanol) Flow rates from 0.3 µl/min to 30 ml/min. Software controlled flow. Automatic N ₂ purge valve. : Gaseous fuels (O ₂ , Air, N ₂) Flow rates from 20 sccm to 100 sccm. Single MFC operating for O ₂ , Air, N ₂ individually.

- Correction factor should be provided for each gas.
 Software controlled flow.
 Automatic N₂ purge valve.
- d. Temperature controls** : Temperature range 0 to 350 °C (± 1 significant digit).
 Temperature controls for anode and cathode separately.
 - e. Humidifiers** : Anode and cathode humidifiers separately.
 Temperature range from ambient to 99 °C.
 Manual fill.
 - f. Back pressure control** : Manual
 - g. Alarm** : All the safety controls

1.2. Frequency response analyser

- a. Electronic load**
 - Maximum load current : 5 A
 - Maximum load power : 100 W
 - Current resolution : < 1 mA on 5 A
 - Current accuracy : < ± 0.3 % of full scale current
- b. Voltage measurement**
 - Max. whole cell voltage : 20 V
 - Voltage resolution : < 1 mV
 - Voltage accuracy : < ± 3 mV or < ± 0.3 % of the reading
- c. Generator frequency range** : 1 mHz to 100 kHz
- d. Frequency error** : < 0.01 %
- e. Amplitude range** : < ± 10 mV
- f. Amplitude error** : < 1 % ± 1 digit
- g. Measurement time minimum** : < 10 ms
- h. Error limits** : < 0.5 % Magnitude error
 < 0.5 ° Phase error

1.3. Fuel cell Potentiostat & Galvanostat(optional)

- a. Cell connections** : 4 terminals
- b. Working electrode**
 - Current range : 2 A
 - Resolution : 122 μ A to 1.22 μ A
- c. DC polarisation**
 - Voltage range : -3 V to +3 V
 - Limit of error : < 0.25
 - Resolution : < 125 μ V
- d. Sweep functions**
 - Scan rates : 1 mV/sec to 1 V/sec
- e. Resolution** : < 152 μ V
- f. Data acquisition speed** : < 10 points/sec (voltage & current)

2. Techniques included:

Standard electrochemical techniques including: Cyclic Voltammetry, Linear Sweep Voltammetry, Electrochemical Impedance Spectroscopy, Chronoamperometry, Chronopotentiometry, Square Wave Voltammetry, Normal and Differential Pulse Voltammetry

3. Accessories:

Working electrode (Pt & GC, 3 mm dia.), Ag/AgCl Reference electrode, Pt Counter electrode, Compatible leads for the electrodes and the heating of the cell, all interface cables & accessories necessary for the installation.

4. Compatible software: software required for analyses of FC test results and standard electrochemical techniques.

5. Compatible computer to operate Fuel Cell Test Station, FRA and Potentiostat (Galvanostat optional): (mention the specification and make clearly in the quotation). This may be supplied locally.

Terms & Conditions:

1. The quotations must have validity of at least three months.
2. Quotation must include insurance and air-freight charges, delivery period of the items addresses to The Indian Institute of Technology, Delhi, India (CIF, New Delhi).
3. The products will be used for educational purposes. Any applicable academic institution discounts should be offered and stated.
4. Detailed Brochures should accompany the offer.
5. If the bidder is an authorized dealer then the authorized Indian dealership certificate from the principles should be enclosed.
6. 2 years warranty desirable.
7. Payment will be through irrevocable letter of Credit.
8. In case the items are proprietary products of the company, a proprietary item certificate stating the same must be provided.
9. Training should be provided free of cost.
10. List of end user should be provided.
11. Institute reserves the right to accept or reject any or all the quotations without assigning reasons thereof

B R Mehta

S. Basu

A. K. Ganguli

A. Shukla