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Enquiry No: CE/EEM/2013/NC/IC-ICP-MS/5

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Sub: Call for quotation for "IC-ICP-MS System"

Sealed Quotation(s) are invited (in foreign currency on CIF New Delhi basis) for the purchase of IC-ICP-MS 1 (One) No quantity.

It must fulfill following technical details

All components of the IC-ICP-MS system must be seamlessly integrated through a single PC-controlled software that auto-triggers component routines. Minimum required specifications for the ICP-MS and IC systems are shown below.

ICP-MS System specification

1. ICP-MS sample introduction system
 - A. Peristaltic pump: A multi channel (>10 rollers) which can support variable flow rate, with at least four channels
 - B. Nebulizer: It must include a PFA nebulizer as standard having high resistance to acid.
 - C. Spray Chamber: Temperature controlled quartz spray chamber with efficient peltier cooling (-10 °C to + 20 °C).

Should be able to handle up to 0.2% of total dissolved solids in the sample.

2. ICP Torch
 - A. ICP Torch: Quartz torch with 2.5 mm or smaller ID injector.
 - C. Precision torch adjustment: Complete computer controlled adjustment

of the position of three torch in X, Y and Z directions with independent movements in the three directions. Automatic alignment option.

D. Precision gas control: Three computer controlled mass flow controllers for controlling all the plasma gas lines precisely (nebulizer, plasma and auxiliary gas flow).

3. RF Power source for ICP torch:

A. RF Generator (source): ~27 MHz frequency, solid state power source, crystal controlled.

B. Forward Power: 500-1600 Watts variable.

C. Plasma shutdown: Automatic shutdown of the plasma by the system after completion of analysis.

4. Interface

High matrix tolerance interface with high purity nickel cone shaving apertures of at least samples cone ~1.1mm. Skimmer cone ~0.5 mm diameter. A set of platinum cones should also be supplied as standard accessory.

5. Collision–reaction cell

The system must have the state-of-the-art technology for analysis in both, collision and reaction modes.

6. Ion Optics

Ion optics should have excellent focusing with 90° deflection system to analyzer and detector for elimination of photons and neutrals.

Background noise should be less than < 1cps in all modes.

7. Quadrupole mass analysis

A. RF generator: Should be 2 MHz or higher

The system should have the facility for overcoming the low mass based interferences.

B. Vacuum system: Should have rotary pump and turbo molecular pump with split flow for extremely high gas throughput. Vacuum should be:

Better than 1×10^{-5} mbar in open valve condition and shall be better than 5×10^{-5} mbar in closed valve condition.

C. Quadrupole material: made of molybdenum or stainless steel rods with RF pre-filters.

Mass range: (5-285) amu.

Scan rate: ≥ 5000 amu/sec

D. Resolution: Computer controlled settings for quadrupole resolution adjustments are to be demonstrated. The best possible quadrupole resolution should be separately indicated in the offer.

8. Detector

Ion detection with electron multiplier shall ensure better than 9 orders of linear dynamic range using simultaneous analog/pulse counting. It shall be possible to measure major and minor concentrations in a single analytical run.

Should have over range protection and fully automated detector cross calibration with good linearity. The detector shall be easily replaceable by the user.

Both the analog and pulse counting modes should be protected against overload. Minimum dwell time $100 \mu\text{s}$ in both pulse counting and analog mode. **Detector should have a minimum life of 3 years without replacement.**

9. Performance criteria

A. Sensitivity

Li/Be $\geq 50.0 \times 10^6$ cps/ppm

Co $\geq 60.0 \times 10^6$ cps/ppm

InorY $\geq 200.0 \times 10^6$ cps/ppm

U/Tl/Th $\geq 110.0 \times 10^6$ cps/ppm.

B. Signal stability:

Short term stability (%SD), less than 3% (over 10 minutes) and

Long time stability (%SD) less than 3% (over 2 hours) have to be demonstrated.

C. **Oxide ratio:** CeO/Ce (%) < 3

D. **Doubly charged ratio (%):** Ba^{2±}/Ba(%) < 3

E. **Isotope ratio precision:** (%SD) AgI07/AgI09 < 0.1

F. **Mass Stability:** 0.025amu/Day or better

10. System control and data acquisition

The system should perform auto optimization of plasma parameters like plasma power, plasma gas flow, etc. The instrument software shall allow auto-tuning to enable the instrument to be used with the consistent and reproducible day to day performance independent of the operator.

A. Acquisition mode:

Peak jumping, scanning, Time resolved analysis, Isotope Ratio measurements using integral software.

B. Analysis mode:

Shall allow for semi quantitative analysis, external calibration and internal standard addition methods for fully quantitative analysis, allowing parts per trillion level analysis and isotope ratio measurements with precision better than 0.2%.

C. Report Generation:

Output results formatted in mixed concentration units e.g. ppt, ppb, ppm etc.

D. Quality control and software:

a. Software for automated QA/QC during unattended operation.

It must have all the features of CFR21 Part11 audit trails offered as standard.

b. Off line data processing and exportability of data to other standard packages should be available.

c. Matrix specific databases to provide preferred isotope selection should be available.

Note:

Master copies of all relevant software must be supplied. All instruction manuals and service manuals must be supplied along with the instrument.

Latest PC along with Laser printer should be supplied at no extra cost.

E. Warranty:

The system should carry a warranty for at least 3 years from installation, against any kind of manufacturing defects and must include periodic servicing of the

instrument on-site. The warranty should be a part of the total IC-ICP-MS system supply.

- a. Multi-element NIST traceable standard - 1No
- b. Fume exhaust for ICP-MS system – 01 set
- c. Gas supply system to ICP-MS system – 01 set

The gas supply system is meant to provide required gases to the ICP-MS system at specific purity, pressure and flow rates. Such a gas supply system should include:

- i. Gas cylinder for Plasma formation - Argon
 - ii. Gas cylinder for Collision cell gases - Helium
 - iii. 2 stage Gas pressure regulators for each cylinder
 - iv. Gas purification panels
 - v. Gas supply manifold for switching gas cylinder
 - vi. SS tubing
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- d. UPS system with 1Hour battery backup – 1 Set
 - e. PC with necessary software for controlling the IC-ICP-MS system
 - f. Color Laser printer at no extra cost - 01No
 - g. Water recirculation chiller for ICPMS system as standard accessory -1
 - h. HF Kit – 01 No

IC (Ion Chromatograph) Specifications

1. The system quoted should include following modules for speciation of As, Cr, Hg, Sn, Fe, Se:-
 - i. An appropriate Quaternary Gradient Pump with flow rates up to 10ml/min and compatible with Micro bore 2mm dia and standard bore analytical columns of 4 mm dia, Compatibility with capillary columns will be an added advantage.
 - ii. Thermostatted Detector Chromatography housing model to accommodate injector, columns, switching valves in thermally controlled environment.
 - iii. Polymeric columns for Anions and Cations, Gradient compatible
 - iv. Chromatography control Software
 - v. Automated sample preparation
 - vi. Standards and Qualification kit
 - vii. PC and Printer

2. Following are the details specification required for each module:-

The complete flow path of the system modules should be nonmetallic PEEK based compatible for 0-14 pH & 100 % reverse phase organic solvent for analysis of Anions, and Cations.

1. QUATERNARY GRADIENT SOLVENT DELIVERY PUMP - 1No

Non metallic PEEK based compatible for 0-14 pH & RP compatibility for 4 solvents gradient and as per the following specification

a	Flow rate Range	0.001-10 mL/min
b	Flow rate accuracy	± 0.1 at 1 ml/min
c	No. of mobile phase	: Should form a gradient of 1-4 mobile
d	Pressure Range	: 50-5000psi
e	Pressure Pulsation/Ripples	: < 1 % without pulse dampner
f	Delay volume	: < 500 µL
g	Seal wash	: On-line automatic
h	Flow Precision	: ±0.1%at 1ml/min.
i	Vacuum degasser	: Built in 4 channels with gradient pump
j	Gradient Proportioning Accuracy	: ±0.5 % at 2 ml/min
k	Gradient Proportioning Precision	: ±0.5 % at 2ml/min

ELUENT ORGANISER

A separate mobile phase organizer should be provided to hold and mount 4 mobile phase bottles with Helium Sparging option must be available. The eluent organizer must be corrosion proof polypropylene.

3. COLOUMN FOR METAL IONS SPECIATION:

- a. Columns must be of polymeric Ion exchange for better efficiency and high loading capacity. All columns must be solvent compatible, non-metallic and non-corrodible components like Frits, preferably made of PEEK for analysis of Anions.
- b. Columns for Anions must have the separation capability for analysis of Anions & Cations.
- c. Columns must be 100 % solvent compatible and must withstand 0-14 pH.

4. CHROMATOGRAPHY SOFTWARE

The Software should be capable to control the complete Ion Chromatography system through ICP-MS console. It should be able to configure any of the detectors available.

Software should be compatible with the windows XP and higher operating systems.

IC & ICP-MS should be controlled through a seamless integrated interface that auto-triggers component software.

4. SAMPLE PREPARATION:

Appropriate sample preparation solid phase cartridges must be quoted and included in the system

5. STANDARDS FOR ANIONS AND CATIONS with the IQ/OQ/PQ qualification kit should be supplied for easy startup and qualification.

Send sealed quotation(s) (Technical and financial quotes separate and clearly marked outside on the envelope) to the following address by 16:00 h on November 4, 2013: Dr Vinod Tare, Department of Civil Engineering, IIT Kanpur, KANPUR - 208016.



Vinod Tare

