



Indian Institute of Technology Kanpur

Environmental Engineering and Management

Department of Civil Engineering

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Enquiry No- CE/EEM/2013/ NC/ IC-ICP-MS /4

Dated: August 22, 2013

Last Date: Sep 02, 2013

Sub: Call for quotation for “IC-ICP-MS”

Sealed Quotation(s) are invited (in Foreign Currency on CIF basis) for the purchase of IC-ICP-MS.

1 No. (One) quantity.

It must fulfill following technical details –

ICP-MS System specification

1. ICP-MS sample introduction system

A. Peristaltic pump: A multichannel (>10 rollers) which can support variable flow rate, with three channels

- 1) For sample introduction,
- 2) For internal standards,
- 3) Spray chamber drain.

B. Nebulizer: It must include a PFA nebulizer as standard having high resistance to acid.

C. Spray chamber: Temperature controlled quartz spray chamber

2. ICP Torch

- A. ICP Torch:** Quartz torch with 2.5 mm or smaller ID injector.
- B. 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.
- C. 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):** ~27.12 or ~ 40 MHz frequency, solid state power source, crystal controlled.
- B. Forward Power:** 500-1600 Watts variable.
- C. Plasma shut down:** Automatic shut down of the plasma by the system after completion of analysis.

4. Interface

High matrix tolerance interface with high purity nickel cones having apertures of at least samples cone ~ 1.1 mm. Skimmer cone ~1 mm diameter. A set of platinum cones should also be supplied as standard accessory.

5. Collision – reaction cell

The system must be having a Cell capable of using He collision mode preferably equipped with KED.

There should be provision to use additional gases in the cell.

6. Ion Optics

Ion optics should have excellent focusing with off axis system to analyzer and detector to eliminate photons and neutrals.

Background noise should be less than <1 cps at 4.5 amu.

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 μ S in both pulse counting and analog mode.

Detector should be having 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

In or Y $\geq 200.0 \times 10^6$ 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) Ag 107/Ag 109 < 0.1

F. Mass Stability: 0.025 amu/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 CFR 21 Part 11 audit trails offered as standard.

- b. Offline 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 warranty for **5 year** from installation, against any kind of manufacturing defects. **The warranty should be a part of the total IC-ICP-MS system supply.**

- a. **Multi-element NIST traceable standard – 1 No**

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

d. UPS system with 1 Hour battery backup - 1 Set

e. PC with necessary software for controlling the IC-ICP-MS system,

f. Color Laser printer at no extra cost- 01 no.

g. Water recirculation chiller for ICP MS 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:-

- 1. An appropriate Quaternary Gradient Pump with flow rates up to 10 ml/min and compatible with Micro bore 2 mm dia and standard bore analytical

columns of 4 mm dia, Compatibility with capillary columns will be an added advantage.

2. Thermostatted Detector Chromatography housing model to accommodate injector, columns, switching valves in thermally controlled environment.
3. Polymeric columns for Anions and Cations, Gradient compatible
4. Chromatography control Software
5. Automated sample preparation
6. Standards and Qualification kit
7. PC and Printer

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

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

1. QUATERNARY GRADIENT SOLVENT DELIVERY PUMP- 1 No

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 | : \pm 0.1 at 1 ml/min |
| c. No. of mobile phase | : Should form a gradient of 1-4 mobile phases |
| d. Pressure Range | : 50-5000 psi |
| e. Pressure Pulsation/Ripples | : < 1 % without pulse dampner |
| f. Delay volume | : < 500 μ L |
| g. Seal wash | : On-line automatic |

- h. Flow Precision : $\pm 0.1\%$ at 1 ml/min.
- i. Vacuum degasser : Built in 4 channels with gradient pump
- j. Gradient Proportioning Accuracy : $\pm 0.5\%$ at 2 ml/min
- k. Gradient Proportioning Precision : $\pm 0.5\%$ at 2 ml/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.

2. COLOUIMN 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.

3. 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 systems.

IC & ICP-MS should be controlled through one 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 envelop**) to the following address by 4.00 pm of Sep 02, 2013.

Dr. Vinod Tare
Environmental Engineering Laboratory (WL-116),
Department of Civil Engineering
IIT Kanpur

Thanking You
Sincerely,



(Vinod Tare)