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SLRS-2

RIVERINE WATER REFERENCE MATERIAL FOR TRACE METALS

The following table gives those metals for which reliable values have been established. Reliable values are based on determinations by at least two independent methods of analysis. The uncertainties represent 95 percent tolerance limits for an individual subsample. That is, 95 percent of samples from any bottle would be expected to have concentrations within the specified range 95 percent of the time.

Milligrams per Litre

Calcium (c,f,o)*	5.70	±	0.13
Magnesium (c,f,o)	1.51	±	0.13
Potassium (c,e,f,o)	0.69	±	0.09
Sodium (c,e,f,o)	1.86	±	0.11

Micrograms per Litre

Aluminum (d,e,o,p)	84.4	±	3.4
Antimony (d,h,j)	0.26	±	0.05
Arsenic (d,h,n,o)	0.77	±	0.09
Barium (e,j,m,q)	13.8	±	0.3
Cadmium (i,j,m,p,q,r,s)	0.028	±	0.004
Chromium (e,j,m,o,q)	0.45	±	0.07
Cobalt (b,i,o,p,q,s)	0.063	±	0.012
Copper (a,e,i,j,m,o,q,s)	2.76	±	0.17
Iron (d,e,o)	129	±	7
Lead (j,m,o,r,s)	0.129	±	0.011
Manganese (d,e,i,p)	10.1	±	0.3
Molybdenum (d,j)	0.16	±	0.02
Nickel (b,d,i,j,m,s)	1.03	±	0.10
Strontium (e,j,m)	27.3	±	0.4
Uranium (j,m)	0.049	±	0.002
Vanadium (e,o)	0.25	±	0.06
Zinc (d,i,j,p,q,s)	3.33	±	0.15

* See next page for key to coding.

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Coding

- * a - Anodic stripping voltammetry
- b - Adsorptive accumulation voltammetry
- c - Direct determination by ICPAES
- d - Direct determination by GFAAS
- e - Concentration by evaporation / ICPAES determination
- f - Direct determination by FAAS
- h - Hydride generation atomic absorption spectrometry
- i - Immobilized ligand separation / GFAAS determination
- j - Concentration by evaporation / IDICPMS determination
- m - immobilized ligand separation / IDICPMS determination
- n - Hydride generation / in situ concentration / GFAAS determination
- o - Direct determination by ICPMS
- p - Immobilized ligand separation / ICPMS determination
- q - Concentration by evaporation / GFAAS determination
- r - Reductive precipitation / GFAAS determination
- s - Chelation-solvent extraction / GFAAS determination

This reference material is primarily intended for use in the calibration of procedures and the development of methods used for the analysis of river waters for trace metals.

Storage

It is recommended that the reference material be stored in a cool, clean location. The bottle should be opened only in a clean area with precautions taken against contamination during sampling. Pour from the bottle. Never wipe the lip.

The metal concentrations of unopened bottles are warranted for a two year period from the shipping date. Studies have shown that the material is stable with respect to total trace metal concentrations for at least five years and is not affected by the air to liquid ratio in the bottle.

Preparation of Material

This sample of river water was gathered at the 2 to 3 metre level in the Ottawa River at Chenaux, Ontario, about 100 kilometres upstream from Ottawa. The trace metal profile is somewhat different from that of SLRS-1.

The water was peristaltically pumped through cleaned polyethylene lined ethyl vinyl acetate tubing and 0.45 µm porosity acrylic copolymer filters. It was acidified immediately with ultrapure nitric acid to pH 1.6 during transfer to 50-litre acid leached polypropylene carboys which had been previously conditioned with pH 1.6 ultrapure water. The water was later refiltered through 0.2 µm porosity acrylic copolymer filters into two 800-litre polyethylene tanks in a clean room at the Division of Chemistry in Ottawa. It was subsequently blended by circulative pumping and bottled in 2-litre quantities in polyethylene. The tank and bottles had been previously acid leached and pH conditioned. The bottled water was gamma irradiated to a minimum dose of 2.5 Mrads at the Canadian Irradiation Centre, Laval, Quebec, to inhibit any bacterial action. The total dissolved organic carbon is 8 mg/litre.

Homogeneity

Randomly selected bottles were chosen for analytical determinations. Results from different bottles showed no statistically significant differences nor was there any correlation between values obtained and bottling sequence. It is assumed, then, that the trace metal concentrations of all bottles are essentially the same.

Certification

The majority of the work was done within the Analytical Chemistry Section of the Division of Chemistry, National Research Council of Canada. Four external expert laboratories cooperated in the certification process.

It is advisable to destroy the organic content in order to get reliable results for arsenic by hydride generation atomic absorption spectrometry or anodic stripping voltammetry.

It is possible that more data may become available and the established values may be updated and certified values assigned to more elements. These updates will be sent to all users of this reference material.

Comments from users will be welcomed.

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Abbreviations

FAAS — flame atomic absorption spectrometry

GFAAS — graphite furnace atomic absorption spectrometry

ICPAES — inductively coupled plasma atomic emission spectrometry

ICPMS — inductively coupled plasma mass spectrometry

IDICPMS - isotope dilution inductively coupled plasma mass spectrometry

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