

Certificate of Analysis

NRC-CMRC

Certified Reference Material

SLEW-3

Estuarine Water Certified Reference Material for Trace Metals

The following table shows the metals for which certified values have been established. Certified values are based on the results of determinations by at least two independent methods of analysis.

Table 1: Certified quantity values for SLEW-3

Element	Mass fraction, µg/kg	Mass concentration, µg/L
Arsenic (o,n,r)	1.34 ± 0.09	1.36 ± 0.09
Cadmium (i,m,q,r)	0.047 ± 0.004	0.048 ± 0.004
Chromium (m,o,r)	0.181 ± 0.019	0.183 ± 0.019
Cobalt (o,q,r)	0.040 ± 0.010	0.042 ± 0.010
Copper (i,m,o,q,r)	1.53 ± 0.12	1.55 ± 0.12
Iron (i,m,r)	0.561 ± 0.058	0.568 ± 0.059
Lead (m,o,q,r)	0.009 ± 0.0014	0.009 ± 0.0014
Manganese (b,d,i,m,q)	1.59 ± 0.22	1.61 ± 0.22
Molybdenum (b,c)	5.1*	5.1*
Nickel (i,m,o,q,r)	1.21 ± 0.07	1.23 ± 0.07
Uranium (m)	1.8*	1.8*
Vanadium (q,r)	2.54 ± 0.31	2.57 ± 0.31
Zinc (i,m,o,q)	0.198 ± 0.037	0.201 ± 0.037

* An information value is listed due to insufficient information to accurately assess uncertainties.

Coding

The coding refers only to the instrumental method of analyte determination.

- b** Direct determination by inductively coupled plasma mass spectrometry (ICPMS)
- c** Direct determination by isotope dilution inductively coupled plasma mass spectrometry (ICPMS)
- d** Direct determination by graphite furnace atomic absorption spectrometry (GFAAS)
- i** Immobilized ligand separation, GFAAS determination
- m** Immobilized ligand separation, isotope dilution ICPMS
- n** In situ hydride generation, GFAAS determination



- o Co-precipitation, ICPMS determination
- q Immobilized ligand separation, ICPMS determination
- r Co-precipitation separation, GFAAS determination

Intended Use

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

Storage and sampling

It is recommended that the material be stored in a cool, clean location. The bottles should be opened only in a clean area with precautions taken against contamination during sampling.

Preparation of SLEW-3

SLEW-3 is the third estuarine water certified reference material for trace metals prepared by NRC. Unlike the previous two samples, this water was gathered in the San Francisco Bay at the 5 metre level near Pt. Molate at latitude 37° 57.470' N and longitude 122° 25.703' W. The water was peristaltically pumped through cleaned polyethylene lined ethylvinyl acetate tubing and 0.45 µm acrylic copolymer filters. It was acidified to pH 1.6 with ultrapure nitric acid during its immediate transfer to 50-litre acid leached polypropylene carboys. The water was later refiltered through 0.2 µm porosity acrylic copolymer filters and homogenized in a 400-litre polyethylene tank in a clean room at NRC in Ottawa. It was subsequently bottled in cleaned 500 mL polyethylene bottles and gamma irradiated with 25 kGy at the Canadian Irradiation Centre, Laval, Québec, to inhibit any bacterial action. The salinity is 15.

Homogeneity

Randomly selected bottles were chosen for the analytical determinations. Results from different bottles showed no significant differences, nor was there any correlation between values obtained and bottle sequence. Thus, it is assumed that the trace metal concentrations of all bottles are similar.

Stability

Studies of similar waters indicate that the material is stable with respect to total trace metal concentrations for at least fifteen years.

Expiry

The certified values for SLEW-3 are considered valid until December 2018, provided the CRM is handled and stored in accordance with instructions herein.

Certified value

Certification analysis was carried out within NRC and by four external expert laboratories. It would appear from the values obtained that the estuarine water was not significantly contaminated in the collection and bottling process.



Metrological traceability

Results presented in this certificate are traceable to the SI through gravimetrically prepared standards of established purity and international measurement intercomparisons. As such, they serve as suitable reference materials for laboratory quality assurance programs, as outlined in ISO/IEC 17025.

Quality System (ISO/IEC 17025, ISO Guide 34)

This material was produced in compliance with the documented NRC Measurement Science and Standards (MSS) Quality System, which conforms with the requirements of ISO/IEC 17025 and ISO Guide 34.

The MSS Quality System supporting NRC calibration and measurement capabilities, as listed in the Bureau international des poids et mesures (BIPM) key comparison database (<http://kcdb.bipm.org/>), has been reviewed and approved under the authority of the Inter-American Metrology System (SIM) and found to be in compliance with the expectations of the Comité international des poids et mesures (CIPM) Mutual Recognition Arrangement. The SIM certificate of approval is available upon request.

Updates

Users should ensure that the certificate they have is current. Our web site at <http://www.nrc-cnrc.gc.ca> will contain any new information.

References

1. Evaluation of measurement data – Guide to the expression of uncertainty in measurement JCGM 100:2008.

Acknowledgements

The following staff members of the Measurement Science and Standards portfolio at the NRC contributed to the production and certification of SLEW-3: C. Brophy, V. Clancy, J. Lam, J.W. McLaren, A. Mykytiuk, S. Willie and L. Yang.

The cooperation of the following is gratefully acknowledged:

R. Hoenicke, San Francisco Estuary Institute

J. Gold and Skipper G. Smith, Research Vessel "David Johnston"

Jim Kuwabara, Brent Topping, U. S. Geological Survey, Menlo Park, CA

David Tucker, City of San Jose, San Jose, CA

Genine Scelfo, UC Santa Cruz, Department of Environmental Toxicology, Santa Cruz, CA

Beverly H. van Buuren, Anacleta Nadong, Frontier Geosciences, Seattle, WA

Eric Crecelius, Batelle Pacific Northwest, Sequim, WA

Howard E. Taylor, U. S. Geological Survey, Boulder, CO



SLEW-3

Date of issue: June 2000

Date of expiry: December 2018

Date of revision: January 2015 (expiry date extended, layout and editorial changes), March 2016 (editorial update), February 2017 (expiry date extended)

Approved by:



Zoltan Mester, Ph. D.
Team Leader, Inorganic Chemical Metrology
Measurement Science and Standards

This Certificate is only valid if the corresponding product was obtained directly from NRC or one of our qualified vendors.

Comments, information and inquiries should be addressed to:

National Research Council Canada
Measurement Science and Standards
1200 Montreal Road, Building M-12
Ottawa, Ontario K1A 0R6

Telephone: 1-613-993-2359

Fax: 1-613-993-2451

Email: CRM-MRCInorganic-Inorganiques@nrc-cnrc.gc.ca



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