epartment of Commerce
Malcolm Baldrige
Secretary
nal Bureau of Standards
nest Ambler, Director

National Bureau of Standards

Certificate

Standard Reference Material 1643b

Trace Elements In Water

This Standard Reference Material (SRM) is intended primarily for use in evaluating the accuracy of trace element determinations in filtered and acidified fresh water and for calibrating instrumentation used in these determinations. SRM 1643b consists of approximately 950 mL of water in a polyethylene bottle, which is sealed in an aluminized bag to maintain stability. SRM 1643b simulates the elemental composition of fresh water. Nitric acid is present at a concentration of 0.5 moles per liter to stabilize the trace elements.

Concentrations of Constituent Elements: The concentrations of the trace elements that were determined are shown in Table 1. The certified values are based on results obtained either by reference methods of known accuracy or by two or more independent, reliable analytical methods. Noncertified values, which are given for information only, appear in parentheses.

Notice and Warnings to Users:

Expiration of Certification: This certification is invalid two years after the shipping date.

Precautions: The bottle should be shaken before use because of possible water vapor condensation. To prevent possible contamination of the SRM, do not insert pipets into the bottle. After use, the bottle should be capped tightly and placed inside the aluminized bag, which should be folded and sealed with sealing tape. This safeguard will protect the SRM from possible environmental contamination and long-term loss of water.

Elemental determinations of ng/g levels are limited by contamination. Apparatus should be scrupulously cleaned and only the purest grade reagents employed. Sampling and manipulations, such as evaporations, should be done in a clean environment, for example, a Class 100 clean hood.

The overall direction and coordination of the technical measurements leading to this certification were performed under the direction of E. Garner, Chief of the Inorganic Analytical Research Division.

The technical and support aspects involved in the preparation, certification, and issuance of this Standard Reference Material were coordinated through the Office of Standard Reference Materials by R. Alvarez.

Washington, DC 20234
May 18, 1984

Stanley D. Rasberry, Chief
Office of Standard Reference Materials

(over)

(Table 1)

Concentrations of Constituent Elements

Element	Concentration,* ng/g	Element	Concentration,* ng/g
Arsenic[1,5]	(49)**	Lead[3,4b]	23.7 ± 0.7
Barium[2a,2b,5]	44 ± 2	Manganese[1,2a,3]	28 ± 2
Beryllium[1,2a]	19 ± 2	Molybdenum[2a,5]	85 ± 3
Bismuth[1]	(11)	Nickel[2a,3]	49 ± 3
Boron[2a]	(94)	Selenium[1,5]	9.7 ± 0.5
Cadmium[2b,3,5]	20 ± 1	Silver[1,5]	9.8 ± 0.8
Chromium[4b]	18.6 ± 0.4	Strontium[2a,5]	227 ± 6
Cobalt[1,5]	26 ± 1	Thallium[4b]	8.0 ± 0.2
Copper[3,4b]	21.9 ± 0.4	Vanadium[4b]	45.2 ± 0.4
Iron[2a,4a,5]	99 ± 8	Zinc[2a,5]	66 ± 2

*The estimated uncertainty is based on judgment and represents an evaluation of the combined effects of method imprecision and possible systematic errors among methods. To convert to nanograms per milliliter, multiply by the density of the SRM. The density at 23 °C is 1.017 grams per milliliter.

**Values in parentheses are not certified.

1. Atomic absorption spectrometry, electrothermal
2. Atomic emission spectrometry,
   a. dc plasma
   b. flame
3. Laser enhanced ionization flame spectrometry
4. Isotopic dilution mass spectrometry,
   a. resonance ionization
   b. thermal ionization
5. Neutron activation, instrumental

Source and Preparation of Material: SRM 1643b was prepared at the U.S. Geological Survey, National Water Quality Laboratory, Arvada, Colorado, under the direction of V.J. Janzer of that laboratory and J.R. Moody of the NBS Center for Analytical Chemistry. Only high-purity reagents were used and the containers were acid-cleaned and sterilized before use. In the preparation, a polyethylene cylindrical tank was filled with distilled water and sufficient nitric acid to make the solution approximately 0.5 moles HNO_3 per liter. Solutions containing known amounts of calcium, sodium, magnesium, potassium, and the elements to be determined were added to the acidified water solution with constant stirring. After thoroughly mixing, the solution was filtered, sterilized, and then transferred to one-liter polyethylene bottles. The approximate concentrations, in μg/mL, of Ca, Na, Mg, and K are respectively 35, 8, 15, and 3.

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