U. S. Department of Commerce
Frederick B. Dent
Secretary
National Bureau of Standards
Richard W. Roberts, Director

National Bureau of Standards Certificate

Standard Reference Material 1642

Mercury in Water - Trace

This Standard Reference Material is intended for use in the primary standardization of instruments and techniques used for the analysis of mercury in water. It is intended for use as received, without dilution or other alteration. The concentration of mercury in this Standard Reference Material is at, or near, the detection limit of most commercial instruments used for the determination of mercury in water. It is to be used for the primary standardization of these instruments near these detection limits where many analytical problems occur.

Mercury Concentration 1.18 ± 0.05 ng/ml

The estimated of accuracy shown is believed to express the overall uncertainty of the certified value. It includes the standard error of the weighted average of 30 determinations by three analytical techniques, allowances for within-method and between-method variability, and allowances for possible systematic errors.

Stability: Trace mercury solutions have been a constant problem when long-term storage is required. Below the μg/ml level, mineral acid stabilization is not sufficient. A new stabilizing technique has been applied to this Standard Reference Material that allows for prolonged storage. Gold, as the tetrachloride, has been added in a concentration 10 times that of the mercury. The gold ion, in conjunction with the normal mineral acid, has proven an effective stabilizer. Stabilization studies have been carried out for nine months and are continuing. It is recommended that this Standard Reference Material not be used after ONE YEAR FROM DATE OF PURCHASE.

This Standard Reference Material was prepared by J. R. Moody. Atomic absorption analyses were performed by T. C. Rains, isotope-dilution mass-spectrometry analyses by J. R. Moody and P. J. Paulsen, and neutron-activation analyses by H. L. Rook.

The overall direction and coordination of the technical measurements leading to the certification were performed under the chairmanship of H. L. Rook.

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 T. W. Mears.

Washington, D.C. 20234
August 16, 1974

J. Paul Cali, Chief
Office of Standard Reference Materials

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Precautions: Traces of mercury vapor are present in most laboratory situations. Therefore, contamination of reagents, equipment, and common laboratory materials is a severe problem. Apparatus for analyses at this level must be scrupulously cleaned immediately before use, and only the purest-grade reagents should be employed. If available, a Class-100 clean room should be used for all samplings and manipulations.

Analytical: Three independent techniques were used in the certification of this Standard Reference Material: atomic absorption spectroscopy, isotope-dilution spark-source mass spectrometry, and neutron activation analysis. Sample sizes for analysis varied from 2 ml to 500 ml, depending on the technique used. The mean results obtained by the individual techniques were in agreement with a coefficient of variation of 2 percent.

Use: This Standard Reference Material should be used as received, without dilution. It may be carried through the chemical manipulations required for the analytical procedure normally used for the analysis of natural waters.

Analytical Methods Used and Analysts:

Analytical Methods

A. Atomic absorption spectrometry
   a. Flame
   b. Graphite furnace
   c. Zeeman
B. Optical emission spectrometry
   a. Flame
   b. Graphite furnace
   c. Inductively coupled plasma
C. Isotope dilution mass spectrometry
   a. Thermal source
   b. Spark source
D. Neutron activation
E. Polarography

Analysts

Analytical Chemistry Division, National Bureau of Standards

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18. R. K. Winge, Ames Laboratory ERDA, Iowa State University, Ames, Iowa.