



# National Institute of Standards & Technology

## Certificate of Analysis

### Standard Reference Material 3174

#### Multielement Mix D Standard Solution

This Standard Reference Material (SRM) is intended for use in atomic absorption spectrometry, optical emission (plasma) spectrometry, spectrophotometry, or any other analytical technique that requires aqueous standard solutions for calibrating instruments. SRM 3174 is a multielement solution prepared gravimetrically with a nitric acid concentration (V/V) of 5 percent plus a trace of HF. The certified values given below are based on gravimetric procedures, i.e., weight per volume composition of the high-purity metal or salt dissolved in NIST high-purity reagents.

#### Certified Concentrations of Constituent Elements

Element	Source, Purity*	Concentration, $\mu\text{g/mL}^a$
Aluminum	Metal (99.99 +)	100.0 $\pm$ 0.5
Beryllium	Metal (99.9)	100.0 $\pm$ 0.5
Boron	H <sub>3</sub> BO <sub>3</sub> (99.99)	100.0 $\pm$ 0.5
Cadmium	Metal (99.999)	100.0 $\pm$ 0.5
Gold	Metal (99.999)	100.0 $\pm$ 0.5
Hafnium	Metal (99.95)	100.0 $\pm$ 0.5
Iron	Metal (99.99)	100.0 $\pm$ 0.5
Lead	Metal (99.995)	100.0 $\pm$ 0.5
Titanium	Metal (99.99)	50.0 $\pm$ 0.25
Zirconium	Metal (99.84)	100.0 $\pm$ 1.0

\* The purity of these materials was determined at NIST.

<sup>a</sup> The uncertainty listed for an element is based on judgment and represents an estimate of the combined effects of any errors attributable to weighing, dilutions, interelement effects, and purity of the metal or compound. No attempt was made to derive exact statistical results as the imprecisions of most analytical methods are much larger than the errors listed above.

SRM 3174 was prepared by T.C. Rains of the NIST Inorganic Analytical Research Division. Atomic absorption, emission spectrometry, and inductively coupled plasma atomic emission spectrometry analyses were made by T.A. Butler, J.A. Norris, T.A. Rush, T.C. Rains and L.J. Yu.

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.W. Seward.

March 30, 1989  
Gaithersburg, MD 20899

Stanley D. Rasberry, Chief  
Office of Standard Reference Materials

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## Procedure for Use

**Stability:** This certificate is valid for one year from the shipping date provided the solutions are kept tightly capped and stored under normal laboratory conditions. NIST will monitor the stability of these solutions; if any changes occur that invalidate this certification, NIST will notify purchasers.

**Preparation of Working Standard Solutions:** All solutions should be brought to  $22 \pm 1$  °C before use and all glass or plastic surfaces coming into contact with the standard must have been previously cleaned. A working standard solution can be prepared from the SRM solution by dilution. Dilutions should be made with certified volumetric class A flasks and 5 or 10 mL class A pipets. All volumetric transfers of solutions should be performed using a proven analytical technique. Each dilution should be acidified with an appropriate high-purity acid and diluted to calibrated volume using high-purity water. The stability of the working standard solution will depend on the final acid concentration; therefore, care should be exercised to ensure that the final acid concentration of the dilution closely approximates that of the SRM. To achieve the highest accuracy, the analyst should prepare daily working solutions from the original SRM solution.