U.S. Department of Commerce
Rogers C. B. Morton,
Secretary
National Bureau of Standards
Ernest Ambler, Acting Director

National Bureau of Standards Certificate

Standard Reference Material 993

Uranium-235 Spike Assay and Isotopic Solution Standard

This Standard Reference Material (SRM) is certified for use as an assay and isotopic standard. The primary intended use is as a spike for uranium determinations by isotope dilution mass spectroscopy. SRM 993, Uranium 235-Spike, is a solution sealed in glass ampoules. Each ampoule contains a nominal 15 grams of solution, which is approximately 0.8 $\underline{N}$ in HNO_3.

Concentration of Uranium
28.270 ± 0.051 micromoles/gram

Isotopic composition (atom percent)

$^{234}U = 0.0442 \pm 0.0004$
$^{235}U = 99.8195 \pm 0.0013$
$^{236}U = 0.0574 \pm 0.0004$
$^{238}U = 0.0789 \pm 0.0004$

The concentration of uranium in SRM 993 was determined by an isotope dilution mass spectrometry technique, which is described in NBS Technical Note 546. A correction for isotopic fractionation was determined by analyzing SRM U-500. The indicated uncertainty for the concentration is the 95 percent tolerance limit* for coverage of at least 99 percent of measured values of this lot of ampoules of SRM-993.

The basic chemical and mass spectrometric procedures used for the uranium isotopic composition analysis are described in NBS Special Publication 260-27. The ^{234}U and ^{236}U values were determined by isotope dilution using ^{233}U. The ^{238}U value was determined by a direct measurement of ^{238}U with respect to ^{235}U. Corrections for isotopic fractionation effects were obtained by analysis of SRM U-500 and a Belgium Congo natural uranium standard. As isotopic composition is independent of concentration, the indicated uncertainties are 95 percent confidence limits of the atom percent of the four isotopes.

The mass spectrometry measurements at NBS were made by E. L. Garner using solutions prepared by L. A. Machlan.

The overall direction and coordination of the technical measurements leading to certification were under the chairmanship of I. L. Barnes.

The technical and support aspects concerning the preparation, certification, and issuance of this Standard Reference Material were coordinated through the Office of Standard Reference Materials by W. P. Reed.

*See page 14, The Role of Standard Reference Materials in Measurement System, NBS Monograph 148, 1975. The concept of tolerance limit is also discussed in Chapter 2, Experimental Statistics, NBS Handbook 91, 1966.

In brief, if we had made concentration measurements on all the ampoules, almost all (at least 99 percent) of these measured values should fall within the indicated tolerance limits with a confidence coefficient of 95 percent (or probability = .95).

Washington, D. C. 20234
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J. Paul Cali, Chief
Office of Standard Reference Materials