

National Bureau of Standards

Certificate

Standard Reference Material 995

Uranium-233 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 995, Uranium 233-Spike, is a solution sealed in a glass ampoule. Each ampoule contains a nominal 10 grams of solution which is approximately 0.8 N in HNO₃.

Concentration of Uranium
2.1023 ± 0.0011 micromoles/gram

Isotopic composition (Atom percent)

$$^{233}\text{U} = 99.9245 \pm 0.0006$$

$$^{234}\text{U} = 0.0181 \pm 0.0002$$

$$^{235}\text{U} = 0.0011 \pm 0.0002$$

$$^{238}\text{U} = 0.0563 \pm 0.0004$$

The concentration of uranium in SRM 995 was determined by isotope dilution thermal ionization mass spectrometry using solutions of accurately known concentrations prepared from a ²³⁵U spike (SRM 993) and uranium metal (SRM 960). 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 995.

The basic chemical and mass spectrometric procedures used for the analyses are described in NBS Special Publication 260-27. The value for the isotopic composition of ²³³U was determined by measurement of ²³³U with respect to ²³⁸U using a Faraday Cage type collector. The ²³³U, ²³⁴U, and ²³⁵U were measured with respect to ²³⁸U using an ion counting detection system. As isotopic composition is independent of concentration, the indicated uncertainties for the isotopic composition are 95 percent confidence limits of the atom percent of the four isotopes.

The certification of SRM 995 is considered valid for only 5 years from date of purchase. Periodic reanalyses of representative ampoules from this lot will be performed and if significant changes are observed within the 5 year period the purchasers of this SRM will be notified.

Measurements leading to the certification of this SRM were made in the Inorganic Analytical Research Division by J. D. Fassett, J. W. Gramlich, and L. A. Machlan.

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

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 T. E. Gills.

*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).

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George A. Uriano, Chief
Office of Standard Reference Materials