

# National Bureau of Standards

## Certificate of Analysis

### Standard Reference Material U-970

#### Uranium Isotopic Standard (Nominally 98% Enriched)

	$^{234}\text{U}$	$^{235}\text{U}$	$^{236}\text{U}$	$^{238}\text{U}$
Atom Percent	1.6653 $\pm 0.0017$	97.663 $\pm 0.003$	0.1491 $\pm 0.0005$	0.5229 $\pm 0.0006$
Weight Percent	1.6582	97.663	.1497	.5296

This Standard Reference Material (SRM) is certified for use as an isotopic standard. The primary intended use is for the evaluation of mass discrimination effects encountered in the operation of a mass spectrometer.

The material consists of highly purified uranium oxide,  $\text{U}_3\text{O}_8$ . The atomic weight of the material is calculated to be 235.045, using the nuclidic masses 234.0409; 235.0439; 236.0457; and 238.0508.

The values for  $^{234}\text{U}$  and  $^{236}\text{U}$  are calculated from measurements made on samples spiked with high-purity  $^{233}\text{U}$  to approximate the  $^{234}\text{U}$  and  $^{236}\text{U}$  concentrations, the ratios  $^{233}\text{U}$  to  $^{234}\text{U}$  and  $^{233}\text{U}$  to  $^{236}\text{U}$  were measured on a triple-filament equipped surface ionization mass spectrometer with d-c amplifier circuits. Ratio determinations were corrected for mass discrimination by measurements made under similar conditions on SRM U-500.

The value for  $^{238}\text{U}$  is calculated from measurements of the ratio  $^{235}\text{U}$  to  $^{238}\text{U}$ , and calibrated by measurements of the same ratio on synthetic mixtures prepared from high-purity separated isotopes of  $^{235}\text{U}$  and  $^{238}\text{U}$  to approximate the composition of the sample. Because of the response time of the measuring circuit when switching from the  $^{235}\text{U}$  peak to the  $^{238}\text{U}$  peak, the  $^{238}\text{U}$  peak was monitored for 1 minute and only data from the last 30 seconds, after the signal had stabilized, were used in the calculations. The value for  $^{235}\text{U}$  is calculated by difference.

The indicated uncertainties for the isotopic compositions are at the 95-percent confidence level for a single determination, and include terms for the inhomogeneities of the material as well as analytical error. The  $^{235}\text{U}$  to  $^{238}\text{U}$  ratio for this standard, 186.78, is known to at least 0.15 percent.

Measurements leading to the certification of this SRM were made by E. L. Garner and L. A. Machlan.

The overall direction and coordination of the technical measurements leading to certification were performed under the chairmanship of W. R. Shields.

The technical and support aspects in the preparation, certification, and issuance of this Standard Reference Material were coordinated through the Office of Standard Reference Materials by J. L. Hague.

NOTE: In many industries traceability of their quality control process to the national measurement system is carried out through the mechanisms of SRM's. It may be therefore of interest to know the details of the measurements made at NBS in arriving at the certified values of this SRM. An NBS Special Publication, 260-27, is reserved for this purpose and is available from the NBS Office of Standard Reference Materials upon request.

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(Editorial revision of  
Certificate dated 7-30-70)

George A. Uriano, Chief  
Office of Standard Reference Materials