

# National Bureau of Standards

## Certificate

### Standard Reference Material U-020a

#### Uranium Isotopic Standard

#### (Nominally 2.0% Enriched)

	$^{234}\text{U}$	$^{235}\text{U}$	$^{236}\text{U}$	$^{238}\text{U}$
Atom Percent	0.01732 $\pm 0.00003$	2.0262 $\pm 0.0011$	0.01179 $\pm 0.00007$	97.9447 $\pm 0.0011$
Weight Percent	0.01703 $\pm 0.00003$	2.0011 $\pm 0.0011$	0.01169 $\pm 0.00007$	97.9702 $\pm 0.0011$

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.

SRM U-020a is a highly purified uranium oxide,  $\text{U}_3\text{O}_8$ , which is certified for isotopic composition and  $^{235}\text{U}/^{238}\text{U}$  ratio. The atomic weight of the uranium is provided for informational purposes only and is calculated to be 237.989 using the nuclidic masses 234.0409, 235.0439, 236.0456, and 238.0508.

The certified isotopic compositions are based on measurements made at the National Bureau of Standards using a thermal ionization mass spectrometer equipped with a triple-filament ion source and Faraday cage collector. The observed isotopic ratios were corrected for mass discrimination effects by intercomparison with synthetic mixtures prepared from high-purity  $^{235}\text{U}$  and  $^{238}\text{U}$  separated isotopes, and blended to closely bracket the  $^{235}\text{U}/^{238}\text{U}$  ratio of the SRM. The abundances of the minor isotopes,  $^{234}\text{U}$  and  $^{236}\text{U}$ , were determined by isotope dilution after spiking with  $^{233}\text{U}$  (SRM 995) to provide a  $^{233}\text{U}/^{234}\text{U}$  ratio that approximates unity.

The uncertainty of the certified values for the  $^{235}\text{U}$  and  $^{238}\text{U}$  isotopic compositions is the 95% confidence interval for the mean and includes an estimate of possible sources of systematic error. For the minor isotopes,  $^{234}\text{U}$  and  $^{236}\text{U}$ , the uncertainty is the 95% confidence interval for the mean and an additional bound on the systematic error associated with the use of SRM's 960 and 995.

The  $^{235}\text{U}/^{238}\text{U}$  ratio of this material is  $0.020687 \pm 0.000011$ . The associated uncertainty is the 95% confidence interval for the mean and includes an estimate of possible sources of systematic error. The relative standard deviation of the  $^{235}\text{U}/^{238}\text{U}$  ratio is calculated to be 0.000234 with nine degrees of freedom.

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

The statistical analyses were performed by W.S. Liggett of the Statistical Engineering Division.

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

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 T.E. Gills.

Gaithersburg, MD 20899  
 March 1, 1985  
 (Revision of Certificate  
 dated July 12, 1984)

Stanley D. Rasberry, Chief  
 Office of Standard Reference Materials