NBL Program Office

U.S. Department of Energy

Certificate of Analysis
Certified Reference Materials C042A
Uranium (Pitchblende-Dunite Mixture) Counting Standard, (0.5, 1, 2, 4% U/g)

Table I. Certified Values for Uranium Concentration

	CRM 42A-1	CRM 42A-2	CRM 42A-3	CRM 42A-4
Uranium Concentration (weight %)	**4.058 ±0.018**	**1.9555 ±0.0034**	**1.0421 ±0.0017**	**0.49055 ±0.00084**

Each uncertainty is expressed as the expanded uncertainty at the 95% level of confidence. The last figure in the reported values is provided for information purposes only, and is not intended to convey a significant degree of reliability.

A unit of Certified Reference Material (CRM) C042A consists of four bottles, each of which contains 100 grams of a mixture of pitchblende (uraninite) diluted with dunite. C042A is primarily intended to provide traceability for amounts of uranium in uranium ore materials measured by radioactive counting methods. This CRM provides a means to calibrate counting equipment by establishing the correlation between instrument response and the known quantities of uranium. The certified values for uranium concentrations (expressed as weight %) are listed in Table I. Supplemental information on the characteristics of the sample material is given in Table II. As reported in 1957, uranium and radium analyses of the pitchblende used in the preparation of these materials indicate that the ratio of grams of radium per gram uranium is 3.45×10^{-7}.

NOTE: *C042A should be stored and handled under proper radiologically-controlled conditions at all tlimes.*

The starting materials for C042A were obtained from the same batches of material that were used in the preparation of CRM 42 issued in 1957. Each batch of material was reprocessed by blending, sieving and sampling. The NBL-Modified Davies and Gray Titrimetric method was used to determine the uranium concentration (expressed as weight %) of the materials. For each material, two analysts, using independent titration systems, performed the concentration measurements. NBL CRM 112-A, Uranium Metal Assay Standard, was used to determine the uranium equivalency of the potassium dichromate titrant. The same uranium standard was used for quality control of the measurement systems.

The expanded uncertainty (U) for a certified property of C042A defines a confidence interval around the value of the property. It is calculated as a product of the combined standard uncertainty (u_c) and the coverage factor (k). The value of k is obtained from the Student's t distribution and is a function of the effective degrees of freedom and the specified level of confidence. The combined standard uncertainties for the certified values consist of Type A components associated with repeated measurements of samples and standards. Type B components were considered and determined to be insignificant.

Table II. Supplemental Information on Materials
(Values Not Certified)*

Parameter	Method	CRM 42A-1	CRM 42A-2	CRM 42A-3	CRM 42A-4
Moisture (weight %)	Mass loss at 110°C	1.21	1.23	1.27	1.26
Absolute Density (g/cm^3)	Helium Pycnometer	3.06	3.00	2.97	2.95

*For each material, four moisture and two density measurements were made. The standard deviation for each value given in Table II is less than 0.01 absolute.