New Brunswick Laboratory
U.S. Department of Energy

Certificate of Analysis
CRM 42-A
Uranium (Normal) Counting Standard

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) 42-A consists of four bottles, each of which contains 100 grams of a mixture of pitchblende (uraninite) diluted with dunite. CRM 42-A 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: *CRM 42-A should be stored and handled under proper radiologically-controlled conditions at all tlimes.*

March 30, 2008
Argonne, Illinois

Jon Neuhoff, Director
New Brunswick Laboratory

(Editorial revision of Certificate dated March 30, 2001)

The starting materials for CRM 42-A 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 CRM 42-A 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 fiom 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.

Glennda J. Orlowicz and Khalida Scheidelman served as project leaders for packaging and certification of CRM 42-A. Peter B. Mason, Paul V. Croatto and Gary A. Sowell prepared and packaged the material. Alma V. Stiffin and Khalida Scheidelman prepared samples for certification analysis. Iris W. Frank, Glennda J. Orlowicz, and Sabrina Cromer performed uranium concentration measurements. Khalida Scheidelman measured moisture content and Maria E. Morales measured the absolute density of the material. Francis P. Orlowicz provided health physics support. Marianne M. Smith prepared the sampling and analysis plan, and Michael D. Soriano and David T. Baran performed statistical evaluation of the data for certification. Usha I. Narayanan and Colleen G. Gradle provided technical guidance for packaging, certification, and issuance of CRM 42-A. Robert D. Oldham and Jon W. Neuhoff supervised the project work.

(Editorial revision of Certificate dated March 30, 2001)