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Application of Uranium Isotope Dilution Mass Spectrometry in the preparation of New Certified Reference Materials

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Proven measurement techniques play a critical role in the preparation of Certified Reference Materials (CRMs) – those requiring high accuracy and precision in the measurement results. Isotope Dilution Mass Spectrometry (IDMS) is one such measurement method commonly used in the quantitative analysis of uranium in nuclear safeguards and isotope geology applications. In this project, we evaluated the possibility of using some of the uranium isotopic and assay CRMs made earlier by the New Brunswick laboratory as IDMS spikes to define the uranium mass fraction in future preparations of CRMs. Uranium solutions prepared from CRM 112-A (a highly pure uranium metal assay standard) and CRM 115 (a highly pure uranium oxide isotopic and assay standard) were used as spikes in the determination of uranium. Two different thermal ionization mass spectrometer instruments (MAT 261 and TRITON) were used for the isotopic measurements. Standard IDMS equation was used for data reduction to yield results for uranium mass fraction along with uncertainties, the latter calculated according to GUM. The results show that uranium mass fraction measurements can be made with the required accuracy and precision for defining the uranium concentration in new CRMs as well as in routine samples analyses.