

## Production of three uranium ore concentrate certified reference materials

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Synopsis

As part of the Government of Canada's broader efforts to enhance and expand its nuclear material provenance assessment capabilities, the Inorganic Chemical Metrology (ICM) team of the National Research Council Canada (NRC) was tasked with producing uranium ore concentrate (UOC) certified reference materials (CRM) to support advanced measurement and characterization activities of front-end nuclear fuel cycle materials. Three candidate UOC materials, each with a unique chemical composition profile and ranging in uranium content from 0.80 g/g to 0.85 g/g. Being an industrial material, these UOCs had to be crushed, sieved, dried, homogenized and individually bottled. A representative number of bottles from each CRM have been selected during the bottling process and have been used for the certification campaign. Measurements for the analytes of interest include a) uranium content; b) isotope ratios of U, Sr, Pb, and Nd; c) S, C, H, N, O, and C content; d) isotope deltas of H, C, N, O, and S; e) trace element impurities; f) accelerator mass-spectrometry measurements of  $^{236}\text{U}$ ,  $^{231}\text{Pa}$ ,  $^{230}\text{Th}$ , and  $^{226}\text{Ra}$ , leading to the reported values for  $^{236}\text{U}/^{238}\text{U}$  and estimates of  $^{231}\text{Pa}/^{238}\text{U}$ ,  $^{230}\text{Th}/^{238}\text{U}$ , and  $^{226}\text{Ra}/^{238}\text{U}$ ; g) measurements of anions, including chloride, fluoride, nitrate, phosphate, and sulfate; and h) physical characteristics such as particle size, shape, density, colour, and Raman signature. This paper will summarize the analytical procedures that led to the certification of the three UOC materials produced by NRC.

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