Sequential Injection Method for Rapid and Simultaneous Determination of 236U, 237Np, and Pu Isotopes in Seawater - DTU Orbit (08/12/2018)

Sequential Injection Method for Rapid and Simultaneous Determination of $^{236}$U, $^{237}$Np, and Pu Isotopes in Seawater

An automated analytical method implemented in a novel dual-column tandem sequential injection (SI) system was developed for simultaneous determination of 236U, 237Np, 239Pu, and 240Pu in seawater samples. A combination of TEVA and UTEVA extraction chromatography was exploited to separate and purify target analytes, whereupon plutonium and neptunium were simultaneously isolated and purified on TEVA, while uranium was collected on UTEVA. The separation behavior of U, Np, and Pu on TEVA–UTEVA columns was investigated in detail in order to achieve high chemical yields and complete purification for the radionuclides of interest. 242Pu was used as a chemical yield tracer for both plutonium and neptunium. 238U was quantified in the sample before the separation for deducing the 236U concentration from the measured 236U/238U atomic ratio in the separated uranium target using accelerator mass spectrometry. Plutonium isotopes and 237Np were measured using inductively coupled plasma mass spectrometry after separation. The analytical results indicate that the developed method is robust and efficient, providing satisfactory chemical yields (70–100%) of target analytes and relatively short analytical time (8 h/sample).

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