Method for Determination of Neptunium in Large-Sized Urine Samples Using Manganese Dioxide Coprecipitation and 242Pu as Yield Tracer - DTU Orbit (11/01/2019)

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A novel method for bioassay of large volumes of human urine samples using manganese dioxide coprecipitation for preconcentration was developed for rapid determination of 237Np. 242Pu was utilized as a nonisotopic tracer to monitor the chemical yield of 237Np. A sequential injection extraction chromatographic (SI-EC) system coupled with inductively coupled plasma mass spectrometry (ICPMS) was exploited to facilitate the rapid column separation and quantification. The analytical results demonstrated satisfactory performance of the MnO2 coprecipitation as indicated by the high chemical yields close to 100% and high separation capacity of processing up to 5 L of human urine samples. The MnO2 coprecipitation process is simple and straightforward in which a batch (8–12) of samples can be pretreated within 4 h (i.e., <0.5 h/sample). In connection with the automated column separation and ICPMS quantification, which takes less than 1.5 h in total, the overall analytical time was on average less than 2 h for each sample. The high effectiveness and sample throughput make the developed method well suited for urine bioassay of 237Np in routine monitoring of occupationally internal radiation exposure and rapid analysis of neptunium contamination level for emergency preparedness.

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