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ORAL PRESENTATION - Separation of Uranium and Polonium in drinking water by calix[6]arene columns

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The general population is chronically exposed to uranium and polonium mainly through day-to-day food and beverage intake. The measurement of these naturally-occurring radionuclides in drinking water is important to assess their health impact. The methods currently used for these analyses require tedious sample preparation techniques (evaporation, precipitation, column separation…) and long counting times by alpha spectrometry. Our laboratory developed calix[6]arene molecules able to entrap the actinides U, Pu and Am from complex matrix like urine samples. In this work, the applicability of calix[6]arene columns for uranium and polonium analysis in drinking water was investigated. The analysis of uranium in water is very simple with calixarene column, named AQUALIX. Drinking water sample (until 500 ml) can be directly loaded onto AQUALIX, without prior specific treatment except an easy step of acidification and gas extraction, to eliminate soluble carbonate species. Then uranium can be eluted in acidic solution from column in order to perform the measurement by inductively coupled plasma mass spectrometry (ICP-MS) or alpha spectrometry. This new procedure is suitable for routine analysis and requires a considerably reduced number of sample treatment steps as compared to usual procedures. In this way, the total analysis time is around half a day by combining the separation on AQUALIX with fast ICP-MS measurement. In case of simultaneous presence of polonium and uranium in water, the separation of both radionuclides is essential due to interferences in spectrometry alpha measurement. So we developed a protocol based on a first step of spontaneous deposition of Po on metallic disk followed by the U extraction on AQUALIX column. This new procedure was applied with success to different French drinking waters (still mineral water, sparkling mineral water, tap water).

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