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Towards sequential and automated CPE methods to pre-concentrate and extract radionuclides from environmental matrices

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It can be challenging to measure the concentration of radionuclides using mass spectrometry when these concentrations are in the "parts per trillion"range. Yet, radionuclides can cause health problems even at these low concentrations, especially alpha-emitting radionuclides with a short half-life. This is why we are developing a methods to rapidly extract and pre-concentrate radionuclides at the ultra-trace level in environmental matrices to be able to measure their concentration.
The method consists of a cloud point extraction (CPE) of target radionuclides coupled with an ICP-MS. The CPE system developed is composed of a mixture of non-ionic (Triton X-114, Triton X-100) and ionic (cetyltrimethylammonium bromide) surfactants. Targeted radionuclides are extracted by forming stable complexes with chelating agents chosen for their selective behavior towards one or a few radionuclides. The complexes formed are electronically neutral and tend to go inside the micelles, in the hydrophobic environment. By separating the micelles from the aqueous phase of the solution, we achieve the pre-concentration and the extraction of the targeted radionuclides.
In this work we will present our progress regarding the use of sequential CPE for the separation and preconcentration of uranium and fission products (lanthanides). The automation of the CPE system to extract two or more target elements from the same sample using two different cloud point extraction systems will also be discussed.

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