Investigation of uranium-colloid interactions in soil by dual Capillary Electrophoresis / Field-Flow Fractionation hyphenated with Inductively Coupled Plasma-Mass Spectrometry.

Claveranne-Lamolère Céline [1,2], Jean Aupiais [2], Gaëtane Lespes [1], Eric Pili [2], Fabien Pointurier [2], Martine Potin-Gautier [1]

(1) Université de Pau et des Pays de l'Adour-CNRS, LCABIE, UMR 5254, IPREM, 2 avenue P. Angot, 64000 Pau, France
(2) CEA, DAM, DIF F-91297 Arpajon, France

celine.claveranne-lamolere@etud.univ-pau.fr
celine.claveranne@cea.fr

Uranium is an actinide which naturally occurs in the environment. Its applications (civilian nuclear industry, agriculture, military applications, etc…) have induced an anthropogenic contamination, particularly in soils. So it is essential to know conditions and understand mechanisms of its transport. According to IUPAC, colloids refer to molecules or polymolecular particles which have in one direction a dimension roughly between 1 nm and 1 µm. In some cases, colloids are assumed to be responsible for the actinide transport thanks to a strong chelating capacity and an important specific surface [(1), (2)]. Despite a great deal of scientific interest [(3), (4), (5), (6), (7)], much information remains unknown.

The aim of this work was to investigate uranium-colloid interactions thanks to CE-ICP-MS coupling. For this, the more mobile fraction of a soil obtained after leaching experiments was studied. In the different samples analysed, colloids were in balance with uranium. By varying the pH and media, the variations of affinity with surface sites were studied. The specific objective was to observe what could be the influence of these factors on the present uranium colloidal species. Indeed, on the site studied site, pH variation is expected between slightly acidic rain water and alkaline chalk soil. To complete the colloidal characterization (nature and size), Asymmetrical Flow Field-Flow Fractionation (As-Fl-FFF)-multi-detection (UV, Multi-Angle Laser-Light Scattering (MALLS) and ICP-MS) was used.

References

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