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Complexation of actinides with organic ligands occurring in the environment: thermodynamic, structural and kinetic study

The application of nuclear technology in industry, research and medicine leads to the production of radionuclides that are likely to result in soil pollution especially with actinides, in the vicinity of uranium mining sites, radwaste disposal facilities, or after accidental spreading. The presence of organic molecules in the environment may favour the mobility of the radioelements up to the food chain. For evident safety reasons, the migration behaviour of these radiotoxic species must be predicted. Among organics that exhibit a strong affinity for hard cations like lanthanides and actinides ions, siderophores, compounds excreted by microorganisms, as well as polyaminocarboxylic acids can affect the chemical behaviour of actinides. According to the principle of Hard and Soft Acids and Basis, these chelating agents that possess hard donor atoms bind strongly to f-element ions. Some have already been used in the frame of advanced separation technologies for reprocessing of spent nuclear fuel.

The proposed work is focused on the interaction of selected actinide and lanthanide ions, on one hand with a group of siderophores: the hydroxamates ($RC(=O)NHOH$), and on the other hand, with simple polyaminopolycarboxylic acids that can be regarded as a simplistic model of organic matter.

Auteurs principaux: Mme LE NAOUR, Claire (IPNO); M. HE, Mingjian (IPNO); Dr SLADKOV, Vladimir (IPNO)

Orateur: M. HE, Mingjian (IPNO)