

Sorption of U and Eu on illite: influence of accessory minerals

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The interaction of radio(-contaminants) at water-mineral interfaces present in natural environments is a key process in retarding their migration. Therefore, elucidation of the processes involved, and the development of sorption models accounting for these processes, is crucial for a reliable risk assessment. This task can realistically only be tackled, if for a given multimineralic soil or rock the most relevant minerals can be identified. Only for these, the sorption processes need to be determined and modelled, and the sorption by the soil/rock entity is then predictable by summing up the models for these few minerals according to their fraction in the soil or rock.

Here we show that this procedure can already be hampered at the level of a presumably pure mineral. Sorption experiments conducted with purified illite du Puy showed under certain conditions (pH, concentration, dissolved carbonate) an unexpected enhancement of the retention of U^{VI} and Eu^{III}. EXAFS and TRLF spectroscopies revealed that this effect is due to the interaction with phosphate groups not expected at the clay surface. Only after a severe acid treatment of the illite the degree of sorption approached that expected for pure illite. The release of Ca and P during the acid treatment suggests dissolution of an apatite-type accessory mineral. The mineral itself is difficult to identify with common analytical methods such as XRD or TEM due to *i.e.* low concentration and/or amorphous nature of the accessory phase, low electron density of its constituent elements. Our results demonstrate that accessory phases might substantially contribute to the sorption of a bulk mineral phase.