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## **Clay mineral coprecipitation with Zr(IV)**

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In many countries operating nuclear power plants, high-level nuclear wastes (HLW) are foreseen to be vitrified and placed in deep geological repositories to isolate them from the geosphere. Depending on the concept, clay rock may host the repository and clay-based material will be used as backfill to delay the radionuclide migration out of the site. Finally, clay minerals have been detected in the glass alteration layer [1]. Consequently, clay mineral will play an important role in such a multi-barrier system. In such sites, reducing conditions are expected to prevail [2]. Under these conditions, the minor actinides Am, Cm and part of Pu will occur in trivalent oxidation state and part of the plutonium should be present as tetravalent cations. In previous studies we investigated the retention of trivalent cations by adsorption on or by coprecipitation with the smectite hectorite [3], a phase identified in simulated HLW glass alteration layer [4].

In the present work, we used Zr(IV) as homologue for Pu(IV) because of similar hydrolysis and colloid chemistry [3]. The magnesian smectite hectorite was synthesized in the presence of Zr(IV) from a brucite ( $Mg(OH)_2$ ) precursor phase. The doped brucite and hectorite were first characterized at the macroscopic scale by XRD and SEM. The zirconium local chemical environment was characterized by probing the Zr *K*-edge by X-ray absorption spectroscopy (XAS). Conventional powder XAS data were collected for the precursor and polarized XAS data were collected for the clay mineral prepared as oriented sample. Zirconium is located in an octahedral environment in both samples, typical of brucite and clay mineral. In the brucite, the EXAFS data modelling results suggest that Zr polyhedra very likely share edges and faces with the Mg octahedra. In hectorite, the Zr first coordination sphere displays a significant angular dependence suggesting an anisotropic environment, but not the higher distances shells. The interpretation of these results is on-going.

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### ***References***

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