Effects of organic matter – Aluminium oxide interactions on Eu(III) speciation

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Interactions between Natural Organic Matter (NOM) and mineral surfaces modify the properties of both reacting phases. It also alters the behaviour of metal ions such as radionuclides in the environment. Here, we focus on the influence of the interactions between humic substances, major NOM components, and some minerals of soils (metal oxides and clays) on the speciation of europium (III), chosen for its analogy with trivalent actinides.

To understand the binding of metal ions, proton binding must first be considered. Potentiometric titrations of both organic matter and mineral suspensions are realized before and after their interactions, to study variations of their reactivity. To be closer to environmental conditions (i.e. low DOC concentrations), a new approach must be considered to characterize organic matter reactivity. Spectrophotometric titrations and UV-vis spectra of NOM [1] are used to estimate changes in reactivity with the help of differential absorbance spectra variations of the solution as function of pH.

The correlation between the two methods of characterization of NOM is quite good, and it is used to determine the changes of the organic matter properties after adsorption onto the mineral surfaces, in order to better describe the binding of radionuclides in a ternary system.

The speciation of Eu(III) in presence of NOM or oxide surface is also studied by time resolved laser fluorescence spectroscopy (TRLFS).

[1] Dryer, Korshin & Fabbricino (2008) *Environ. Sci. Technol.* **42**, 6644-6649.

REE-mineral record of fluid circulations in metasediments from the Swiss Central Alps

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In metamorphic rocks, U-Th-Pb isotopic resetting at the grain-scale depends on thermally induced diffusion and/or dissolution-reprecipitation processes, and correct age interpretation requires that we can discern where fluid-assisted crystallization occurred. In this study, we address the role of fluids on the texture and composition of the REE-minerals, in order to identify intrinsic criteria of growth in the presence of a fluid. For this purpose, we selected metasediments recording regional Alpine metamorphism (T = 400-500°C). Samples were collected in various types of metasediments and veins therein, in the Central Alps. Most of the veins developed early in the metamorphic history, but structural criteria indicate also late veins crusscutting the first generations. In homogeneous metasediment, the dominant REE-mineral is allanite; it occurs as <20-50 μm grains aligned in the foliation. However, directly adjacent to carbonate veins, allanite consists of porphyroblastic grains (50-100 μm) overgrowing the main foliation. In few samples, Variscan and/or Alpine monazite are found (chemical dating). In comparison to inherited monazite, newly formed grains are rich in quartz inclusions and differ in phase composition. In a cross-cutting vein, association of monazite and quartz indicates crystallization from a late stage silica-rich fluid. Differences in texture, compositions and mineralogy suggest that, at least at low-grade metamorphism, the timing as well as the composition of the fluid may be recorded by REE-minerals.