Colloid formation and mobilisation from compacted bentonite in favourable environments

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Compacted bentonites are commonly used as barriers to prevent the migration of hazardous contaminants, such as radioactive wastes because bentonites have good sealing properties and high contaminant retention capacity. However, the inherent colloidal nature of these clays, can entail a safety problem, because surrounding water can favour the removal of surface material and its mobilisation in available pores and fractures. Under favourable geochemical conditions, released colloids may contribute to contaminant transport.

In the last decades, many efforts were paid to asses the role of clay colloids in the transport of contaminants, but its quantification and parametrization are still difficult.

The aim of this study is to analyse the main physico-chemical factors playing a role in bentonite colloid formation, under compacted and confined conditions.

An experimental set-up consisting on a compacted bentonite pellet placed in artificial fractures was used. Two scenarios wete consiered, with stagnant and /or flowing water, chosing initial conditions which are considered as favourable for colloid formation.

Throughout the experiment, clay extrusion in the fracture are monitored along time. Moreover, the mobilization of colloids in the water flow is measured, quantifiying the mass released and the particle sizes. Obtained values are related, in each case, to the clay structural propierties, to the fracture characteristics (slope, aperture, roughness) and, mainly, to the geochemical conditions established at equilibrium.

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