Geophysical Research Abstracts, Vol. 8, 09785, 2006
SRef-ID: 1607-7962/gra/EGU06-A-09785


# Bentonite hydration in solution: application of confined volume wet-cell X-ray diffraction techniques

**L.N.Warr** (1) and J.N.Berger (1)

(1) Centre de Géochimie de la Surface (CNRS-ULP), 1 rue Blessig, 67084 Strasbourg, France

We use in-situ wet-cell X-ray diffraction monitoring techniques to monitor the hydration behavior of compacted bentonites (Na- and Ca-montmorillonite) in laboratory mixed- and natural- solutions. This approach allows us to determine the mechanism and rate of solution uptake in a confined volume, percolating flow-through reactor, and serves as an experimental analogue for predicting the performance of repository clay barriers. The pressed bentonite powders show continuous and strongly partitioned water uptake into montmorillonite interlayers, onto clay particle surfaces and within open pore spaces. During the hydration of compacted Na-bentonite in ground- and sea-water, roughly equal quantities of both interlayer and non-interlayer water enter the material. In contrast, the Ca-bentonite was dominated by the intake of more loosely bound pore and surface water, which amounts to roughly three times more than that incorporated into the interlayer sites. Our experiments demonstrate how both the confined reaction volume and the strength of the ionic solution can inhibit the interlayer expansion process. As significant volumes of solution are incorporated as loosely bound non-interlayer water, quantification of the rates and mechanisms of water storage is a necessary requirement for improved modeling of elemental transport in a hydrating bentonite sealant.