

Bentonite – a natural habitat for sulfate-reducers

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Concerning the deep geological disposal of high-level radioactive waste (HLW), bentonite plays a crucial role by using it as a barrier and buffer material in between the steel-canister, containing the HLW, and the surrounding host rock. In order to analyze the potential influence of naturally occurring microorganisms within the bentonite on the bentonite barrier, we set up microcosm-experiments. Therefore, two different Bavarian bentonites (a natural and an industrial one) were supplied with an anaerobic, synthetic Opalinus-clay pore water solution under an N₂/CO₂-atmosphere and were incubated for one year at 30 °C and 60 °C. To some set-ups organics (acetate or lactate) or H₂ were supplemented. During the incubation time samples were taken and analyzed for several bio-geochemical parameters and the evolution of microbial diversity.

Our results clearly demonstrate, that naturally occurring microbes affect geochemical parameters. Set-ups containing the industrial bentonite supplemented with lactate show the most striking effects. The microbial diversity changed completely within 6 months. The respective batches were dominated (up to 81 %) by *Desulfosporosinus* spp. – spore-forming, strictly anaerobic, sulfate-reducing organisms, able to survive under very harsh conditions. Concomitantly, an increase of ferrous iron and a simultaneous decrease of ferric iron was observed. Furthermore, the lactate and sulfate concentration decreased, whereas pyruvate and acetate were formed. Similar observations were also made in set-ups containing H₂. *Desulfosporosinus* spp. also dominated the microbial population in the respective batches. *Desulfosporosinus* spp. are known to metabolize a broad range of substrates including H₂ and organic acids, thereby reducing sulfate or iron to form H₂S, acetate or ferric iron – metabolites that could affect different properties of the barrier system of an HLW.