

Microbial diversity in Czech bentonite

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Nowadays, many countries across the globe have accepted the strategies of long term management and treatment of intermediate and high level waste within suitable deep geological formation. Compacted form of bentonite has been widely accepted as a buffer material surrounding the nuclear fuel waste container. Mechanical support to the canister, chemical buffering of the near field, limiting canister corrosion and prevention of convective flow are the major functions of bentonite buffer. Bentonite is not sterile and therefore, microbial community may compromise the effective performance and safety of waste disposal system. Therefore, emphasis has been given to understand the activity and diversity of microorganisms existing in bentonite. The radioactive waste repository authority in the Czech Republic, SÚRAO, selected bentonite from Černý Vrch as a buffer material for the engineered barrier system. Two Mg-Ca bentonite first unhomogenised “raw”, and second homogenised “BaM” were subjected to microbiological analysis. Our main goals were to assess the microbial diversity naturally occurring in the bentonite and also to study differences in the composition of microbial consortia between raw and homogenised bentonite. Microbial diversity was determined by NGS amplicon sequencing of 16S rRNA gene using IonTorrent platform. Surprisingly, both types of bentonite had relatively similar microbial communities. It indicates that the composition of bacterial communities was not much affected by the commercial processing. Alpha- and Beta-proteobacteria dominated in both bentonite samples. Moreover, microorganisms that are involved in oxidation processes of ammonia, iron, manganese and sulphur were present in both bentonite types, highlighting the importance of further studies of microbial activity in bentonite buffers under conditions of deep geological radioactive waste repository.