

Effect of irradiation and pressure on microbial activity in bentonite in relation to safety of the radioactive waste repository

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Bentonite will be used as an important part of an engineered barrier system for the geological disposal of radioactive waste due to its specific physical and chemical properties. However, it is not a sterile material as it comprises various indigenous microorganisms. Moreover, it can provide nutrients for allochthonous pore water microorganisms. Microorganism and their activity in repository may significantly influence and compromise the safe performance of disposal system through corrosion of canister, gas production, bio-mineralization, sorption and migration of radionuclide to surface biosphere. After the closure of repository, reducing environmental conditions with high radiation, pressure, temperature, compaction and pH are expected to prevail. Nevertheless, such extreme conditions can only suppress microbial processes but might not be lethal to them. The major aim of this study was to investigate the survivability of microorganisms subjected to irradiation and different pressure in relation to repository condition and describe changes in microbial community. It also intends to determine the limit that influences the microbial proliferation. To simulate the condition similar to repository and to estimate the potential risk, microbial activity in slurries from BaM bentonite and VITA underground water from Josef URC, Czech Republic was studied. Quantitative polymerase chain reaction was employed to determine the presence of total bacterial biomass along with sulfate, nitrate and iron reducing bacteria and the microbial community structure was investigated by the next generation sequencing technology using Ion torrent PGM. The results are being analyzed and will be presented and discussed.