Response of Bentonite Microbial Communities to Stresses Relevant to Radioactive Waste Disposal

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Since the 1940's the UK has been generating nuclear waste. High heat generating wastes (HHGW) consisting mostly of spent fuel (SF) and high level waste (HLW) from SF reprocessing are being considered for disposal in a geological disposal facility (GDF). In many HHGW disposal concepts the waste canister will be protected by a bentonite clay barrier that delivers long-term low permeability, a chemical environment limiting the corrosion of the canister, mitigates radionuclide transport, and keeps microbial activity to a minimum[1]. However, active microbes have been found in natural bentonite strata, as well as after barrier material fabrication, and under simulated conditions[2]. Fe(III)-reducing bacteria may contribute to the dissolution of the engineered barrier[3], and sulphate-reducing bacteria (SRB) can induce microbially-induced corrosion (MIC) in the waste canisters[1]. This study looked at the influence of pelletisation, temperature, and irradiation on the culturable number of bacteria in Fe(III)-reducing, and SRB enrichments. Our results show that both Fe(III)-reducing, and sulphate-reducing (SRB) bacteria are present in the bentonites, and remained active after the treatments, in reduced quantities.

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