Development of the safety case knowledge base about the influence of microbial processes on geological disposal of radioactive wastes

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A multidisciplinary EU-project, denoted MIND, addresses key technical issues that must be tackled to support the implementation of planned geological disposal projects for radioactive wastes across the EU. The current understanding of the impact of microbial metabolism on the safety of geological repositories remains tenuous, even though microorganisms may have controlling influences on waste form evolution in situ, multibarrier integrity and ultimately radionuclide migration from the repository. The emphasis is on quantifying specific impacts of microbial activity on safety cases under repository-relevant conditions, thus altering the current view of microbes in repositories and leading to significant refinements of safety case models currently being implemented to evaluate the long-term evolution of radioactive waste repositories. The program runs during 4 years starting June 2015.

One part of the MIND project focuses on microbiological processes in organic containing long-lived low- and intermediate level waste that require geological disposal. The work includes combined irradiation and biodegradation experiments of anthropogenic organics within the waste, including halogenated polymers, cellulose, bitumen and ion exchange resins and studies of gas generation and consumption under *in situ* conditions. A review of anthropogenic organic wastes and associated microbiological processes has been provided. Another part focuses on the microbial processes in high-level nuclear waste repositories, especially the performance of bentonite buffers, metallic canisters and cementitious materials in the presence of microbes. Sources of sulphide and processes affecting sulphide formation are studied, as well as factors limiting the viability of microbes at the high density of bentonite. Experiments are performed to study the corrosion of iron embedded in bentonite buffer and degradation of bentonite barriers.