

Geomicrobiological characterizations of tertiary sedimentary rocks obtained during an aseptic and deoxygenated drilling program

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We performed multidisciplinary investigations in order to reveal geomicrobiological processes occurring in tertiary sedimentary rocks down the depth of 350 m. Whole-round cores of tertiary sedimentary rocks, which were obtained by an aseptic and deoxygenated drilling program, were transported to the laboratory under anoxic conditions at 4°C to minimize oxidation and microbial contamination. The cores were subsampled in an anaerobic chamber purged with a gas mixture containing 95% N₂ and 5% H₂. Inner portions of the cores were subjected to pore-water extraction by using high-pressure squeezing up to at 70 MPa. Immediately after extraction, pore water samples were analyzed in terms of iodine that was used as a tracer to check contamination, pH, ORP, alkalinity and the concentrations of ferrous iron and hydrogen sulfides. In addition, dissolved gases of H₂ and CH₄, cationic elements, anionic species, as well as dissolved organic matter were analyzed. Microbial characterizations with respect to total cell counts, viable cell counts based on cultivation, culture-independent molecular analyses of microbial populations, and in-situ activity of denitrification were conducted. We also quantified total organic carbon, maturation indices and kerogen. In the presentation, it is discussed how the multidisciplinary data set can be interpreted and implied for the safety assessment of nuclear waste disposal.