Study of corrosion of structural steel under simulated conditions of spent nuclear fuel repository

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The Czech method for disposal of spent fuel in a deep geological repository is based on Swedish KBS-3 model with certain modification. The current design concept utilizes two engineered barriers: double walled canister with an inner shell of stainless steel and an outer shell of carbon steel and highly compacted bentonite clay buffer. The repository will be constructed in the granitic bed-rock approximately 500 m below the surface. To ensure the maximum protection of disposed of material it is necessary to determine carbon steel behavior and the expected near-field environment in similar conditions that are presumed in the deep geological repository. This work is focused on corrosion behavior of the carbon steel in the presence of bentonite suspension in anaerobic condition. Several techniques (e.g. EIS, Tafel extrapolation, Weight loss measurements) were used to monitor the corrosion processes. Additionally, the various surface analysis (Raman spectroscopy, SEM, XPS) was also carried out.