DSM SL-DSM-10-0338

Research field:

Radiation-matter interactions / Solid state physics, chemistry and nanosciences

Ultra-divided matter, Physical sciences for materials / Solid state physics, chemistry and nanosciences

Title:

Long term effect of radiolyse on steels corroded in anoxic mediums

Abstract:

Low carbon steels should be present in numerous elements of the disposal envisaged for the long term repository of the nuclear waste (canisters, overcontainers, reinforced concrete?). In these environments the main constraints to consider dimensioning the metallic structure is the corrosion. Laboratory simulation combined to the study of archaeological analogues have shown that corrosion rate in anoxic mediums are low (<1 µm/year) and that the corrosion products form a protective barrier. On the other hand the effect of an equilibrium rupture due to change in the medium of external constraints are not known. Among these latter is the exposure to ion radiation through the radiolysis could play an influent role. The radiolysis creates highly reactive species (hydroxyl radicals, hydrogen peroxide) which could by accumulation or reaction, modify the redox properties of the medium. Moreover it has been observed that these effects are stressed at the vicinity of the metal/electrolyte interface and could react with the protective layer. For this PhD work the degradation of young (few months) and ancient (400 years) corrosion layers will be studied under irradiation. The results of this research project will allow understanding the radiolysis effect of on corrosion system in anoxic conditions and will contribute to establish reliable predictive model.

Location:

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