

Corrosion behaviour of high-level radioactive waste forms in a geological repository in Boom Clay in the Netherlands

G. DEISSMANN^{1,2*}, K. HANEKE², A. FILBY², R. WIEGERS³
AND D. BOSBACH¹

¹Forschungszentrum Jülich GmbH, Institute of Energy and Climate Research: Nuclear Waste Management and Reactor Safety (IEK-6), 52425 Jülich, Germany
(*correspondence: g.deissmann@fz-juelich.de)

²Brenk Systemplanung GmbH, 52080 Aachen, Germany

³IBR Consult BV, 6081PH Haalen, The Netherlands

The primary objective of the Dutch research programme into geological disposal of radioactive waste (OPERA - OnderzoeksProgramma Eindberging Radioactief Afval) is the development of safety cases for generic repositories in the Tertiary Boom Clay and Zechstein rocksalt formations in the Netherlands. The generic disposal concept for high-level radioactive wastes (HLW) in Boom Clay is based on the Belgian supercontainer concept, where the extensive use of cementitious materials in the engineered barrier system will lead to highly alkaline post-closure conditions in the repository near field. The HLW inventory for the OPERA safety case comprises in particular vitrified wastes (HLW glass) from the reprocessing of light water reactor fuels from commercial nuclear reactors and spent research reactor fuels, besides spent uranium targets from molybdenum isotope production, and non-heat generating wastes such as compacted hulls and ends from fuel assemblies.

Here we present and discuss initial results of the evaluation of the corrosion behaviour of and the radionuclide release from vitrified HLW and spent fuel from research reactors under the disposal conditions encountered in a geological repository in Boom Clay in the Netherlands. The overall aim of this project is (i) to provide a coherent picture of the radionuclide release from HLW disposed in a generic repository in Boom Clay, (ii) to increase the understanding of waste form evolution (i.e. leaching and dissolution behaviour with time) and the radionuclide migration behaviour in the near-field, and (iii) to develop source terms for relevant radionuclides that are the main contributors to dose in support of the post closure safety assessments. Due to the generic nature of the OPERA safety case (i.e. without selection of a repository site) and the variability of the porewater composition in Boom Clay in the Netherlands, various scenarios regarding the composition of the near field water will be discussed.