



NES Colloquium

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Aqueous leaching and X-ray spectroscopy experiments on spent nuclear fuel: results from the „FIRST Nuclides“ project

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In Switzerland, the major part of nuclear waste arising from nuclear power plants will be disposed of as non-reprocessed spent fuel in a deep repository hosted in the Opalinus Clay formation. Upon failure of the technical barriers, a significant pulse of easily soluble nuclides (the “Instant Release Fraction”, shortly IRF) will be rapidly released from water-accessible spent fuel surfaces. The primary goal of the “FIRST-Nuclides” European project was to provide extensive IRF data specifically for high-burnup fuels. Such data are critical input parameters to safety assessment calculations.

In this talk, I will present the results obtained at PSI in the framework of the “FIRST-Nuclides” project. This includes aqueous leaching experiments on spent fuel samples from Swiss nuclear power plants, as well as X-ray absorption spectroscopy data for selenium, obtained at SLS on spent fuel micro-samples. The results substantially confirm earlier results (“Gap” project), indicating that iodine and caesium are major contributors to the IRF, whereas selenium is hardly released. The spectroscopic data show that selenium is probably trapped as sparingly soluble Se(-II) ion replacing oxygen atoms in the UO_2 structure, thus explaining the failure to detect this element in solution during the leaching experiments.