

## In-situ diffusion experiments in Callovo-Oxfordian mudstone

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The French National Agency for radioactive waste management (Andra) investigates the feasibility of a high-level radioactive waste repository in deep geological formation. This concept is based notably on the impermeable properties of the host rock barrier (the Callovo-Oxfordian mudstone of the Eastern Paris Basin). Diffusion is assumed to be the main transport mechanism governing radionuclide migration through argillite. Diffusion properties were measured i) on a large set of 1 cm-wide samples from drill cores, using through-diffusion cells at CEA Saclay and ii) *in situ*, in the constrained rock, by seven experiments carried out in Andra's Underground Research Laboratory. Among these *in-situ* experiments, one is particularly innovative and original. Flow circulation starts at the down to 542 m depth, through 1 km of hydraulic lines. This *in-situ* diffusion experiment gave access to the diffusive parameters of the Callovo-Oxfordian argillite for Co, Nb, HTO, <sup>134</sup>Cs, and <sup>36</sup>Cl. Monitoring of tracer concentrations and water geochemistry in the circulating fluid (Figure) was carried out for 12 months. Average diffusion properties (diffusion coefficients, porosity and eventually  $K_d$ ) are estimated based on empirical correlations between the various transport parameters (Archie Law). The obtained results are in good agreement with those obtained from through-diffusion tests on drill core samples.

