

## Effects of pore structure on diffusivity of deuterated water and its activation energy in bentonite

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To quantify the effects of temperature on the diffusivity of deuterated water (HDO) in compacted sodium-bentonite, through-diffusion experiments were conducted at elevated temperatures ranging from 298 to 333 K. Kunipia F (Na-montmorillonite content 98 wt. %; Kunimine Industry Co.) was compacted to a dry density of 0.9 or 1.35 Mg/m<sup>3</sup>. As montmorillonite particles were oriented perpendicular to the direction of compaction, the anisotropy of diffusivity was investigated both parallel and normal to the preferred orientation of the montmorillonite. At dry densities of both 0.9 and 1.35 Mg/m<sup>3</sup>, the effective diffusion coefficient  $D_e$  of HDO was larger when the diffusional direction was parallel as opposed to normal to the preferred orientation for both dry densities. The magnitude of  $D_e$  and the anisotropy for HDO were in good accordance with previously reported results for tritiated water at room temperature. Activation energies of  $D_e$  were isotropic and increased with increasing dry density over the range of 19 - 25 kJ/mol. This relationship was considered to be due to both pore structure development and the high activation energy of water near the montmorillonite surface.