

Anion Diffusion (^{36}Cl) in Clay Rocks with different Cations (Na, Ca & Cs)

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The disposal of radioactive waste in clay rocks is considered in various countries. This is based on the advantageous properties of these rocks, such as the strong sorption of radionuclides, the low water flow, and the slow radionuclide transport. Due to the low hydraulic conductivity of clay, molecular diffusion is the major migration process for radionuclides released from the waste matrix into the host rock (Altmann et al., 2012).

For neutral and positively charged chemical species, the whole pore space of a clay rock is available for transport. However, anions are repulsed by the negatively charged clay mineral surface (Bolt and de Haan, 1979). Hence, only a part of the pore space is available for anion transport, i.e. the anion porosity is less than the total porosity (Muurinen, 1994).

This presented study shows a systematic investigation of the anion accessible porosity in natural clay rocks. The aim of the research was:

- to study the anion diffusion behaviour in clay rocks with a different mineral composition.
- to compare the diffusion behaviour of ^{36}Cl with different cations Na, Ca and Cs.
- to better understand the relation between the ionic strength of the pore water and the anion diffusion in these clay rocks.
- to better constrain the anion accessible porosity.

The results contribute to a better understanding of the migration of anionic radionuclides in clay rocks and provide also better constraints of the pore water porosity which is important to further assure characterisation of the in situ pore water composition in clay formations.

[1] Altmann et al. (2012). Appl. Geochem. 27, 463-478.

[2] Bolt and de Haan (1976). Soil Chemistry: A. Basic Elements. Elsevier Scientific Publishers, Amsterdam – Oxford – New York, 91-95.

[3] Muurinen, A. (1994). VTT Publications 168, Technical Research Centre of Finland, Espoo, Finland.