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Migration characteristics of rock samples studied by electromigration method: methodology: procedure modification

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In several concepts of deep geological repository (DGR) development granites are considered as potential hosts rocks (Sweden, Finland, Czech Republic) . Safety calculations, evaluating safety functions of DGR barriers, require information about radionuclide migration within fractured rock formations, where advection and matrix diffusion are considered as the most important processes for activity decrease.
Radionuclide diffusion into rock matrix can be studied both in laboratory and in-situ (e.g. Long term diffusion project, Grimsel URL, Switzerland). However, due to diffusion speed the lab experiments usually take longer time than e.g. batch experiments, even in year perspective. Moreover, some parameters, e.g. formation factor Ff, are difficult to determine using convention methods.
Hereby, the through electromigration methods (TEM; Löfgren, 2004) can be used for diffusion parameter studies, especially due to speeding up the experimental work in comparison standard through-diffusion methods. The TEM experiments gain both formation factor (Ff) and effective diffusion coefficient (De) values.
In NRI the experimental cells for TEM method, based on the work of M. Löfgren (2004), were assembled, modified in order to increase its function and tested. Iodide anion as a tracer in sodium chloride background electrolyte of different concentration was used. Blank experiments with Plexiglas piece, substituting rock sample, were performed for in order to test the experimental apparatus for leakage failures, sample sealing and non-conductive cell materials. Subsequently, TEM experiments with rock samples were accomplished, including samples of crystalline rocks (granite, granodiorite) from Czech Republic, Sweden and Switzerland. The results (Ff and De) obtained were compared and evaluated, taking into account rock sample properties.

M. Löfgren: Diffusive properties of granitic rock as measured by in-situ electrical methods, Doctoral Thesis (2004), Royal Institute of Technology, Stockholm, Sweden.
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