Chlorine stable isotope diffusion throught natural porous media

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Chlorine is widely assumed to be natural conservative tracer in surface and subsurface water systems. In groundwater and porewaters, δ37Cl is an appropriate tracer of some physical process controling transfert between different source and/or reservoirs. Among different hydrogeological processes, various studies have used chlorine stables isotopes to better constrain transport of solute in porous sedimentary deposits through chemical diffusion.

Recent experimental and theoritical studies (Richter *et al*, 2006; Eggenkamp *et al*, 2009) have focused on the determination of isotopic fractionation during diffusion of chloride in water (freewater diffusion). The α fractionation factor corresponds to the ratio between diffusion coefficients of 35Cl and 37Cl, and is measured to be of ~ 1.0064 at 21°C in free water (Eggenkamp *et al*, 2009). Most studies on chloride diffusion in natural groundwaters assume that this value remains unchanged even if diffusing through a porous media.

In this study, we explored the effective diffusion coefficient of chloride and associated isotopic fractionation factor when diffusing through a porous media. Experiments were performed at 21°C using a diffusion cell and carbonate and sandstone rock samples of various porosity and permability. Diffusion through pure carbonate produces some relatively large isotopic fractionation, however the fractionation factor we determine at the same temperature, is slighlty lower (i.e 1.0012), than the one measured in freewater. This difference could be related to change in the chloride hydration shell within the porous media.

In contrast to carbonates, similar diffusion experiments done with sandstones, yielded unexpectedly high effective diffusion coefficient for chloride and no isotopic fractionation. This result could be linked to some electrical pore surface effects. Additional work is underway to refine further these preliminary results.