

4.64.P01

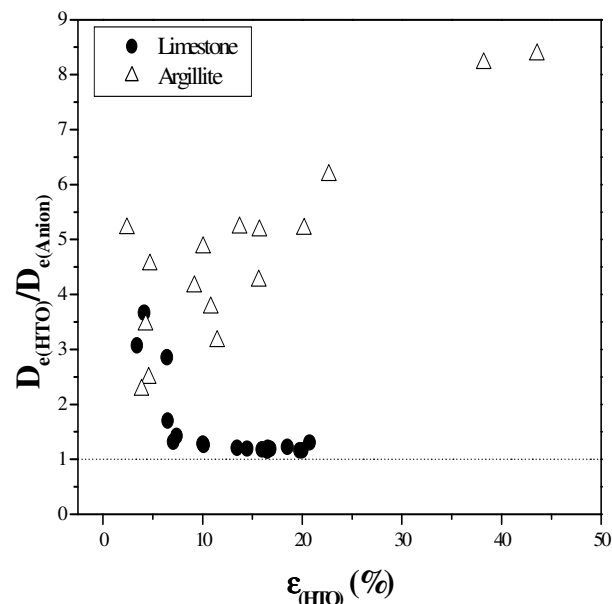
 $^{125}\text{I}^-$ and $^{36}\text{Cl}^-$ diffusion in Oxfordian limestones and Callovo-Oxfordian argillites formations

M. DESCOSTES, V. BLIN, B. GRENUT, P. MEIER,
I. POINTEAU AND E. TEVISSIN

CEA/DEN/DPC/SECR/L3MR, CEN Saclay, F-91191 Gif-sur-Yvette (michael.descostes@cea.fr)

Diffusion coefficients (D_e) and accessible porosities (ϵ) for $^{125}\text{I}^-$, $^{36}\text{Cl}^-$ and HTO, were measured on 23 samples from the Andra Underground Rock Laboratory site in Meuse/Haute-Marne (France) using the through diffusion technique. Core samples from two distinct geological formations were studied: oxfordian limestone and callovo-oxfordian argillite between 298 and 477 m depth. The experiences were carried out with synthetic pore-water representative of each formation. D_e and accessible porosities of each anionic tracer are lower than values measured for HTO. Typically, measured values of D_e are ranging from 1.10^{-13} to $1.10^{-10} \text{ m}^2.\text{s}^{-1}$ while accessible porosities are between 2 and 30%. In limestones $D_e(\text{HTO})/D_e(\text{Anion})$ is close to 1, meanwhile in higher clay content samples, the ratio is higher (Cf. fig 1.). This discrepancy between the calculated ratio is explained by the effect of anionic exclusion.

Figure 1: $D_{e(\text{HTO})}/D_{e(\text{Anion})}$ versus $\epsilon_{(\text{HTO})}$ according each geological formation.



4.64.P02

Characterization of organic-rich $^{239,240}\text{Pu}$ -containing colloids from surface and ground waters from a contaminated site in Colorado, USA

K.A. ROBERTS¹, P.H. SANTSCHI¹, G.G. LEPPARD² AND
M. M. WEST³

¹Texas A&M University, 5007 Ave U, Galveston, TX 77551, USA (roberts@tamug.tamu.edu; santschi@tamug.edu)

²National Water Research Institute, 867 Lakeshore Road, P.O. Box 5050, Burlington, Ontario, Canada L7R 4A6 (Gary.Leppard@ec.gc.ca)

³Electron Microscopy Facility, Faculty of Health Services, McMaster University, Hamilton, Ontario, Canada L8N 3Z5 (westm@mcmaster.ca)

Colloids can play an important role in the dispersion of actinides in surface and groundwater environments. Therefore, colloids (3kDa – 0.45 μm) were collected through filtration and cross-flow ultrafiltration from three different environments, i.e., surface water, pond water and near-surface ground water at the Rocky Flats Environmental Technology Site, Colorado, where elevated actinide concentrations had previously been documented. The chemical composition of these colloids, further purified through dialysis, was determined in order to better understand their role in actinide migration. All three types of colloid samples were found to be similar in chemical composition, with a higher percentage of organic carbon, OC (5-18%), than any other measured component, and with only small amounts of Si, Mn, Al, and Fe (1% or below). $^{239,240}\text{Pu}$ concentrations in these colloids ranged from 0.03 to 1.3 pCi/g. Transmission Electron Microscopy (TEM) images of colloidal material from all three sample types indicate the presence of cellulose degradation products, likely from plant (terrestrial and/or aquatic) material. Other major components include humic acid type particles, with less than 5% of mineral particles. Our findings of colloids high in organic and low in inorganic matter content agree with previously reported results on Pu(IV) associated with an acidic 10 kDa natural organic compound that also contains small amounts of Fe [1]. Pu/OC and Fe/OC ratios both showed a steady decrease from surface runoff water to pond water to groundwater, with a more marked decrease in Fe/OC ratios, and no significant change in overall OC and mass concentrations. These findings contribute to a better understanding of the coupling of organic matter, iron and actinide cycling in these environments.

Reference

- [1] Santschi, P.H., Roberts, K., and Guo, L. (2002) The organic nature of colloidal actinides transported in surface water environments. *Environ. Sci. Technol.* **36**, 3711-3719.