Nanoscale Geofluid-Shale Interactions

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The physical properties of pure and mixed geofluids imbibed in the narrow pores of earth materials play important roles in the uptake, mixing, storage, extraction, and transport of these fluids. Fluid-pore interactions play out at the molecular to microscopic levels, and include sorption, wetting, diffusion, and flow, all impacted by confinement effects. Neutron scattering experiments probe the pore structure and dynamics of pore fluids and provide detailed information about density and volume of fluid phases, sorption properties, as well as species mobility and self diffusion characteristics [1]. We will discuss excess sorption, small-angle neutron scattering (SANS) and quasi-elastic neutron scattering (QENS) studies of confined pure fluids to clay minerals and porous silica, which provide detailed insight into mineral associations of light hydrocarbons, water, and CO_2 with shale components. This work aims at obtaining a basic understanding of the sorption capacity and fluid recovery rates and levels of different shales, and their dependence on shale composition, structure, and pore size distribution.

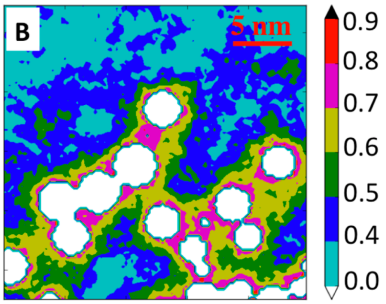

Figure 1: Density map of supercritical CO_2 inside silica aerogel, obtained from Grand-canonical Monte Carlo simulations calibrated to experimental data.

References:

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