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Neutron Scattering Applications for Characterizing Phase Behavior and Dynamics of Confined Fluids in Nanoporous Materials YURI MELNICHENKO, Biology and Soft Matter Division, Oak Ridge National Laboratory — Fluid-solid interactions in natural and engineered porous solids underlie variety of technological processes, including sequestration of anthropogenic greenhouse gases, hydrogen storage, membrane separation, and catalysis. The size, distribution and interconnectivity of pores, the chemical and physical properties of the solid and fluid phases collectively dictate how fluid molecules migrate into and through the micro- and mesoporous media, adsorb and ultimately react with the solid surfaces. Due to the high penetration power and relatively short wavelength of neutrons, small-angle neutron scattering (SANS) as well as quasi elastic neutron scattering (QENS) techniques are ideally suited for *in situ* studies of the structure and phase behavior of confined fluids under pressure as well as for evaluating structure of pores in engineered and natural porous systems. It has been demonstrated recently that SANS and USANS can also be used for evaluating the volume of closed pores as a function of pore sizes in the range from micrometer to sub-nanometer pores. In this talk I will overview some recent developments in the SANS and QENS methodology and give several examples of how it can be used for in-situ studies of the adsorption and dynamics of carbon dioxide and methane in porous fractal silica and carbon aerogels as well as characterizing the abnormal densification of hydrogen in activated carbons at ambient temperatures.

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