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Methane Adsorption and Diffusion in Nanoporous Gray Shale by QENS BO WANG, MATTHEW BYRAN, GARFIELD WARREN, PAUL SOKOL, Indiana Univ - Bloomington, INDIANA UNIVERSITY TEAM — Adsorption of methane in nano-porous structures is of great important for applications such as shale gas extraction. In this work, methane adsorption and diffusion in gray shale is studied by Quasi-elastic Neutron Scattering (QENS) on the CNCS at the Spallation Neutron Source. The shale, which was characterized by nitrogen adsorption isotherms and X-ray diffraction, has an average pore size of 5.6 nm and pore volume of 0.038cm³/g. Adsorption studies were carried out at 106 K as a function of pressure between 0 and 1.5 bar. Diffusion studies were carried out at temperatures between 50 K and 190 K at several methane filling fractions. Diffusion constants obtained using several different diffusion models will be discussed. We find that the microscopic diffusion of methane depends on the filling fraction inside the pore and the jump length is comparable to the scale of confinement. This report was prepared by Indiana University under award 70NANB10H255 from the National Institute of Standards and Technology (NIST), U.S. Department of Commerce. The statements, findings, conclusions, and recommendations are those of the authors and do not necessarily reflect the views of the NIST or the U.S. Department of Commerce.

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