AAPG Annual Meeting
March 10-13, 2002
Houston, Texas

K. A. M. Gasem[1], J.E. Fitzgerald[1], Z. Pan[1], M. Sudibandriyo[1], R. L. Robinson[1] (1) Oklahoma State University, Stillwater, OK

Modeling of Gas Adsorption on Coalbeds

Nitrogen and carbon dioxide (CO2) injections are potentially useful for enhanced recovery of coalbed methane (CBM). Knowledge of the competitive adsorption of methane, nitrogen, and CO2 on coal is required to elucidate mechanisms for the recovery process. This study focuses on evaluating and developing the predictive capability of the combined simplified-local-density / Peng-Robinson (SLD-PR) model for supercritical adsorption systems of the type encountered in CBM recovery and CO2 sequestration. Such developments facilitate the use of highly efficient equation-of-state (EOS) computational frameworks that represent adsorption behavior.

We have modified the SLD-PR model to improve its predictive capability. The abilities of the modified SLD-PR model to correlate supercritical adsorption systems of the type encountered in CBM recovery and CO2 sequestration are demonstrated by combining new measurements on activated carbon and Illinois-6 coal with our previous data on Fruitland coal. The modified SLF-PR model represents the adsorption behavior on all fluids considered within 6% average deviations, including the near-critical behavior of carbon dioxide beyond 8.3 Mpa (1200 psia). These results indicate the modified model is capable of representing the systems considered within twice their expected experimental uncertainty.

Our results indicate that proper accounting of coal heterogeneity and structural complexity within the SLD-EOS framework is effective in improving our modeling capability of high-pressure adsorption phenomenon. Further, the present framework generates direct estimates for the adsorbed-phase densities, and it describes the maximum observed in Gibbs-adsorption isotherms of CO2 at temperatures and pressures encountered in coalbeds.