Effects of Moisture on Gas Sorption Capacity of Minerals Within Gas Shales

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ABSTRACT

An increasing exploration of shale gas is currently carried out around the world, especially the United States and China, which were proved to have the largest shale gas reserves. The storage capacity and reserve of shale gas was greatly impacted by the pore structure of shales, which is determined by the mineral composition. In addition, mineral composition itself, especially organic matter and clay minerals, mainly determines the capacity of sorbed gas, which can attribute up to 85% of total shale gas-in-place, including free gas, sorbed gas and dissolved gas. Water molecules can occupy the hydrophilic sorption sites of clay minerals, however, how water molecules quantitatively impact the sorption capacity of whole minerals remain poorly understood. This project will compare the high-pressure methane sorption isotherms under dry, 8%, 33%, 53%, 75% and 97% of relative humidity conditions to characterize the quantitative effect of water on gas sorption of nine kinds of minerals, including clay minerals (smectite, illite, chlorite and kaolinite), quartz, feldspar, calcite, coke and graphite (two products of organic matter at over mature stage), which were separately sampled in the quarries. The results will help better understand the importance of composition for shale gas storage, and effectively estimate the shale gas-in-place, which can in turn decrease the risk and enhance the success of exploration.

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