

Porosity Characterization of Indian Shale Gas Basins

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ABSTRACT

Gas shales in India present a promising opportunity towards meeting its growing energy demand. The objective of the study is to understand the petrophysical and pore system dynamics of select Indian shales in order to assess their suitability as reservoir rocks for gas production. A three-pronged methodology of field studies, laboratory tests, and numerical simulation will be applied in the course of the research. Shale samples from prospective basins were analyzed for their petrophysical parameters such as fracture behavior, anisotropy, stress-strain behavior, elastic properties, porosity, sonic wave velocities, and permeability. The pore size distribution of the shales will help in understanding gas accumulation process and design necessary stimulation techniques. Further, a novel high pressure-temperature experimental set up has been developed as a part of this research to conduct a simultaneous hydro-mechanical analysis of shale; analogous to reservoir evolution during gas withdrawal. Methane, nitrogen, and carbon-dioxide will be used as the fluid media during the tests. The reservoir potential of the shales will be estimated by high pressure gas adsorption of both carbon dioxide and methane. The laboratory results will be used for numerical simulation of the reservoir using COMSOL to understand the rock deformation phenomena when coupled with fluid flow. This study will not only provide a detailed petrophysical analysis of Indian shales but also resolve some unanswered fundamental questions on the unconventional deformation vis-a-vis flow behavior of shales. These findings will have further implications for enhanced gas recovery and possible carbon-dioxide sequestration for a cleaner future.