

## **Integrated Rock Characterization of Tight Reservoir by Multiple Analytical Techniques**

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### **Abstract**

Tight gas reservoirs contain a variety of formations, such as shale gas, tight sandstone, and carbonates etc. Many of these reservoirs are very complex in terms of mineralogical composition and petrophysical properties; consequently, the hydraulic properties are not simple and straightforward. The mineralogical compositions are complex because of varying amounts of quartz, calcite, dolomite, feldspar, and clay. The type and nature of clay content present between the pores greatly affects petrophysical properties. Therefore, an integration of geological and petrophysical properties are very crucial to gaining an understanding of the reservoir and optimizing the development strategy.

This paper discusses rock characterization of formation samples using multiple analytical instruments, such as X-ray fluorescence (XRF), X-ray diffraction (XRD), and qualitative evaluation of minerals by scanning electronic microscope (QEMSCAN). The XRF determines the elemental composition of formation and XRD determines the mineralogical composition of formation based on international center for diffraction data (ICDD) database and regression method using external standards. QEMSCAN is used for spatial distribution of individual minerals and textural variations, porosity distribution, and grain density within rock samples. The presence of swelling clays in a formation leads to swelling upon contact with water. Swelling clay content is estimated by cation exchange capacity and correlated with XRD mineralogical analysis.

The compilation of data from diverse techniques helps present a complete picture of lateral heterogeneity in unconventional reservoirs, which ultimately helps improve designing formulation for fracturing fluid and drilling fluids to help prevent non-productive time (NPT).