



Methods for Shale Gas Play Assessment: A Comparison between Silurian Longmaxi Shale and Mississippian Barnett Shale

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Based on field work, organic geochemical analyses and experimental testing, a six-property assessment method for shale gas is proposed. These six properties include organic matter properties, lithofacies, petrophysical properties, gas content, brittleness and local stress field. Due to the features of continuous distribution over a large area and low resource abundance in shale plays, a sweet spot should have these following properties: a) TOC > 2%; b) brittle minerals content (>40%) and clay minerals (<30%); c) R_o (>1.1%); d) porosity (>2%) and permeability (>0.0001 mD), and e) effective thickness (30m-50m). Applying these criteria in the Sichuan Basin, the Silurian Longmaxi Shale consists of four prospecting sweet spots, including blocks of Changning, Weiyuan, Zhaotong and Fushun-Yongchuan. Although these four blocks have some similarities, different features were usually observed. After comprehensive analyses using the six-property assessment method, the Fushun-Yongan block ranks the most favorable sweet spot, followed by the Weiyuan block. For the other two blocks, the Changning block is better than the Zhaotong block. By comparing with the Mississippian Barnett Shale, characteristics that are crucial for a high-yielding in the Sichuan Basin include a high content of organic matter (TOC > 2.5%), a moderate thermal maturity ($R_o = 0.4\% \sim 2\%$), a high content of brittle minerals (quartz: 30%~45%), a high gas content (>2.5 m³t⁻¹), and types I and II₁ kerogen.