

The Lower Jurassic Continental Shale Facies of the Sichuan Basin and Comparative Analysis of Hydrocarbon Generation, Reservoir and Fracturing Capacity

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Abstract

Continental shales in China are rich in gas resources, and show similar enrichment conditions to those of marine shales, while their geological conditions are greatly different. Compared with marine shales, which are rich in organic matter, continental mud shales feature rapid changes in sedimentary facies, diverse facies types (e.g., interbed and interlayer), low abundance of organic matter, and a significant difference in reservoir capability, among others. In this study, the Lower Jurassic continental shales in the Sichuan Basin were taken as an example, and based on different lacustrine sedimentation models and facies types, the lacustrine mud shales were divided into four major types and eight specific types of shale facies, including shales laminated with thin layers and shale interbeds and interlayers. Methods and technologies including organic geochemistry, high-pressure Hg injection, and gas adsorption were adopted to study the hydrocarbon generation, reservoir and fracturing capacity of shales according to each facies type, and shales in the Longmaxi Formation of marine facies in the Sichuan Basin were introduced for comparison. The results indicated that the shales deposited in carbonate lakes with clastic limestone interbeds showed favorable hydrocarbon generation, reservoir and fracturing capacity, which were beneficial for the formation of shale gas, thereby making it the ideal type of lacustrine facies shale. The shales deposited in carbonate lakes with shell limestone interlayers and shales deposited in lakes containing terrigenous clasts with sandstone interbeds had

hydrocarbon generation and shale gas reservoir abilities with moderate fracturability, which made them relatively favorable shale types.

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