

## Shale Gas Accumulation Conditions of the Mesozoic Formations in Kuqa Depression, Tarim Basin

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### Abstract

Kuqa foreland basin is located at the north of Tarim Basin; its natural gas resource extent is about  $3.16 \times 10^{12} \text{m}^3$ , which has great exploitation potential. There are two types of source rocks that are lacustrine mudstone and coal measure source rocks distributed in the region. The lacustrine mudstone is mainly developed in the Upper Triassic and Lower Jurassic series, and the coal measure source rocks are mainly developed in the Middle-Lower Jurassic series. Based on available well data and field section survey, the Triassic strata thickness is 165m~1500m; and the Jurassic strata thickness is 1450m~2072m. To understand the gas potential, it is critical to evaluate the organic matter type and richness of source rocks. According to maceral composition and rock pyrolysis analysis, the main organic matter type of Triassic strata is type III, and their TOC content is from 0.15%~13.47%, the main range is about 1%~3%. In contrast, the organic matter type of Jurassic strata belongs to type II/III, but type III kerogen also exists partially, their TOC content is 0.53%~27.73%, and the main range is 1%~5%. The organic matter type and richness reveal that both the two series have strong heterogeneity and high gas generation potential. In addition, the organic maturity of black shales in the study area is high; most of them have reached high- or over-maturity. The Ro value of the Triassic strata is from 2.0%~2.5% in the hydrocarbon generation center, and the Ro value of the Jurassic strata ranges from 1.5%~2.0% in the central sag, indicating that both the source rocks have reached the threshold of generating a large amount of gas. Besides, the mineral composition of shales is another factor controlling gas exploitation, and brittle index (BI) is the primary parameter to characterize fracability of rocks, which influence the hydraulic stimulation. By XRD analysis of core data, the BI ranges approximately from 34.3% to 74% for the Triassic samples and from 30% to 65% for the Jurassic samples, indicating high brittleness. According to the geological features, the Mesozoic shales in Kuqa Depression shows high gas resource potential, and it seems that the Jurassic stratum is the more favorable horizon for natural gas explanation than the Triassic stratum.