

The Geochemical Characteristics of source rocks in Laiyang period of Riqingwei Basin: Implication on unconventional oil and gas prospect

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Several sets of thick source rocks have been found in the earliest early Cretaceous (Laiyang period, 150-125Ma) deep-water sedimentary layers of LK-1 drilling from the Riqingwei basin. In this study, we provide comprehensive geochemical characteristics of the source rocks, to explore the prospect of oil and gas resources.

The total organic carbon (TOC) contents of the source rocks are 0.49 to 1.83 % (average 1.24 %), suggesting that most of the samples are high-quality. The samples have low potential hydrocarbon generation amount (S1 + S2), ranging from 0.10 to 0.19 mg/g (average 0.14 mg/g). The chloroform bitumen values are 0.013 -0.0275% (average 0.0188%). The organic geochemical research shows that samples are mainly sapropelic and sapropelic-humic organic types. The T_{max} is 347-436°C and the R_o is 1.73-4.06 % indicating that the studied samples is high to over maturity stage.

The whole-rock compositions of source rocks have SiO₂ contents of 44.57-62.09 wt.%, Al₂O₃ contents of 11.61-16.19 wt.% and SiO₂/Al₂O₃ ratios of 3.29-5.20 show that they are the low maturity. The V/(Ni+V) ratios (average 0.74) suggests that the water in Laiyang period is anoxic environment and beneficial to preservation of organic matter. The REE patterns and the index of Ce_{anom} in source rocks beneath the studied area reflecting that the Riqingwei basin is deep-water reduction environment with medium-high salinity during the Laiyang period.

Considering all the evidence, we propose that the source rocks of LK-1 drilling from the Riqingwei basin have a good prospect for unconventional oil and gas field.