# Hydrocarbon Generation and Expulsion Characteristics of Lower-Middle Permian Lucaogou Formation in Jimusar Sag, Eastern Margin, Junggar Basin, Northwest China: Implications for Tight Oil Accumulation Potential

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## Abstract

The Jimusar Sag, at the eastern margin of the Junggar Basin, has made significant progress in the tight oil exploration of the Lucaogou Formation (P2l) recently, which indicates that the tight oil resources have good exploration prospects. Whereas the lack of recognition of the hydrocarbon generation and expulsion characteristics of the P2l source rocks results in misunderstandings of tight oil resource potential. Based on the comprehensive analysis of geological and geochemical characteristics of wells, seismic inversion, sedimentary facies, tectonic burial depth, the characteristics of the P2l source rocks were investigated, and the horizontal distributions were predicted: the thickness of source rocks, abundance and type of organic matter. And on this basis, an improved hydrocarbon generation potential methodology together with basin simulation techniques were applied to unravel the hydrocarbon generation and expulsion characteristics of the P2l source rocks. Results show that the P2l source rocks distribute widely (up to 1500 $km^2$), are thick (up to 160 m), have high total organic content (TOC, ranging from 0.03 to 19.01 wt%), are dominated by type II kerogen, and have entered into low mature-mature stage. The modeling results indicate that the source rocks reached hydrocarbon generation threshold and hydrocarbon expulsion threshold at 0.48% and 0.86% VR. The amount of generation and expulsion from the source rocks was $54.10x10^8$t and $16.69x10^8$t, respectively, with a residual amount of $37.41x10^8$t within the source rocks. Volumetrically, the geological resource of shale oil is up to $36.69x10^8$t. Small differences ($0.72x10^8$t) between the amounts calculated by volumetric method compared with that by hydrocarbon generation potential methodology may be due to other oil accumulations present within interbedded sands associated with the oil shales. Key words: Junggar Basin; P2l; source rocks characteristics; hydrocarbon generation and expulsion characteristics; tight oil potential