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Characteristics and controlling factors of lacustrine tight oil accumulation: A case study from Yanchang Formation, Ordos Basin, China

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Tight oil has become a hotspot in the field of petroleum exploration and development. However, previous researches have predominantly focused on the tight oil in marine basins and barely in lacustrine basins. In China, tight oil is mainly distributed in the lacustrine basins, such as Triassic of Ordos Basin, Jurassic of Sichuan Basin and Cretaceous of Songliao Basin. Triassic Yanchang Formation of Ordos Basin has advantageous tight oil accumulation conditions, which has been proved that it has good exploration potential in the production practice..

In this study, we take the Triassic Yanchang Formation of Ordos Basin for case. On the basis of sufficient collection and application of geological data in the study area, we collect core samples, conduct geochemical experiments and analyze the data, combining with the methods of sedimentology, organic geochemistry and accumulation dynamics. The characters of source rocks, reservoir beds, assemblages of sources-reservoirs, hydrocarbon charging episodes and times, and hydrocarbon charging power have been analyzed in detail. Then the controlling factors of lacustrine tight oil have been ascertained. The conclusions are as follows.

- Two episodes of oil charging developed at the Early Cretaceous, which were 128-122 Ma and 114-106 Ma. The accumulation times were the same with the main generation (expulsion) times (140-110 Ma) approximately, which caused the crude oil charged rapidly and tight oil accumulated adjacent to the source rocks effectively.
- Widely distributing source rocks with high-quality were the material bases of tight oil accumulation. Strong generation (expulsion) intensity controlled the enrichments and distributions of the reservoirs, which is the decisive factor of "sources controlling distributions". The reservoirs mainly distributed in the transition areas between the hydrocarbon generation (expulsion) centers.
- Massive continuous sandstones were widely contacted with the high-quality source rocks, which provided favourable reservoir beds. Tight sandstones were the critical factors for "retention accumulation", which formed the large-scale continuous tight oil reservoirs.
- Favorable para-genetic assemblage of sources-reservoirs contributed to improve the crude oil charging in huge degree and is the vital factor of "approaching-source accumulation".
- Pressure difference between source rocks and reservoir beds (PDBSR for short) provided the main expulsion and migration power for crude oil in the main accumulation period. It was the power guarantee of non-buoyancy migration and accumulation. The low limit of PDBSR is 4.7 MPa. Moreover, the overpressure sealing was conducive to preserve the tight oil reservoirs at present.

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