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Shale Oil Geological Characteristics and Resource Potential of Mesozoic Yanchang Formation in Ordos Basin, North-Central China

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Shale oil in this paper is referred to as the matured oil, which is stored in organic-rich shale stratum with nano-sized pore-throats, and is a very promising exploration field in future.

Taking shale oil of Mesozoic Yanchang Formation in Ordos Basin for example. Shale oil occurs in the organic-rich shale in the middle-lower seven member of Mesozoic Yanchang Formation in Ordos Basin, with the thickness 21-36m, burial depth 110-2900m and the exploration area 50 thousand square killometers. Shlae oil have five typical geological characteristics. (1) the organic-rich shale developped in the semi-deep ro deep lacustrine deposit, with I-type and II_1-type kerogen, R_o 0.7-1.1% , TOC 1.4-25.6%, S_1 1.2-11.6mg/g, chloroform asphalt A 0.2-1.2%, pyrite content 5.4-34.5%, and specially the hydrocarbon generation potential of shale is about five times of that of the mudstone; (2) laminated structure appeared commonly in the shale, pore-throats diameter are mainly 50-300nm, locally micro-sized pores, and nano-sized pore-throats and parallel bedding fractures are the main reservoir space; (3) higher brittle mineral content, with quartz, feldspar, calcite and dolomite 41%, and clay content lower than 50%; (4) lower formation pressure and lighter oil quality, with pressure coefficient 07-0.9, crude oil density 0.75-0.85 g/cm^3, and viscidity 0.7-5mPa·s; (5) residual liquid hydrocarbon occurs in adsorption state and free state, with adsorption state in organic matters, adsorption state and free state in nano-sized pore-throats in pyrite, clay and brittle minerals, and free state in parallel bedding fractures.

Organic-rich shale of Mesozoic Yanchang Formation in Ordos Basin, have “five higher” typical characteristics, respectively higher TOC, higher pyrite content, higher S_1, higher chloroform asphalt A, and higher Gamma ray value. The beneficial shale oil distributiona area, with TOC higher than 2% and R_o higher than 0.7%, is about 20 thousand square killometers, and the preliminary resource potential is about 1 billion tons.

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