

Pooling Conditions and Exploration Prospect of Shale Oil & Gas in Songliao Basin, Eastern of China

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Two sets of black shale, named Nenjiang formation and Qingshankou formation, were deposited in the late Cretaceous in Songliao basin, located in eastern of China. This article describes the primary geological and geochemical characteristics of the black shale in Nenjiang and Qingshankou Formation, and its exploration potential is analyzed.

Gross thickness of Nenjiang formation's shale ranges from 70 to 240 meters and Qingshankou's from 100 to 150 meters with a burial depth of about 300-1500m. The Shale mainly consists of clay mineral, and sometimes includes few siltstone. Dark mudstone, light-colored siltstone and ostracoda are mostly interbedded. Shale total organic carbon(%TOC) content ranges from 1 to 5%, up to 13%. Qingshankou formation's shale thermally mature for hydrocarbon generation, vitrinite reflection(%Ro) ranges from 0.7 to 1.2%. Nenjiang's shale has relatively low maturity, Ro only up to 0.9%. The two sets of black shale have high pressure in drilling. Studies have shown that hydrocarbon generating pressure-boosting is one of the main factors to generate overpressure. Gas measurement showed obvious abnormality in Nenjiang and Qingshankou formation's shale. In addition, multiple types of cracks, such as structural cracks, super-pressure micro-cracks, diagenetic micro-cracks, are developed in the basin. The cracks are favorable to form fractured shale reservoirs.

On the basis of comprehensive evaluation by geology, geochemistry, well logging and seismic data, it is a favorable zone for shale gas & oil exploration in Xinli, Da-an and Qian-an etc. Drilling result revealed that the two sets of black shale have oil & gas shows. Even in some wells, commercial oil & gas production has been received in the shale. Shale exploration has broad prospects, and is expected to become a new exploration field in Songliao Basin, even in China.