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Small-scale petroliferous basins in China: Characteristics of type and hydrocarbon occurrence

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Abundant small-scale sedimentary basins are widely distributed in China. These basins have complex geological characteristics and various hydrocarbon occurrences. Among the small-scale basins with less than an area of 2 km^2, 13 basins have discoveries of commercial hydrocarbons. Part of the 13 small-scale petroliferous basins have a higher hydrocarbon abundance ratio (i.e., average hydrocarbon content in unit area) than other middle- to large-scale petroliferous basins. At present, the integrated study on these small-scale petroliferous basins in China is very weak. In this study, we mainly make a systemic investigation on the type and hydrocarbon occurrence of the small-scale petroliferous basins in China. This analysis might have important implications for other regions in the world where small-scale basins are also present, such as South America and Africa.

According to their typical characteristics and formation drive, these small-scale petroliferous basins can be divided into 3 types: residual type basin, thermal type basin and strike-slip basin.

(1) Residual type basin. The present-day basin is the residual part of a bigger basin which underwent tectonic modification. In this type of basin, the excellent source rocks deposited during the dominating development stage of the original bigger basin have been preserved. These source rocks are buried deeply and give birth to hydrocarbon in late time, providing foundation for hydrocarbon occurrence in the basin. Jiuxi, Yanqi and Santanghu basins belong to this type basin.

(2) Thermal type basin. Obvious deep thermal effects occurred during a dominating development stage of this type of basin. Generally, the thermal type basin has special evolutionary processes and complex structural characteristics, resulting in higher geothermal background, which are beneficial to the formation and transformation of source rocks. Nanxiang and Jinggu Basins belong to this type basin.

(3) Strike-slip basin. The formation and evolution of this type of basin have close relationships with the

strike-slip motion of large-scale fault zones. These basins usually have the following characteristics: very rapid sedimentation rates, abrupt lateral and vertical facies changes, high geothermal values, various subsections of basin configuration and diverse geological characteristics in plane view, and synchronous process of structural formation and modification. Yitong-Jiamusi, Baise and Lunpola Basins belong to this type basin.

Many factors affect the formations of hydrocarbon accumulation and preservation in these three types of basin. The most important one is that the thermal conditions in these basins are beneficial to the formation, maturation and preservation of the massive excellent source rocks.