HYDROCARBON GENERATION CHARACTERISTICS OF SOURCE ROCKS IN GYPSEOUS-SALT STRATA AND ITS SIGNIFICANCE ON PETROLEUM GEOLOGY

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Gypsum-salt rocks are perfect cap rocks (Uphoff, 2005; Jin et al., 2010) due to its superior seal capability and control the accumulation horizons of hydrocarbon in the petroleum system (Uphoff, 2005; Mohriak, et al., 2012). In addition, it has great influence on the thermal evolution of source rocks (Mello, et al., 1995; Petersen and Lerche, 1995) as it possesses high thermal conductivity. However, previous studies about the impact on thermal evolution of source rocks were still qualitative (Tang, et al., 2014; Zhuo et al., 2014). In this regard, quantitative analysis was made to explore the impact of gypsum-salt rocks on hydrocarbon generation of source rocks by measured stratum temperature and vitrinite reflectance data of source rocks in Dongpu Depression, a petroliferous depression that gypsum-salt rocks were extensively developed.

The result shows a two segment model of stratum temperature with much higher geothermal gradient in post-salt strata and quite lower in subsalt layers. And the turning point is just matching the gypsum-salt interval. The vitrinite reflectance of post-salt strata exhibits logarithmic increase with depth, while it deviates the regular track with abnormally lower values in the subsalt strata due to temperature difference. Based on the thermal evolution profile of strata with various thickness of gypsum-salt layers, the hydrocarbon generation characteristics of source rocks with gypsum-salt layers were recognized. First, the gypsum-salt layers accelerate the thermal evolution of post-salt layers by elevating the hydrocarbon generation threshold nearly 400 m, as well as the depth of hydrocarbon generation peak and high mature stage. And the elevated range show a positive correlation with the thickness of gypsum-salt layers. Second, the gypsum-salt layers can restrain the thermal evolution of subsalt source rocks. The depths for subsalt source rocks reaching overmature stage are increasing with the thickness of gypsum-salt. In conclusion, the existence of gypsum-salt layer can expand the range of hydrocarbon generation window. With the thickness of gypsum-salt less than 400m, oil and wet gas generation window can both be extended, and 200m gypsum-salt possessing the largest extended oil window range. When the thickness is over 400m, the extended hydrocarbon generation window is mostly for wet gas rather than oils (Fig.1). The quantitative analysis towards the effect of gypsum-salt on hydrocarbon generation of source rocks would be prospective for the saline basin hydrocarbon resource evaluation and petroleum exploration.

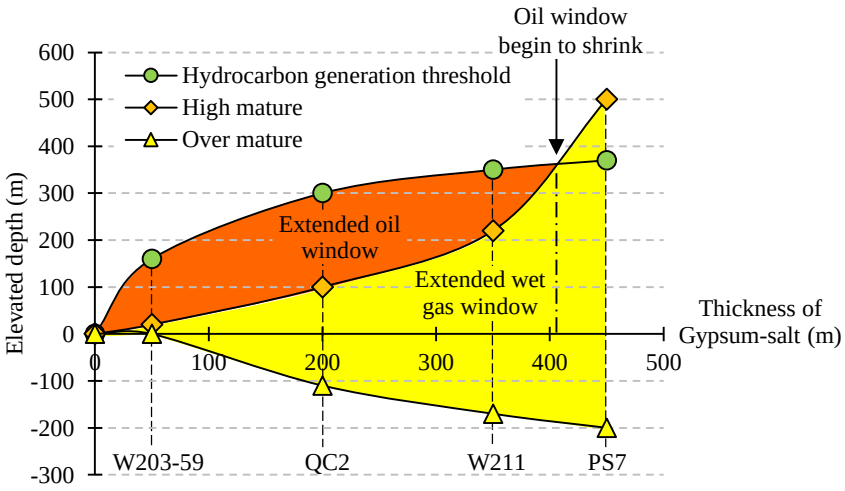

Figure 1 *Effect of gypseous-salt strata on hydrocarbon generation characteristics of source rocks.*

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