Recent progress in the quantitative analysis of liquid hydrocarbons detained in source rocks

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A large quantity of liquid hydrocarbons were still retained in the source rocks after hydrocarbon expulsion period, and these hydrocarbons might evolve further through deep burial with the strata under the control of some tectonic events, and their gas-generating potential and accumulation significance has attracted lots of scholars' attention espesically since the exploration of shale gas which proves that the detained hydrocarbons in source rocks can crack into gas at high maturity stage to form commercial gas pools. This study is focusing on the quantity of liquid hydrocarbons detained in source rocks.

The results of thermal simulation experiments of source rocks showed that the expulsion efficiency of oil from source rocks was mainly 40% to 60%. To further verify the reliability of the previous results and to determine the quantity of retained hydrocarbons in the source rocks, thousands of source rocks pyrolysis data from different basins were analyzed using S_1 represents the quantity of retained hydrocarbons approximately. The samples were sellected from the Mesozoic lacustrine source rocks in the Songliao Basin, the Upper Paleozoic marine source rocks in Sichuan Basin, the Mesozoic lacustrine source rocks and Lower Paleozoic marine source rocks in the Ordos Basin and the Cenozoic marine and lacustrine source rocks in the East China Sea and Pearl River Mouth basins. The results indicated that S_1 showed enrichment peak values in the liquid-window stage, which proved that the source rocks still retained a large quantity of liquid hydrocarbons after the expulsion of hydrocarbons. In addition, the statistical interval for the quantitative analysis of detained hydrocarbons was suggested to set in the liquid-window stage for the reason that it was not only the massive generation period but also the massive expulsion period of liquid hydrocarbons. After that, the quantity of liquid hydrocarbons retained in source rocks would decreased rapidly due to cracking into gas in the high-post maturity stage, thus these data with high maturity is unsuitable to be included in the quantification.