

Study on History of Hydrocarbon Generation and Accumulation in Beier Depression, Hailaer Basin of China

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Hailaer Basin located in northeastern China, in which the maximum buried depth of sedimentary rocks is about 6000 m. The basin is composed of 16 depressions with a total area of 25260Km². The petroleum geological conditions and oil-gas bearing conditions are complicated. Beier Depression is about 3000Km², which is the largest oil and gas accumulation depression in Hailaer Basin at present. The study of history of hydrocarbon generation and accumulation in Beier Depression is important guiding significance not only for exploration and deployment of Beier Depression, but also for petroleum geology research in other 15 depressions of Hailaer Basin.

There are three source rock kitchens in Beier Depression, which are the BeiNW Sub-sag, BeiSW Sub-sag and Beizhong Sub-sag. The main source rocks are Nantun formation, followed by Tongbomiaoyao formation. Using basin simulation method, the main period of hydrocarbon generation and expulsion in Beier Depression is 131Ma-65Ma. There are three peaks of hydrocarbon generation and expulsion in Beier Depression, which are 124Ma, 114Ma and 89Ma, respectively. The peaks of hydrocarbon generation and expulsion are different in three source rock kitchens. The peaks of hydrocarbon generation and expulsion of the BeiNW Sub-sag are earlier than the BeiSW Sub-sag and the Beizhong Sub-sag that are 124Ma and 114Ma. The peaks of hydrocarbon generation and expulsion of the BeiSW Sub-sag are 114Ma and 89Ma. The peak of hydrocarbon generation and expulsion of the Beizhong Sub-sag is 89Ma, it is the latest.

By microscopic identification of inclusions, there are 2 stages of oil and gas accumulation in Beier Depression. The characteristics of oil and gas inclusions are obvious. In the first stage, the oil and gas inclusions are in secondary quartz enlarged margin or quartz micro-fissures, which are generally light brown under polarized light, and green-yellow and light yellow under fluorescence. In the second stage, oil and gas inclusions are in calcite cementation, which are generally light brown under polarized light, and yellow-green and bright yellow under fluorescence, the maturity of oil and gas is little higher than that of the first stage. Taking the BeiNW Sub-sag as an example (Fig. 1), it has been found two stages of oil and gas accumulation in the BeiNW Sub-sag under the microscope. The first stage is in secondary quartz, the homogenization temperature of fluid inclusions are 71°C-98°C. The second stage is in the calcite cementation, the homogenization temperature of fluid inclusions are higher than that of the first stage, 101°C-109.8°C. Combined with burial history and thermal history, The first stage of oil and gas accumulation in the BeiNW Sub-sag is 116Ma-105Ma. The second stage of oil and gas accumulation is 99Ma-96Ma. The oil and gas accumulation time in the BeiNW Sub-sag is little later than the peaks of hydrocarbon generation and expulsion. The result of K-Ar isotope dating method is similar age.

Through analyzing burial history, thermal history, hydrocarbon generation and expulsion history, oil and gas accumulation history, and studying on the geological evolution process

from hydrocarbon generation to oil and gas accumulation, we determine the key time of oil and gas accumulation, and provide technical support for revealing the main controlling factors of oil and gas accumulation.

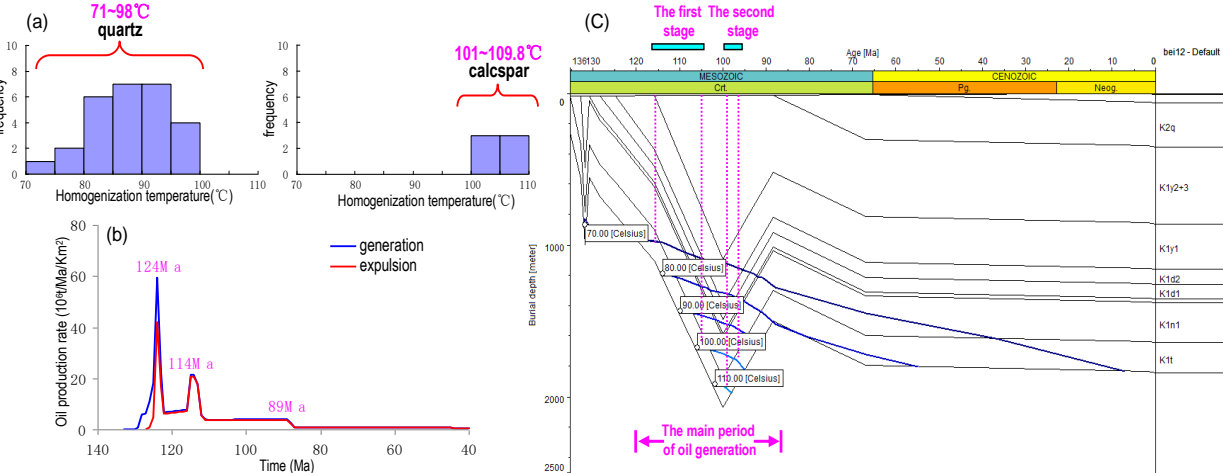


Fig.1 Homogenization temperature of fluid inclusions(a), oil generation and expulsion history diagram of Nantun formation in the BeiNW Sub-sag(b), burial history and thermal history of Bei12 Well(c)

References:

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