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Genetic potential evaluation of Binbei area in the Songliao Basin

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Abstract: After many exploration，Binbei area in the Songliao Basin，with large oil and gas exploration potential，is the key exploration area at present. Through the existing data of Binbei area, combining previous research results, this article will give a brief introduction of oil-generation condition in Binbei area.

Keywords: Beibei area, exploration potential, oil-generation

1. The tectonic characteristics and development

Combined with previous studies and based on regional geology and basin geology,the evolution of Beibei area can be divided into six evolutionary stage, include extrusion, the volcano-down faulted basin, fault depression, fault depression transformation, subsidence and shrinking balance stage.

After the shrinking balance stage, the basin comprehensively rise and the lake basin massively shrink. In the overall rising background, the eastern of basin uplift differently, the Sifangtai Formation and Mingshui Formation's sedimentary shore back to the west region, the deposition rate becomes slow, and the tectonic movement becomes passive. Under the system of extrusion stress, the basin thrusts to the northwest and forms extrusion anticline belt of tectonic inversion phenomenon with the inner part in the southeast area. Paleocene-Miocene(65-9Ma;especially between 50 and 15Ma),the pacific plate become oblique subduction to the northwest, lead to the east margin of the Eurasian plate under pressure torsion stress field and the boundary faults in the right-lateral strike-slip state. Under the pressure of torsional stress system, phenomenon appears that the inner part of the basin thrusts to the northeast and the tectonic inverse. On the basis of erosion, tertiary and quaternary system is a kind of molasse formation, when the activity is weak and the basin shows the characteristics of the demise gradually.

2. Oil producing formation in Binbei area

Binbei area is located in the large fresh water lake basin sedimentary environment, near the northern provenance of Songliao basin.Qingshankou Formation and the first and second member of Nenjiang Formation belong to deep lake facies, dark mudstone is relatively development and is the main oil producing formation.

From the point of plane distribution, the first and second member of Nenjiang Formation is widespread, then is the first member of Qingshankou Formation and the second and third member of Qingshankou Formation, the rest of the group is small. From the source rock volume, the second member of Nenjiang Formation is the largest, followed by the second and third member of Qingshankou Formation, and the last is the first member of Qingshankou Formation.

3. The qualitative evaluation of the source rocks

Source rock is the material basis for the oil and gas generation. The purpose to study the qualitative evaluation of the source rocks is to explain the existence of the source rocks in the area, development situation and its quality, and the most important parameters are: organic matter type, organic matter maturity and so on.

3.1 Organic matter type

It is known form the application of element analysis data, qn1 Member and n1 Member sample distribution in Ⅰ、Ⅱ zone，qn2+3 Member exist in both Ⅰ zone and Ⅱ zone. Overall, qn1 Member and n1 Member have a

better Organic matter type (Fig1).

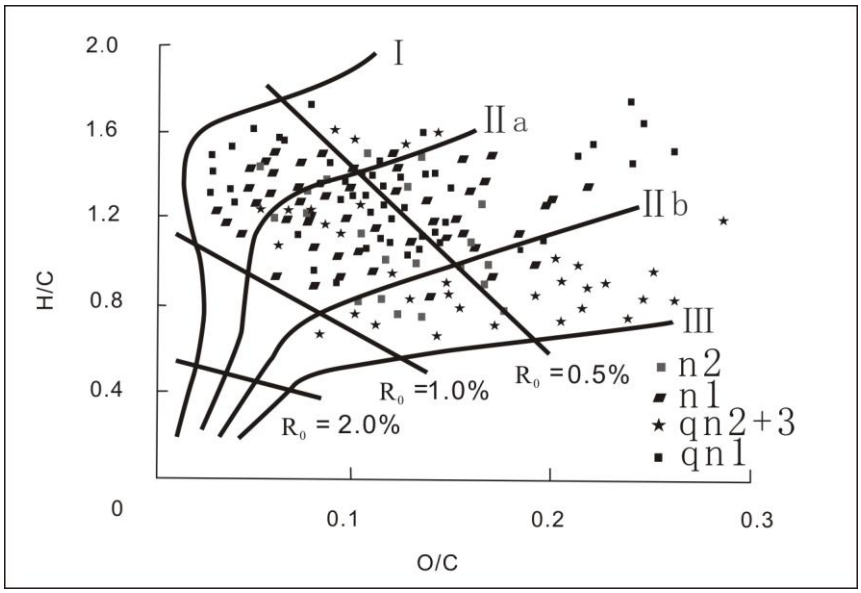

Fig1 The H/C - O/C curve of Binbei area

3.2 Organic matter maturity

Among the entire indicator that reflects the organic matter maturity, the vitrinite reflectance (R_o) is the most widely used and the most authoritative. Classic hydrocarbon accumulation patterns thought R_o from 0.5% to 0.7% is the corresponding oil threshold and R_o from 0.5% to 0.7% - 1.3% correspond to the main oil region.

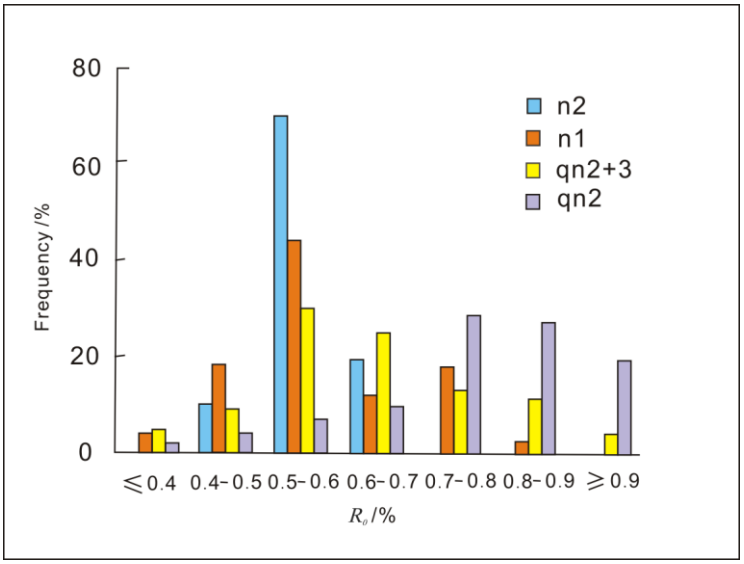

Fig2 R_o histogram of different source rocks in Binbei area

From the distribution histograph of n1,n2,qn1,qn2、3 in Binbei area(Fig2) ,we know that shallow source rock maturity is generally not high, most of the samples of R_o are below 0.9%.The maturation of organic matter of the main hydrocarbon source layer is lower, which is generally lower than that of low mature stage, that is the key factor restricts the region's oil and gas exploration.

3.3 Oil threshold

It is generally believed that hydrocarbon source rock oil threshold of R_o is from 0.5% to 0.7% . If the R_o=0. 5% as oil threshold, from the R_o and depth relationship curve (Fig3) in the area, a certain threshold depth is very shallow, about 1150 m or so. Therefore, previous determining oil threshold may be based primarily on this.

Predecessors thought it needs less energy to destroy atomic bonds (like C-C、C-H) of organic matter type I than that of organic matter type Ⅱ、Ⅲ. So give priority to with Ⅰtype organic matter of the main source area of Songliao basin, the main source rock oil threshold corresponds to the R_o is 0.5%. More and more mainstream, more authoritative opinion, to the contrary. Such as Tissot P B, Welte P H think Ⅰkerogen oil threshold temperature is the highest, the corresponding vitrinite reflectance can reach 0.7%;Ⅱtype oil threshold temperature is minimum, R_o for 0. 5%; Hydrocarbon source rocks in Binbei area are I type more. Accordingly, its oil threshold should correspond to the R_o = 0.7%.

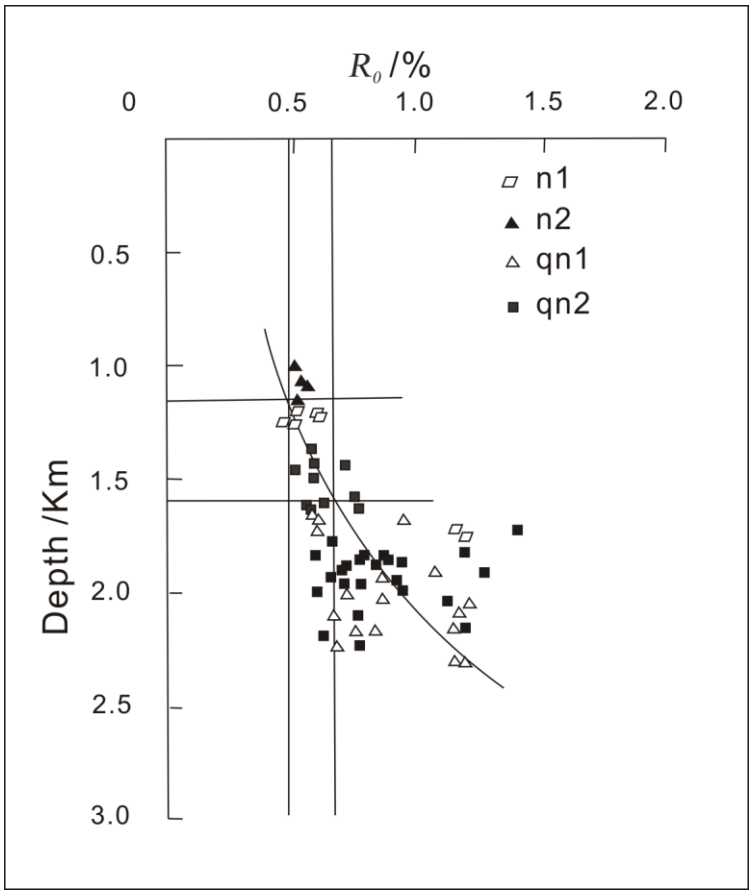

Fig3 The relationship between vitrinite reflectance and depth in Binbei area

Such determined by Fig3 threshold depth is 1600 m or so, main oil generating range between 1700-2350 m.

4. Conclusion

(1)The most development dark mudstone in Binbei area is the second and third member of Qingshankou Formation, followed by the first and second member of Nenjiang Formation.

(2) The main source rock organic matter type is better, mainly is Ⅰ, Ⅱ type.

(3) The organic matter maturation of main source rocks is lower, generally located in the low mature stage; it is the key factor that restricts the oil and gas exploration in this region.

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