

## STUDY ON GENESIS OF HEAVY OIL IN THE BAYANHUSHU SAG OF HAILAER BASIN IN CHINA

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The Hailaer basin lies in the northeastern part of China. The basin is rich in oil and gas resources. It is one of the key exploration area of Daqing oil field. Bayanhushu Sag is one of the most promising depressions in the Hailaer Basin. Since the heavy oil appeared in 1999, the study on genesis has not stopped. It is generally believed that the formation of heavy oil in Bayanhushu Sag is the low maturity. (Chen Jianping, 2004; Zhang Li, 2012) But this paper has different views.

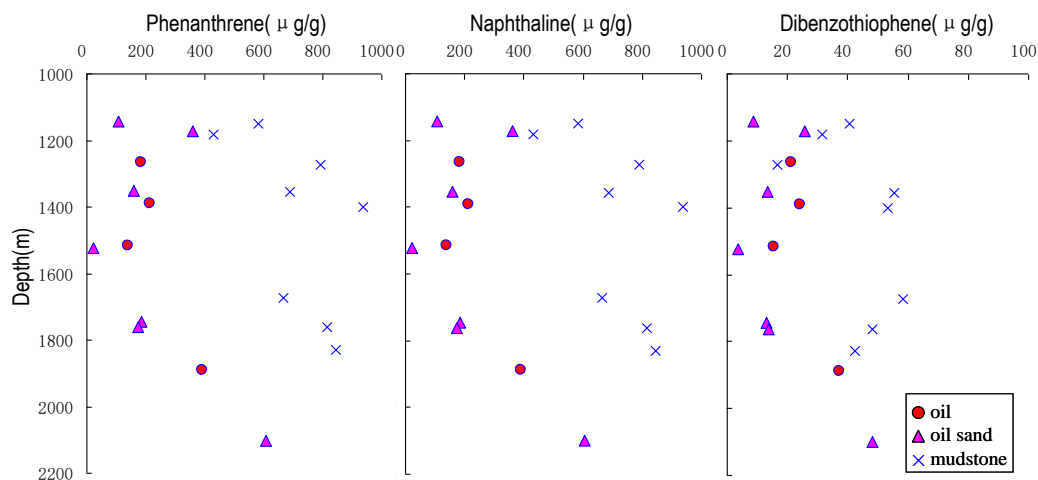
Based on absolute quantification of biomarkers, individual hydrocarbon carbon isotopes, organic petrology, hydrocarbon inclusions and other analytical methods, this paper has discussed the genesis of heavy oils in the Bayanhushu Sag, and pointed out the next exploration direction in the Bayanhushu Sag.

The research shows that heavy oils in the Bayanhushu sag are derived from the mature hydrocarbon source rocks and mainly formed through biodegradation and water washing. Evidences are as follows.

(1) Biodegradation evidences: Compared with immature-low mature mudstone, heavy oils have lower content of saturated hydrocarbons and higher content of non-hydrocarbons and asphaltenes; The concentration of steranes and terpanes in the heavy oils is similar to immature-low mature mudstone, whereas n-alkanes in the heavy oils are lower in content than in immature-low mature mudstone; compared with the Wuerxun Sag and the Beier Sag of Hailaer Basin, the wax content and freezing point of heavy oils in the Bayanhushu sag are lower, whereas the resin content is higher.

(2) Water-washing evidences: The concentration of water-soluble compounds such as naphthalene, phenanthrene and dibenzothiophene in the heavy oils is significantly lower than in immature-low mature mudstone. (Figure 1)

(3) Accumulation evidences: The corresponding hydrocarbon inclusions show light brown and yellowish green fluorescence, indicating that the oil is mature; the presence of gas bubble in the oil inclusions with gas-oil ratio at 1:3 by volume shows that the oil was normal and not heavy during filling stage. The heavy oils are therefore the result of secondary alteration after accumulation.



**Figure 1** Comparison of absolute concentration of aromatic compounds in oil and mudstone of Bayanhushu Sag

## References

Chen Jianping, Qin Jianzhong, Zhang Jiguang, 2004. Origin of the low-wax heavy oils in Well Shu-1, Hailaer Basin, Northeast China. *Petroleum Exploration and Development*, 31 (3):61-65.

Zhang Li, 2012. Geochemical features and source analysis of crude oils from the western slope of Bayanhusu sag, Hailaer Basin. *Acta Petrolei Sinica*, 33(4):595-600.