

## **The mechanism of high-quality source rocks in Nanpu Sag, Bohai Bay Basin, China**

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Nanpu Sag, one of the many small sags within the larger Bohai Bay Basin, is located in the northeast part of Huanghua Depression and covers an area of only 1932 km<sup>2</sup>, and Paleogene Dongying formation is leading oil-production reservoir in the shallow sea area. According to the previous study of the oil-source correlation, Paleogene sediments, especially the third member of Dongying Formation (Ed<sub>3</sub>) and the first and third member of Shahejie Formation (Es<sub>1</sub> and Es<sub>3</sub>), have been regarded as the most important source rocks in Nanpu Sag. Detailed geochemical analysis of source rocks, petrology, element geochemistry and organic geochemistry are comprehensively applied to discuss development conditions of high-quality source rocks in this area.

The results show that Es<sub>3</sub> source rocks are deposited in fresh-brakish water condition with rapid subsidence in the humid climate, with high water inflow and moderate sediments supply in retrogradation or aggradation filling pattern. Organic matters originate from higher plants distributing around the lake rim, and the abundant 4-methylsteranes reveal the combination of Dinoflagellate and freshwater microalgae.

Es<sub>1</sub> source rocks deposited in freshwater condition with low subsidence in the arid climate, with inadequate water inflow and sediments supply in retrogradation or aggradation filling pattern. Organic matters originate from moderate input of higher plants. High ratios of pristanes to phytanes and low ratios of gammaceranes to hopanes indicate the deep oxidation-reduction interface and unstable lake stratification.

While Ed<sub>3</sub> source rocks were deposited in freshwater condition with rapid subsidence in the humid climate with relatively high water inflow and sediments supply in progradation filling pattern. High ratios of C<sub>19</sub>/C<sub>23</sub> tricyclic terpanes and C<sub>24</sub> tetracyclic terpanes to C<sub>26</sub> tricyclic terpanes reveal the low input of higher plants organic matter. Moderate ratios of pristanes to phytanes and low ratios of gammaceranes to hopanes indicate the deep oxidation-reduction interface and stable lake stratification.