

The Elemental Geochemical Method for Distinguishing the Fluvial Facies and Shallow Water Delta in the Southeast of Bohai Bay

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Abstract

An interactive sedimentary system of fluvial-lacustrine is well developed in the Southeast of Bohai bay during the lake shrinking period of the lower Miocene Guantao formation (N1g) and the upper Miocene Lower Member of Minghuazhen formation (N1mL). It is difficult to distinguish the fluvial and shallow water delta (SWD) sedimentary system, which brings difficulties for reservoir prediction. This paper tries to make a comparative study of the elemental geochemical characteristics between SWD and fluvial sedimentary system. In order to solve this problem, the following work have done. Firstly, the types of sedimentary facies of the target strata are determined by comprehensively study of paleontology, lithology-combination and logging response. Then, the Paleoclimatic geochemical index of CIA (Index of Alteration Chemical), the paleosalinity geochemical index of m value ($100 \cdot \text{MgO}/\text{Al}_2\text{O}_3$), the Paleobathymetric index of $\delta\text{Ce}(\text{CeN}/(\text{LaN} \times \text{PrN})^{1/2})$ and the Pale-offshore distance index of Mn/Ti were preferred respectively as paleoenvironment parameters by comparative study. Finally, The response characteristics of paleoenvironmental parameters of SWD and fluvial sedimentary system are compared. The following findings were obtained from the study. First, negative correlations between the relative Paleobathymetric (δCe) and the paleosalinity (m value) reflects the relatively closed freshwater characteristics of SWD sedimentary system; Second, negative correlations between the relative Paleobathymetric (δCe) and offshore distance (Mn/Ti) reflects the SWD constructively development during the base-level falling period; Third, the Rb/Sr ratio of SWD sedimentary system is relatively high under the warm and humid climate during N1g and N1ml period, for the reason of that the Sr of

lacustrine chemical precipitation and terrigenous transport are relatively low in such a climate and geological condition. The above characteristics of fluvial facies are just opposite to those of SWD sedimentary system. It is the first time pointed out that the Rb/Sr ratio has different sedimentary environment significance in different geological conditions. The above understanding has a giant guiding role for exploration and reservoir development in this area, and has important reference value for distinguishing the fluvial and shallow water delta sedimentary system during the lake shrinking period in other areas.