Petrography-Geochemistry, Provenance and Palaeoclimatology for Eocene Liushagang Formation of Wushi Depression, Beibuwan Basin, the South China Sea

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Abstract: Wushi depression is a typical example of small rift basin. Provenance analysis of Liushagang sandstone is significant for better understanding of its “Source-to-Sink system”. Based on the analyses of the rock types, Heavy mineral assemblage characteristics, mass/trace elements and rare earth elements of rocks, the research on estimating provenance and chemical characteristics is more practical to the reservoir evaluation and prediction of the petroleum exploration. The results show as follows: (1) The lithology is composed mainly of middle-fine sandstone, and the rock types are litharenite and feldspathic litharenite. The sandstone of the eastern and central part of the depression, which sourced from Qixi uplift in the northern sag, is mainly feldspathic litharenite with high contents of feldspar. Whereas the sandstone of the southern which sourced from Liusha low uplift is dominated by litharenite. (2) The heavy mineral assemblages of the northern and central area are characterized by high tourmaline, hematite contents and low garnet contents, while the sourthern area exhibit high hematite, garnet, zircon contents and low tourmaline contents. (3) The geochemical characteristics of sandstone samples show as higher SiO_2 contents, and the Al_2O_3/TiO_2 ratios are generally greater than 23.0, while the ratios of K_2O/Al_2O_3 are inferior to 0.4 as a whole, which indicate that the source area is enriched in quartz and depleted in potassium feldspar, and is of quartz-feldspathic sediment source.(4) The slope of rare earth element distribution curve in the sandstone samples is larger in the light rare earths than in the heavier rare earth, indicating that the light rare earth elements in the study area are relatively enriched. The value of δEu is expressed as a strong negative anomaly with a range from 0.03 to 0.44, which is obviously "concave" in the distribution pattern. (5) The CIA values of sandstones are generally between 65 and 85, with a few less than 65, proving that the source region experienced low-to-moderate chemical weathering, and representing a warm and humid palaeoclimatic condition.

Key words: provenance, palaeoclimatology, geochemical characteristics, chemical weathering, Liushagang formation, Wushi depression.

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