Gas accumulation model of Baodao Northern Slope, Qiongdongnan Basin

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Baodao Northern Slope is the northern slope of the Baodao Sag located in the northeast of the Qiongdongnan Basin. Because of lacking in data, the comparison of the hydrocarbon far away from the Baodao Sag (area A) and the hydrocarbon close to the depression (area B) should be a key to analyze the hydrocarbon model of the study area. On the basis of all the geochemical data, some differences between them could be concluded as follows: compared with area B, the natural gas in area A has higher heavy-hydrocarbon content (8%~17%), lower non-hydrocarbon content (2%~3%), lighter $\delta^{13}C_{co2}$ (-28‰~-30‰), $\delta^{13}C_1$ (<-45‰), $\delta^{13}C_2$(<-30‰), and the gas condensate contain almost no dicadinane and 4-methyl-steranes. After further analysis, we got two accumulation models that could result in the differences. The natural gas of area A is mainly migrated from area B (the sag) by the lateral reservoir rock, and then mixed with little biogenic gas. Or, the natural gas of area A and area B have different origins; the former is generated from some low-mature source rock beneath, while the later is mainly generated from the sag.

To determine a more reliable accumulation model, we calculated the faults activities and sealing capacities by seismic and well logging data, and also analyzed oil-gas-bearing characteristics by quantitative grain fluorescence experiments. The results show that the faults had poor sealing capacities and the gas reservoirs of area A were formed very late. So the natural gas tends to migrate along the faults vertically, and the gas is unlikely to be generated from the sag where the source rock has already been over mature. With the consideration of some other geological background, we concluded that the natural gas of Baodao Northern Slope was mainly migrated vertically from the source rock beneath rather than the depression.