

PS Hydrocarbon Sources and Charge History in the Ultra-Deep-Buried Cretaceous Sandstone Reservoir, Kuqa Depression, Tarim Basin*

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Abstract

The Kuqa Depression is an exploration highlight in the northern Tarim Basin, this area has been a serious of exploration success in the Cretaceous Basijiqike sandstone reservoir in recent years. Bozi condensate field is located at the east of the Kuqa Depression, and the reservoir is at a record burial depth of over 6500m. BZ 1 well is the deepest ever drilled in this area, with a daily oil production of 14.85t and a daily gas production of 15.01×10⁴m³. However, so far there has rare study focusing on its condensate origin, migration and accumulation. The biomarkers of the oil in the Bozi condensate field were analyzed to identify the hydrocarbon origin. The pristane/phytane (Pr/Ph) value of the oil is 1.6, indicating a weak oxidation environment for oil source. The Bozi oil has abundance of C₂₄ tetracyclic terpane relative to C₂₆ tricyclic terpane, a high detection of C₃₀ diahopane, a poor detection of gammacerane, distribution of tricyclic terpanes of C₁₉>C₂₀>C₂₁, high relative abundances of C₂₉ steranes compared to C₂₇ and C₂₈. These biomarker indicators are similar with those of the Jurassic Qiakemake source rock in the region, and it can be concluded that the Bozi oil was sourced from the Qiakemake source rock. The carbon isotope of ethane of the Bozi gas ranges from 18‰ to 24‰, this parameter indicates that the natural gas is coal-derived, and it is possible that the gas was sourced from the underlying Jurassic coal measures. The petrography and homogenization temperature (Th) of fluid inclusions in the reservoir were analyzed. Two kinds of inclusions were observed under the microscope, the one is oil-bearing inclusions with green fluorescence color; the other is gas inclusions with no fluorescence color. Th values from the reservoir are in two ranges of 120-130 centigrade and 140-150 centigrade, which is corresponding to the petrography observation. Based on the reconstruction of the thermal evolution history, the hydrocarbon charge history was obtained. Two stages of hydrocarbon charge were identified in the Bozi condensate field. The first hydrocarbon charge was that the Jurassic Qiakemake-sourced oil migrated into the reservoir during the late Miocene; while the second hydrocarbon charge was that the Jurassic coal-derived gas filled into the reservoir during the Pliocene.

