

## GENESIS AND ACCUMULATION OF THE UPPER PALEOZOIC TIGHT GAS IN THE NORTHEASTERN ORDOS BASIN, CHINA

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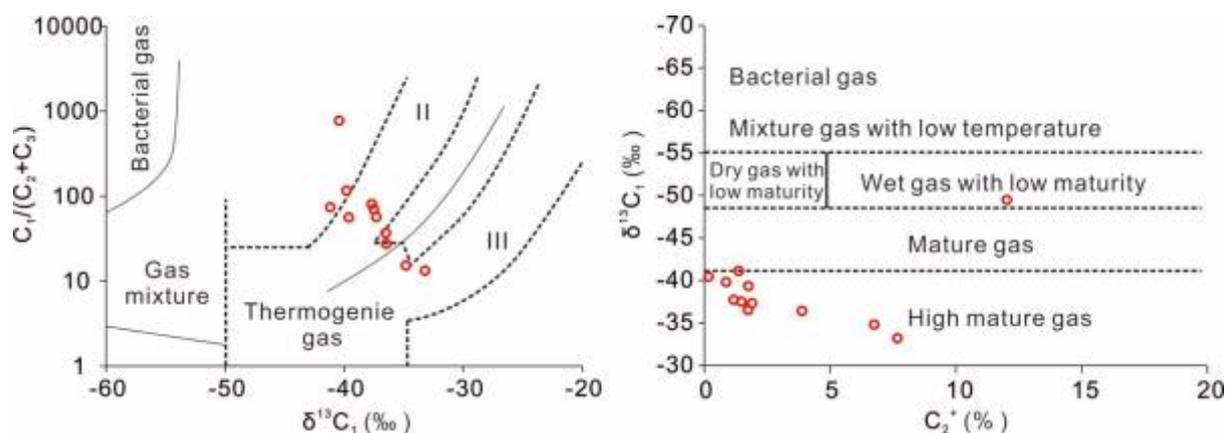
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Hydrocarbon exploration and exploitation have proved that the Ordos Basin in China possesses a huge potential of natural gas resources, and the tight gas in the Upper Paleozoic strata has been a most important exploration target. A number of Upper Paleozoic tight gas reservoirs have been discovered in the central part of the Ordos Basin. Nevertheless, there is a lack of studies related to the margin of the basin, and the research on genesis and accumulation of the Upper Paleozoic tight gas here is of great significance to expand the areas of exploration and development in the Ordos Basin. In this study, by analyzing the geochemical characteristics of the source rocks and the natural gas, the genesis of the Upper Paleozoic tight gas was identified. In addition, the accumulation process was discussed by combining the studies of hydrocarbon generation and burial-thermal history.

Three sets of source rocks are developed in the Upper Paleozoic strata in the northeastern Ordos Basin, including Carboniferous Benxi (C<sub>2b</sub>), Permian Taiyuan (P<sub>1t</sub>) and Shanxi (P<sub>1s</sub>) formations, with their lithology consisting of mudstone, carbonaceous mudstone and coal. These source rocks mainly contain type II and type III organic matter, while the average TOC values of mudstone and carbonaceous mudstone are about 3% and 25%, with the TOC values of coal generally larger than 50%. Source rocks in the study area have mostly entered into mature to high mature stage. Some of the source rocks lying in the southeastern part of the study area are in overmature stage because the intrusion of the Zijinshan magmatic rock has accelerated the thermal evolution of the source rocks.

The tight gas is characterized by high content of methane ranging from 86.83% to 97.18% with a mean value of 93.99%. The distribution pattern of light hydrocarbons and the composition of stable carbon isotopes reflect that the tight gas is generated by humic organic matter and is mainly thermogenetic gas. The evolution of the marine-continental transitional to continental depositional environment of the source rocks generated the Upper Paleozoic natural gas with different geochemical characteristics in the study area.

Fluid inclusions mainly develop in the fractures of quartz grains. Oil inclusions mostly have yellow-green fluorescence, and a few have blue-white fluorescence reflecting the influence of the Zijinshan magmatic rock on the maturity of the generated hydrocarbon. The homogenization temperature of salt-water inclusions coexisting with hydrocarbon inclusions mainly range between 100°C and 130°C. The gas charging of the northeastern Ordos Basin is a long-period continuous process occurred from 165 Ma to 65 Ma. Three types of gas-accumulation mechanisms and three formation stages are identified for the Upper Paleozoic tight gas in the study area according to the special distribution of the reservoirs. The large amount of generated natural gas from source rocks is the basis of the formation of the tight gas reservoir, the continuous distribution pattern of tight sandstone makes it possible for tight gas reservoirs to develop in large scale, the well developed faults and microfractures provide migration paths for long-distance migration, and the thick cap rocks prevent the natural gas from dissipation.



**Figure 1** Gas-type identification plate of Upper Paleozoic tight gas in the northeastern Ordos Basin (after Bernard, 1978)

### References

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