Fault-caprock Dual Control Hydrocarbon Accumulation Regularity in Volcanic Rocks in Xujiaweizi Fault Depression

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To recognize the gas forming rule of Xujiaweizi depression under the fault-cap rock dual control, this paper is based on the material of Xujiaweizi which includes three-dimensional seismic processing results interpretation of logging curves outcrop core observation and analytical test in laboratory, Analysis of the lithology, distribution and brittle ductile characteristics of ductile - brittle of Xujiaweizi depression, evaluating sealing property of cap rock, studying deformation mechanism of the fracture in patch of cap rock, analyzing the top sealing ability and vertical adjustment of gas. Study on the internal structure of the fracture zone, analyzing sealing mechanism of different types of fault, establishing quantitative sealing evaluation method on corresponding fault, and quantitatively evaluating fault sealing in gas reservoir controlled by fault, research on the correlativity between fault sealing and gas distribution, systematically summarize the forming models of gas controlled by different fault-cap rock passage system.

There are three main types of deep gas cap rock in Xujiaweizi fault depression, and they are mud stone, volcanic rock and clayey breccia. Mudstone is mainly distributed in the 1st and 2nd Member of Quantou Formation, the 4th,3rd and 2nd Member of Denglouku Formation, it is primarily regional cap rock of deep gas in Xujiaweizi fault depression. Volcanic rock is mainly distributed in the 1st and 3rd Member of Yingcheng Formation and clayey breccia is mainly distributed in the 4th Member of Yingcheng, both of them constitute Yingcheng group’s gas top locality cap rock in Xujiaweizi fault depression. Volcani rock and clayey breccia are intercalary strata at the 1st and 3rd Member of Yingcheng.

Taking into account the formation and evolution of the sealing capacity of cap rock. During Quantou group’s late deposition and Qingshankouzu group’s early deposition, the 1st Member of Yingcheng top local cap rock, and the 2nd Member of Denglouku Formation and the 1st and 2nd Member of Quantou Formation cap rock had entered the late diagenesis A subage period, and kepted in plastic state with strong sealing ability. The cap rock did not produce a large number of cracks and lost the sealing ability with fracture activity. During the Mingshui group last phase, the deep cap rock had common entered the late diagenesis B subage period, the cap rock was dehydration and brittle, If there was a large scale fault activity, will produce a large number of cracks and cap rock sealing ability will be lost. While Qingshankou group’s cap rock was in strong closed stage at the late diagenesis A subage period, the deep gas at inversion structure belt was adjusted into Fuyang reservoirs to accumulate.

According to the role of the vertical adjustment of natural gas, the intensely activity fault in late Quantou deposition - early Qingshankou deposition prompted a large-scale natural gas vertical migration. Fault often dislocate mixed rock cap on the top of volcanic rock, gas source fault, as well as the unconformity between the 4th Member of Yingcheng Formation conglomerate and the lower volcanic rocks constitutes the deep gas conduit system. The migration pattern of natural gas is a short distance along the unconformity lateral migration following the vertical migration. lateral migration areas are mainly distributed in the ancient central uplift belt and Xujiaweizi rift convergence of the site. Natural gas in controlled by the 2nd Member of Denglouku Formation, appearing multi-layer aggregation. Although the mixed rock cap on top of volcanic rock was cutted by the faults in Key Time, resulting in poor vertical sealing capability in the fault zone, industrial air is still found in Yingcheng Formation, indicating that this volcanic cap plays a role of seal to prevent a large number of hydrocarbon diffusion

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loss. Meanwhile, the fault which cut the 2nd Member of Denglouku Formation cap is the fracture which is adjusted secondary gas reservoirs. By the heterogeneity of the scale and impact of the fault plane of the cap layer thickness distribution, that is, "off-Cover" Configuring deep relationship determines whether there has been hiding the original angry vertical adjustment. Statistical results showed that the thickness of less than 35m disconnect fracture is faulted Yingcheng Formation gas to adjust the shallow channel.

Through the research on the internal structure of volcanic fault zone, the fault sealing mechanism in the fault of this fault depression is lithology juxtaposition sealing. The fault does not have the sealing property basically at the juxtaposition of 1st Member of Yingcheng Formation period of volcanic rock reservoir. Fault sealing is formed at the juxtaposition of the volcanic rock reservoir stratum and the overlying conglomerate bed and mudstone bed.

Comprehensive the above research showed that Xujiaweizi Fault Depression developing two sets of petroleum system: One is hydrocarbon source rocks of Shahezi Formation, the reservoir is 1st and 3rd Member of Yingcheng Formation, the top local cap rock of Yingcheng formation compose the deep gas bearing system in volcanic rock. Another is hydrocarbon source rocks of Shahezi Formation, the cap rock is the regional cap rock of the 2nd Member of Denglouku Formation, the 3rd Member of Yingcheng Formation and the 2nd Member of Denglouku Formation as the reservoir composed the upper part of petroleum system.

References