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Research on Formation Mechanism and Forecast Method of Windows of Accumulated and Deeply Buried Shale Gas

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1 Background

The shale at the bottom of Wufeng-Longmaxi Formation is one of the major strata in exploration and exploitation of shales in southeast Sichuan. In the tectonic strong modified regions in the edge and outer places of the basin of southeast Sichuan, the Wufeng-Longmaxi Formation Shale lies in the favorable sedimentary facies of Deep Water-Shallow Water Shelf (Chen Zemin et al, 2013), developing shale of rock facies with high silicon and high carbon which help the enrichment of shale gas and obtaining the material base for the shale gas to be accumulated into buried treasure. The result of exploration and exploitation of the syncline shale gas in Sang Zheping shows that in tectonic strong modified regions, there is still the ability for the shale gas to be accumulated into buried treasure (Li Jianqing et al, 2014). However, the buried depth of Wufeng in the Southeastern Sichuan Basin -Longmaxi Formation Shale now varies enormously from the surface exposure to the burial depth of 7,000 meters and the relations between the buried depth of shale and shale gas enrichment are still unclear. Is there a buried depth window help the enrichment of shale gas enrichment? The study of the formation mechanism and prediction methods in favor of buried depth is one of the research directions at present and for a long time to come.

The occurrence stage of shale gas has the characteristic of diversity while absorbed gas is the important component of shale gas. Absorption is one of shale gas' essential attributes, which is an important parameter of the comprehensive assessment of shale gas. For the Wufeng-Longmaxi Formation Shale constructed in Jiaoshiba, its strata pressure coefficient is 1.55, having the ultra-high-pressure feature (Guo Tonglou et al, 2014). Among the gas components with different modes of occurrence, the proportion of free gas reaches 53~65%, reflecting the characteristic of shale gas that its main component is free gas. However, in the outer tectonic strong modified regions, the shale gas reservoir has the characteristic of low pressure-atmospheric pressure, and its main mode of occurrence is adsorbed gas. The evaluation and study of the adsorption capacity of shale gas are especially important, and the amount of the adsorbed gas under the strata condition is an important parameter describing the adsorption capacity of shale gas. From the perspective of preservation and enrichment, the adsorption capacity of shale gas under the strata condition is a capacity of Gas-solid effect preventing the gas to dissipate.

2 Mechanism Analysis and Forecast Method

Although the Langmuir volume is influenced and controlled by the experimental temperature and maximum pressure in the experiment, under the similar experimental conditions, the adsorption capacity of shale gas of the shale is usually described by the Langmuir volume of the isothermal absorption experiment. The experimental test data in the southeast Sichuan shows, on one hand, the adsorption capacity of shale gas of the shale is positively associated with its organic carbon content, specific surface area and porosity, which reflects the influence of property of the shale on the adsorption ability; on the other hand, temperature and pressure which have reverse and dual influence on and control over adsorption capacity of shale gas are external conditions that influence the adsorption capacity of shale gas. Adsorption capacity of shale is the coefficient result of property of the shale, outer temperature and pressure condition, and it is also the crucial mechanism which is beneficial to the formation of adsorbing and gathering buried depth window of shale gas.

It is beneficial to the formation of adsorbing and gathering buried depth window of shale gas, which possesses of crucial guiding significance to the optimization of exploration objects. The whole train of

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thought is: basing on the studies of depositional environment, petrology, geochemical characteristics, occurrence space of shale gas and so on, using the isothermal adsorbing experiment data as the bridge, referencing solid-gas adsorption theoretical model, building the relation model between property of the shale (S), temperature (T), pressure (P) and absorptive gas amount Q in the strata condition (QSPT model for short), it is meant to predict the absorptive gas amount of shale in different buried depth, combine the results of production test of drilled wells and evaluation of gas bearing characteristic to divide and confirm the buried depth window that is beneficial to the adsorbing and gathering of shale gas, and provide the reference to the optimization of exploration objects basing on the figure delineated shale formation depth areas which is beneficial to the adsorbing and gathering of shale gas.

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