

# Influence of Pyrite on Shale Gas Enrichment: A Case Study of the Longmaxi Formation in Southeastern Sichuan Basin

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9.29.2020 - 10.1.2020 - AAPG Annual Convention and Exhibition 2020, Online/Virtual

## Abstract

Pyrite is widely distributed in marine shale of Longmaxi Formation in southeastern Sichuan Basin. As one of the important components of shale, pyrite has an important influence on the enrichment of shale gas, but there are few studies on pyrite in shale. Therefore, this paper selects the Longmaxi Formation marine shale in the southeastern Sichuan Basin as the research object. Based on the outcrops, cores, thin section and analytical data, the characteristics of pyrite and its influence on shale gas enrichment in the high-quality shale section of Longmaxi Formation are studied. The results show that the pyrite morphotypes of Longmaxi Formation in southeastern Sichuan are various (macro-micro scale). There is a good positive correlation between pyrite content and TOC and gaseous hydrocarbon (S<sub>2</sub>) content and an inverse ratio of S<sub>1</sub> (residual hydrocarbon content in rock), which reflects the close relationship between the formation and content of pyrite and organic matter content. Pyrite may play a catalytic role in hydrocarbon generation of organic matter. The intergranular pore of pyrite and abundant organic pores in the organic /pyrite assemblages are developed in the Longmaxi Formation shale in the study area. The average contribution rate of the pyrite framboids to the porosity in shale is 3.21%, which indicates that the pore developed by pyrite contributes to the pore system of shale reservoir. There is a significant positive correlation between the content of pyrite and the amount of methane adsorbed, and energy spectrum analysis of pyrite surface shows that a large amount of hydrocarbons are accumulated on pyrite surface. Therefore, pyrite can promote the enrichment of Longmaxi Formation shale gas from two aspects of

adsorption and accumulation of free gas. In addition, pyrite, as a brittle mineral, can improve the brittleness of shale reservoirs. Under the action of acid-oxygen complex fracturing fluid in the shale reservoir, pyrite will be dissolved, oxidized, consumed and released heat, resulting in induced pore-fracture, thus increasing the micro-nano pore system of reservoir, improving the transmission performance of shale reservoir and enhance the recovery of shale gas.

*Key words: Shale reservoir; pyrite; Longmaxi Formation; southeastern Sichuan basin*