

Key factors of gas content for organic-rich shales in the structurally complex areas: A case study from Well A in the Zhaotong area, China

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It is generally considered that shale gas content is significantly positively correlated with organic matter content of shales. However, in the structurally complex areas, such as Zhaotong area in SW China, some wells encountered organic-rich (TOC > 2.0%) shales with the thickness of > 30m, but the gas content is very low. Aiming at this problem, taking the organic-rich shales of the Lower Cambrian Qiongzhusi Formation in the Well A of Zhaotong area as an example, the gas content and its influencing factors were discussed. The TOC values of the shales range from 0.11%-5.13%, with an average of 1.67% (n=167), and the thickness of the organic-rich shales on the bottom of the formation is 89.0m. The Ro values of the organic matter is 3.71%-3.91%. The shales have the gas content of 0.05-0.16m³/t, and the gas composition is mainly N₂. The gas content has no correlation with the TOC values. We think that the low gas content is mainly related to the over-maturation of the organic matter and the destruction of preservation conditions of the shale gas. It is considered that too high maturity of shales results in little hydrocarbon generation, organic matter carbonization, and adsorption capacity decline [1,2,3]. The Ro values of the shales of Well A are generally more than 3.5%, the laser Raman spectrum of the organic matter has a high D peak, showing a significant carbonization, and the specific surface area (BET) values are only 2-7 m²/g. It has been demonstrated that the preservation conditions also affect shale gas content [4]. The Qiongzhusi Fm. in this area is in unconformity with the underlying Dengying Fm. Porous dolomites, resulting in a poor preservation condition on the Qiongzhusi Fm. bottom. In addition, cores and imaging logging indicate that lots of high-angle fractures occurred in the shales, indicating that the shales were severely suffered from the tectonic movements, thus the preservation conditions of shale gas have been damaged.

[1] Chen et al. (2007) *Chin. Sci. Bull.* **52(S1)**, 95-100. [2] Wang et al. (2014) *Nat. Gas Indus.* **34**, 1-7. [3] Chen & Xiao (2014) *Fuel* **129**, 173-181. [4] Jin et al. (2016) *Earth Sci. Fron.* **23**, 1-10.