

Maturation and accumulation controls of high-maturated marine shale gas isotopes from the Silurian Longmaxi Shale of the Sichuan Basin

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Longmaxi shale gas in Sichuan Basin shows unique molecular and isotopic compositions: such as high methane, low C₂₊ gases, higher $\delta^{13}\text{C}_1$ and relatively lower $\delta^{13}\text{C}_2$, and the hydrogen isotopes of gases also show special trends. What is the main control of compositions of shale gas: maturation or accumulation? This is a very important question for shale gas study in high-maturated marine shale area of southern China.

We analyzed the shale gas samples and conducted a kinetic experiment for deriving kinetics of gas generation and isotopes with a low-maturated marine shale sample of Middle Ordovician Pingliang formation in Northern China as an analogue. The basin model in five typical areas was built using the representative well data and PetroMod software, respectively. We found that the reversal and “roll-over” of carbon isotopes were caused by the higher maturations of the shale gas in this area, which were mainly controlled by the maturities of source rocks (Fig.1). Interestingly, a typical “roll-over” for gas hydrogen isotopes was also found, which might be controlled by maturity and accumulation or other complex processes, including mixing, gas cracking or catelysis involving during maturation and migration. Acknowledgments come to Strategic Program of CAS (XDB10010300) for grants.

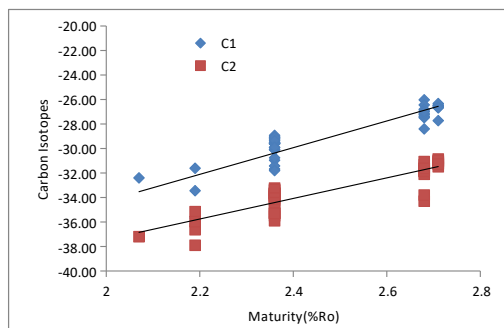


Fig. 1 Carbon isotopes of shale gas vs. maturities of source rocks, Sichuan Basin