

Strontium, carbon and oxygen isotopic compositions of Silurian on the northern and southern margins of Sichuan Basin, China

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The Sr, C and O isotopic compositions across the stratigraphic section have been obtained in the light of the systematic determinations of $^{87}\text{Sr}/^{86}\text{Sr}$, $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$ values for the Upper Ordovician-Lower Silurian strata in the northern and southern margins of the Sichuan Basin. On the basis of the isotopic Data in combination with the sedimentary facies and tectonic data and the global Silurian regressive-transgressive events, the following conclusions can be drawn:

1. The $^{87}\text{Sr}/^{86}\text{Sr}$ values are commonly higher than the average values of $^{87}\text{Sr}/^{86}\text{Sr}$ for sea water in the geologic records on the southern margin of the basin. This is because the study area was in a ramp setting governed by intraplate palaeocontinent, and the addition of a large amount of terrigenous strontium led to the increase in $^{87}\text{Sr}/^{86}\text{Sr}$ values.

2. The $^{87}\text{Sr}/^{86}\text{Sr}$ values are positively fluctuated at the Upper Ordovician-Lower Silurian Boundary and Rhuddanian-Aeronian boundary, indicating a temporary fall of sea level at that time.

3. The $\delta^{13}\text{C}$ values increased gradually on both the northern and southern margins from the Aeronian to early Sheinwoodian, while the things for $\delta^{18}\text{O}$ values are contrary.

4. The isotopic evolution shows that the Upper Yangtze area was influenced by the Transgressive events from the Rhuddanian to early Sheinwoodian.

Early Paleozoic shale gas reservoir microscopic structure characteristics in southern Sichuan, China

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The well-preserved Lower Cambrian (Qiongzhusi Fm) and Lower Silurian (Longmaxi Fm) in the southern Sichuan province, China consists mainly of two lithological associations including shallow marine and lagoonal dark to black shales and shallow marine dark silty shale, with a total thickness of up to 1900 m. Using ESEM, AFM and test data and adsorption/desorption isothermal that produced from Multipoint Brunauer Emmett Teller (MBET) to do multi-researches on the types of reservoir spaces and micro-pore structure characteristics of early Cambrian Qiongzhusi Fm. and early Silurian Longmaxi Fm. shale gas reservoirs in southern Sichuan basin area. The shale gas reservoir spaces of early Cambrian Qiongzhusi Fm. and early Silurian Longmaxi Fm. mainly including residual primary intergranular pores, intercrystal pores, mineral moldic pores, secondary dissolution pores, micropores among clay minerals, organic matter pores. Through the analyses of ESEM and AFM, the micron and nanoscale pore image in the shale can be observed directly, and the pore specific surface area measurement can test samples of nano and micro nano level pores. The authors show that the Qiongzhusi Fm. and Longmaxi Fm. shale gas reservoirs are with great development of micro holes, and provide the large pore volume and surface area for shale gas. But the specific surface area and pore volume of Qiongzhusi Fm. are smaller than that of the Longmaxi Fm. shale. The organic carbon content and kerogen type, clay mineral type and content, and thermal evolution degree is the main factors to control the microscopic pore structure development, among them, the thermal evolution is the most obvious. Along with the thermal evolution degree, the organic carbon content and II kerogen content increase, the numbers of the micro-pore, the specific surface area and pore volume are increased. When the thermal evolution degree developed over a certain value, the specific surface area, pore volume all along with the increase of the degree of thermal evolution decreases sharply.