

Geochemical Characteristics of Carbonate Reservoirs Modified by Magmatic Intrusions in the Bachu Area, Tarim Basin, Nw China

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Oil and gas exploration had significant success in carbonate rocks in recent years in the Ordovician in Tarim Basin, NW China. Here we investigate the carbonate reservoirs in the Bachu area of the Tarim Basin through petrological and geochemical studies, combined with oil and gas exploration data. Geochemical analysis included major, trace and rare earth elements, fluid inclusion thermometry, clay mineral characterization, and carbon and oxygen isotopes of the carbonate rocks. Intrusive rock is mainly gabbro and diabase. Mainly composed of gabbro and diabase, and its ω (SiO_2) is between 39.91%-44.62%, $\omega(\text{K}_2\text{O}+\text{Na}_2\text{O})$, 3.04%-3.95%, $\omega(\text{Na}_2\text{O})/\omega(\text{K}_2\text{O})$, 2.32~2.8, sodium-alkaline series formed in intraplate tectonic environment. Enrichment of trace element distribution patterns of Ba Sr loss characteristics. ΣREE between $(106.72 - 158.15) \times 10^{-6}$, $\text{La}_{\text{N}}/\text{Yb}_{\text{N}}$, 5.124 ~ 5.442, δEu , 1.091-1.237, rare-earth distribution patterns are LREE enrichment type. Homogenization temperatures of fluid inclusions of Well He-3 in the Bachu area indicate three groups as: 60°C ~80°C, 90°C ~130°C, and 140°C ~170°C, and suggest that the carbonate rocks experienced modification by heating events. Porosity in the reservoir is defined by fractures and secondary pores and there is a notable increase in porosity of the carbonate reservoirs with proximity to magmatic intrusion, particularly about 8m-10m from the intrusive rocks. The development of secondary pores was controlled by lithofacies and corrosion by various fluids. We identify supercritical fluids with high density (138.12-143.97) in the Bachu area. The negative correlations of $\delta^{13}\text{C}$ (-2.76‰~ -0.97‰) and $\delta^{18}\text{O}$ (-7.91‰~ -5.07‰) suggest that the carbonate rocks in the study area were modified by high-salinity hydrothermal fluid. The formation of clay minerals such as illite and montmorillonite caused a decrease in porosity. Our study demonstrates the effect of magmatic intrusions in modifying the reservoir characteristics of carbonate rocks, and has important implications for oil and gas exploration.

Biography:

Kang Xu (1985) male, engineer, postdoctoral, graduated from China University of Geosciences (Beijing), now working in Wuxi Research Institute of Petroleum Geology of SINOPEC. The main research areas are Sichuan basin and Tarim Basin in China. 9 papers have been published. The main research areas are oil and gas basin sedimentary and oil and gas reservoir geology research, has led the team as the chief technology officer responsible for major scientific and technological projects of SINOPEC. In the long term research, we have accumulated a wealth of information, mastered the development direction of related fields, have a solid theoretical foundation, complete scientific research conditions and advanced scientific research instruments.