Multi-parameter Identification of Dolomite Genesis and Controlling Factors of Dolomite Reservoir in Yingshan Formation of Gucheng Area, Tarim Basin, NW China

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Dolomite reservoir in Yingshan Formation of lower Ordovician in Tarim Basin provides a important hydrocarbon exploration field. However, the ancient carbonate reservoir experienced significant tectonic and diagenesis throughout its long geological history, which greatly complicated the reservoir properties, with strong heterogeneous characteristics. Nearly 500 samples were collected to reveal the dolomite genesis and controlling factors of dolomite reservoir. And the new understandings have been put forward as follows.

Reservoir space is dominated by fabric selective reservoir space and it mainly exists in fine-coarse crystalline dolomite, with average porosity, 2%-4%. The distribution of pores has stratification and cycle, the pores mainly developed in the top of upward shallowing sequences, which was related to early sea-level drop. Huge $\delta^{13}C$, $\delta^{18}O$, and $^{87}Sr/^{86}Sr$, trace elements, fluid inclusion and rear earth elements data were analyzed, and the results reflected that dolomitization mainly took place in the shallow-medium burial phase, with the sea water as the main dolomitization fluid. Some dolomite was partially modified by hydrothermal fluid in the later buried stage, demonstrated by $\delta^{18}O$ and ^{30}Si. And the size of crystals is associated with the size of protolith structure and its pore size. The bigger that the protolith structure and pore size was, the coarser the crystalline dolomite would be. This is a good explanation why most reservoir spaces developed in the fine-coarse crystalline dolomite. Dolomitization did not produce pores directly. Because of its strong anti-compacting ability, dolomite mainly inherited early pores, intergranular pore and intercrystalline pore. However, early dolomitization protected most pores from being compacted. This understanding may be useful in guiding the prediction of ancient dolomite reservoir in Tarim Basin and other areas.

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