

Geochemical attributes in Lower-Ordovician dolostones from Tarim Basin: Implications for genesis of dolomite and porosity

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Dolomite reservoirs from the Lower Ordovician Yingshan Formation (Tarim Basin, NW China) constitute potentially important hydrocarbon exploration targets. However, these carbonate reservoirs experienced significant tectonic and diagenesis, with strong heterogeneous characteristics. In this paper nearly 900 samples were collected to analyse dolomite genesis and other key factors for the understanding of dolomite reservoirs in Gucheng area. Reservoir space types in Yingshan Formation are dominated by the intergranular pores and intercrystalline pores. And they mainly exist in fine to coarse crystalline dolomites, with porosities ranging between 2%-4%. Huge oxygen, carbon, and strontium isotope elements, trace elements, and rare earth elements were analysed. The results indicate that dolomitization mainly took place during the shallow-medium burial phase, with sea water as the main dolomitization fluid. Some dolomites were partially modified by hydrothermal fluids in their later buried stage, which was demonstrated by silicon and oxygen isotopic analysis. The size of crystals was 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 of why most reservoir spaces in Yingshan Formation mainly developed in the fine to coarse crystalline dolomite. Dolomitization did not produce pores directly. Because of its strong anti-compacting ability, dolomite mainly inherited early pores, intergranular pores and intercrystalline pores. Early dolomitization protected most early pores from being compacted. This understanding may be useful in guiding the prediction of ancient dolomite reservoir in Tarim Basin and other areas.