

LI Zhexuan, LIU Yiqun, JIAO Xin, LI Hong 2017. The Characteristics of the Hydrothermal Exhalative Dolostone of Lucaogou Formation in Santanghu basin and its Geology Setting Indication (English Edition), 91(supp. 1): 131-131.

The Characteristics of the Hydrothermal Exhalative Dolostone of Lucaogou Formation in Santanghu basin and its Geology Setting Indication

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Abstract

The NW-SE trending Santanghu basin is located in Xinjiang, NW China, between Tianshan Mountains and Altai Mountains. The tectonic evolution history of north Xinjiang has long been debated, especially the question when did that area began its intraplate rift evolution stage. This abstract discusses the features and possible origin of the hydrothermal exhalative dolostone of Lucaogou Formation in Santanghu basin, aiming to provide relevant information about this question.

The target dolostone are characterized by extreme thin lamina of 0.3cm – 1 cm thick. Dolomite, ankerite, potassium feldspar and analcite are dominant composition. Most dolomite is poor crystallized and is in anhedral or subhedral shapes. Ankerite is generally porphyritic, few is in irregular shapes. It has to be noted that the porphyritic ankerite commonly develop zonal textures characterized by rings with various FeO content. Potassium feldspar and analcite (<50%) are commonly observed in dolostones. Thin sections show some analcite is tetragonal trisoctahedron with harbour – like corrosion rims. Besides, few fragments of carbonatite rocks are observed in Lucaogou Formation and they perform intermittent or scattered distribution in rock layers.

Previous work done by our study team shows $\delta^{13}\text{C}$ PDB values are 4.8 ‰ ~11.4‰, 6.93‰ on average. The $\delta^{18}\text{O}$ PDB values are between -5‰ ~ -21.1‰, -10.94 ‰ on average. Paleosalinity calculated by $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$ is between 128.35 and 136.81, 134.42 on average. Sr content of dolostones in study area reaches to 164×10^{-6} ~ 537×10^{-6} (379.1×10^{-6} on average), most Sr/Ba > 1 (4.05 on average). $^{87}\text{Sr}/^{86}\text{Sr}$ of iron-rich dolostone in target area are between 0.70457~0.706194,

average at 0.705360.

Considering either accompanying residual tuff or residual leucite is found via electron probe, this indicates the analcite may derive from analcime phonolite. Furthermore, fragments of carbonatite rocks proves mantle-derived magmatism exist. The rapid variation of $\delta^{18}\text{O}$ indicates multiple interactions of hydrothermal fluids with lake water during Lucaogou sedimentary period. $^{87}\text{Sr}/^{86}\text{Sr}$ values are much lower than that of crustal silica rocks while are more close to mantle derived rocks, which indicates diagenetic hydrothermal fluid is mantle-origin.

It has been reported that dolostone does not intergrow with iron-rich dolostone in study area. According to the latest X diffraction results of cores, iron-rich dolostone distributes rather locally. Given that ankerite commonly develop zonal textures characterized by various FeO content, we confirm it is due to multiple hydrothermal fluids activities in different hydrothermal vents.

There should be abundant hydrothermal vents during Lucaogou period. Deep faults and its relevant fractures built plenty paths for mantle-origin hydrothermal fluids to run up. Different vents owned various fluid properties, so did relevant sedimentation products.

Hence we inclined to believe Santanghu basin was at intraplate rift evolution stage, under regional extension condition in late Carboniferous. During early-mid Permian the basin was a starved, deep lacustrine intracontinental rift basin. Accordingly, in northern Xinjiang, ocean basin may close in late Carboniferous and started continental sedimentary development in early Permian.

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