

REE geochemistry and analysis of sedimentary aqueous media in lower part of Kelimoli Formation, Middle Ordovician, Zhuozishan area

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Zhuozishan area in Inner Mongolia is a very important area to research sedimentary deposits in Ordovician of Western Ordos basin for its well outcrops and variable sedimentary types. During the Middle Ordovician, the study area is located in the transitional position from shallow to deep sea, especially in Darriwilian Stage, Kelimoli Formation which consists of dark gray thin-bedded limestone and grayish black mudstone is an ideal section for research of redox conditions in deep-water from western Ordos basin in Ordovician. Based on the detail fieldwork, this article focus on the sea water redox conditions while the materials of Kelimoli Formation were deposited using rare earth element and yttrium (REY) and other trace elements related to redox condition such as V, Cr, Ni, and Co in thin-bedded finely crystalline limestone to micrite and grayish black mudstone respectively.

The results show following: ① the rare earth element (REE) concentrations average 28.18 ppm and 100.37 ppm in limestone and mudstone respectively, as well as the ratio of LREE and HREE is 9.60 and 9.69; ② the molar ratios of shale-normalized (PAAS) data of (Y/Ho)_N, (La/Yb)_N, (La/Sm)_N and (La/Nd)_N average 29.01, 1.35, 0.92, 0.95 and 25.72, 1.21, 0.96, 1.02 in limestone and mudstone respectively; ③ limestones yielded no Ce anomalies or a little positive anomalies with obvious positive Eu anomalies and the mudstones yielded negative Ce anomalies with a weak positive Eu anomalies which is less than limestone (Fig 1); ④ the ratio of other trace elements including V/Cr, V/(V+Ni) and Ni/Co is average 1.10, 0.62, 7.75 and 3.54, 0.89, 5.15 in limestone and mudstone respectively.

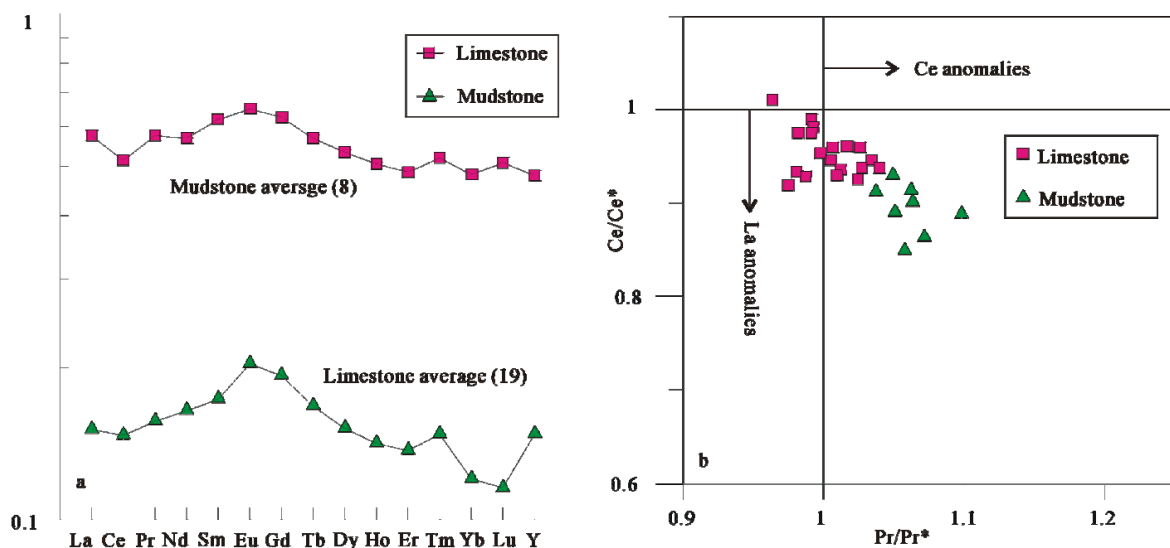


Fig 1 REE patterns (PAAS) of limestones and mudstones of Kelimoli Fomation (a) and Cross plots showing the correlation between Ce/Ce*-Pr/Pr* (b).

According to these results and the sedimentary characteristics of lower part of Kelimoli Formation and some previous research, it is likely suggesting that: the depositional environment of Kelimoli Formation is a quiet environment under storm wave base which is both apart from seacoast and effected by freshwater, and the limestone deposited in oxic condition while the interlayer mudstone deposited in anoxic condition. This alternation redox conditions may be induced by warm contour current, and we can call this hydrodynamic oxic environment.

Key words: rare earth element; contour current; hydrodynamic oxic