Permian-Triassic Boundary Microbialites: Deciphering the Shallow Seawater Redox History After the End-Permian Mass Extinction

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9.29.2020 - 10.1.2020 – AAPG Annual Convention and Exhibition 2020, Online/Virtual

Abstract

The redox condition of shallow seawater after end-Permian mass extinction remains uncertain, leaving the precise pattern of extinction and its aftermath poorly constrained. Permian-Triassic boundary microbialites (PTBMs) are widely adopted as a robust tool to address this issue. However, works with high resolution and multiple proxies are rare, as well as a contradiction existed in interpretations by different authors. Herein we adopted three kinds of proxies to decipher redox condition of ambient water of PTBMs, which are 1) trends in abundance and size of shelly fauna of PTBMs; 2) total organic carbon abundance (TOC) and total sulfur abundance (TS); 3) rare earth elements abundance in clots of PTBMs. The results and suggestions are: 1) Increase in size and abundance of shelly fauna in the microbialite sequence implies a well-oxygenated environment during PTBMs growth. 2) TOC and TS are rather low as 0.07% and 0.31% respectively. We excluded other possibilities of the low values, which are a) low input of organic materials; b) high sedimentation rate; c) hydrocarbon thermal transformation and d) low iron influx, thus considers PTBMs forming in oxygenated and agitated seawater. 3) Despite clots in the most upper sequence being strongly diagenetically altered, the rare earth elements of Yudongzi PTBMs are generally characterized by Ce negative anomaly, depletion of LREE and rich of HREE. It indicates a well-oxygenated shallow marine setting, as well as suggesting shallow

marine in Tethys was not influenced by anoxic events immediately, at least, was oxygenated during the growth of PTBMs.