

Difference of depositional environment between mudstone and shale in the seventh member of Yanchang Formation in Ordos Basin, China

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Purposes and Methods

Organic-rich source rocks are the material basis of oil and gas generation in sedimentary basins. The source rock of the seventh member of the Upper Triassic Yanchang Formation (Chang 7 Member) is the most important source rock in the Ordos Basin, China, which is composed of dark-grey mudstone and black shale. However, the difference of paleoenvironment between mudstone and shale in the Chang 7 Member is still obscure. Reconstructing the paleoenvironment during the deposition of source rocks is of great significance to reveal the difference of enrichment mechanism between mudstone and shale. In this study, molecular geochemistry and elemental geochemistry methods were used to reconstruct the paleoenvironment during the deposition of the Chang 7 Member mudstone and shale. Twenty-six mudstones and twenty-one shales were selected for relevant geochemical analysis.

Discussion of Results

The results showed that paleoclimate during mudstone deposition was warmer and wetter than that during shale deposition, which is more conducive to the supply of terrigenous nutrients. However, the massive input of terrigenous clastic rocks makes the sedimentary rate of mudstone higher than that of shale, resulting in the dilution of organic matter in mudstone sediments, which reduces the abundance of organic matter in mudstone. The enrichment of organic matter in the Chang 7 Member source rocks is caused by the freshwater algae blooming^[1], however, the higher salinity of water column during mudstone deposition affects the growth of freshwater algae, resulting in the paleoproductivity of lake basin during mudstone deposition is lower than that during shale deposition. Moreover, shale deposition occurred in reduction condition, while mudstone deposition occurred in weak reduction to weak oxidation condition. The anoxic water environment during shale deposition is conducive to the preservation of organic matter in sediments, while oxygenic water environment during mudstone deposition makes organic matter in sediments easy to be oxidized and

degraded. In summary, there are obvious differences in depositional environment between mudstone and shale, which will inevitably lead to differences in the enrichment mechanism of organic matter.

[1] Shi et al., 2022. Mar. Petrol. Geol. 135, 105404.