

Nitrogen isotope compositions of the Chang 7 Shale, the Ordos Basin, north China: implications of depositional redox changes

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Nitrogen isotope ($\delta^{15}\text{N}$) analysis has been used to evaluate depositional redox conditions in well-preserved sedimentary systems, however, less N-isotope studies have been made to reconstruct the redox changes in lacustrine shales. In this paper, we report the $\delta^{15}\text{N}$ data from the Upper Triassic Chang 7 Shale of the Ordos Basin, north China. Bulk $\delta^{15}\text{N}$ values are significantly higher in the Chang 7₃ and the lower part of the Chang 7₂ submembers (Zone A; average = $9.4 \pm 1.3\text{‰}$) than in the upper part of the Chang 7₂ and the Chang 7₁ submembers (Zone B; average = $5.4 \pm 1.5\text{‰}$). Lithological aspects of these deposits and previous geochemical measurements suggest that Zone A were mainly deposited under suboxic bottom water conditions, whereas Zone B deposits accumulated within an oxygenated water column. Stable organic carbon isotopes ($\delta^{13}\text{C}_{\text{org}}$) and total nitrogen (TN) values of the two zones display little variation that could be attributed to changing organic matter sources and/or post-depositional alteration of $\delta^{15}\text{N}$. Thus, we suggest that changes of $\delta^{15}\text{N}$ through the Chang 7 Shale primarily reflect differences in depositional redox conditions and $\delta^{15}\text{N}$ values of shale can provide important details regarding the depositional history of unconventional resource plays.