

Geochemical characteristics of nitrogen isotopic composition of oils and source rocks in terrestrial basin from China.

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Nitrogen is an important element in organic matter, source rock and crude oil. Due to the low nitrogen content and high C / N ratio of crude oils and source rocks, it is difficult to prepare the oil and source samples for nitrogen isotopic analysis, which make the research works on nitrogen isotopic composition of oil and source rocks rare. In this work, a series of crude oil and source rock samples from several typical basins (marine carbonatite, saline water-salt lake, brackish water lake, fresh water lake sedimentary basin) in China were analysed to reveal the distribution characteristic and main influence factors of nitrogen isotope in different sedimentary environments.

In this work, the elemental analyzer (EA) coupled directly to an isotope ratio mass spectrometer (IRMS) is used to measure the nitrogen and carbon isotope composition of crude oil and source rock samples based on Dumas combustion method. The deviation of the $\delta^{15}\text{N}$ ratios for oil and source rock samples is lesser than $\pm 0.2\%$.

The results show that there are obvious differences between nitrogen isotopic composition of crude oil and source rock from different sedimentary environments. The oil and source rock from marine sedimentary environment are significantly deplete in ^{15}N than oil and source rock from terrestrial sedimentary environment. The $\delta^{15}\text{N}$ ratios of oil from marine source rock (Ordovician, Tarim basin) range from -2.0% to 2% , and the $\delta^{15}\text{N}$ ratios of oil from terrestrial source rock range from 4.0% to 21% . In terrestrial sedimentary environment, the composition characteristics of nitrogen isotope in crude oil and source rock are related to the salinity and redox condition of sedimentary environment (Fig.1). The nitrogen isotope composition ($\delta^{15}\text{N}$ ratios) source rock from Songliao basin (brackish water lake) range from 8.9% to 15.5% . The $\delta^{15}\text{N}$ ratios of source rock from Ordos basin (typical freshwater water lake) range from 0.6% ~ 5.6% (Fig.2). This result show that the source rock from Songliao basin is obviously rich in ^{15}N than Ordos basin. The crude oil shows slight rich in ^{15}N in comparison to source rock.

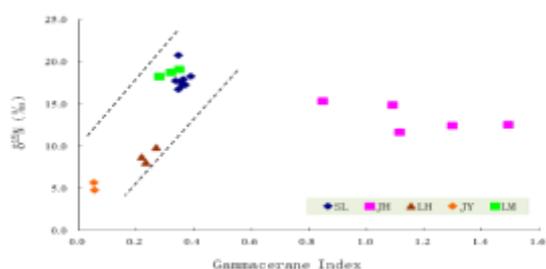


Fig. 1. The relation graph of $\delta^{15}\text{N}$ vs. gammacerane index of crude oils in different continental depositional environment (LS: Songliao basin; JH: Jiamhan basin; LH: Liaohe basin; JY: Jiyang basin; LM: Laiman basin)

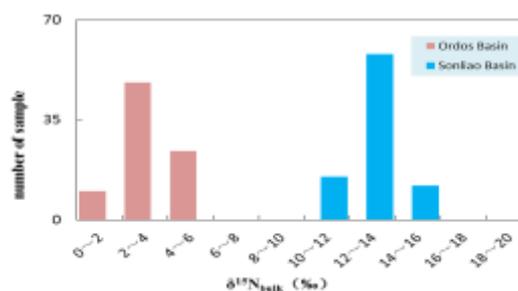


Fig. 2. The histogram of $\delta^{15}\text{N}$ ratios of source rock from Songliao basin and Ordos basin: the source rock from Songliao basin (brackish water lake) is obviously rich in ^{15}N than Ordos basin (typical freshwater water lake).

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