

Bacteria effects in carbon isotopic compositions of natural gas—A case study in Shinan gas field, NW China

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Based on the published data (Cao et al., 2012), geochemical characteristics of natural gas from Shinan gas field, NW China, were re-examined. According to $C_1-\delta^{13}C_1$ and $\delta^{13}C_1-\delta^{13}C_2$ identification diagrams, most gases were derived from the type III kerogens in the Permian Wuerhe Formation. However, abnormal geochemical characteristics were seen in several gas samples:

J001, J003, SN4 and SN5 had relatively heavy $\delta^{13}C_2$ values and light $\delta^{13}C_1$ values which was caused by the mixing of biotic gases. Carbon isotopic reversal between $\delta^{13}C_2$ and $\delta^{13}C_3$ was observed in SN34 with $\Delta\delta^{13}C (C_3-C_2)$ and C_2/C_3 being -0.7% and 1.15, respectively. We subscribe this phenomenon to the selective biodegradation of ethane. SN30 had the highest $\Delta\delta^{13}C (C_3-C_2)$ and C_2/C_3 ratios which was most probably caused by the selective biodegradation of propane. S106 had the lowest $\Delta\delta^{13}C (C_2-C_1)$ and dry coefficients (C_1/C_1-C_5) which were inconsistent with the thermal maturities of Permian source rocks. We subscribe this phenomenon to the selective biodegradation of methane. The biodegradation effects were obviously controlled by their burial depth.

[1] Cao et al. (2012) Org. Geochem 53, 166-176.