

Distribution and origin of straight long-chain alkyl naphthalenes in the Upper Cretaceous lacustrine sediments of Songliao Basin, China

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A series of doublet straight long-chain alkyl naphthalenes (LANs) is detected in the Cretaceous Lacustrine sediments in Songliao Basin. The $\delta^{13}\text{C}$ composition of LANs vary from -27.1‰ to -31.4‰, compared to normal alkanes' much negative composition of -31.9‰ to -34.5‰, and displays a gradual negative trend along with the increase of carbon number of alkyl chain. The $\delta^{13}\text{C}$ composition of methyl- & dimethyl naphthalenes is in the range of -25.6‰ to -28.4‰, which is apparently much heavier than that of LANs. Based on the carbon isotopic composition of n-alkanes, methyl and dimethyl naphthalenes and LANs and their variation trend, a new hypothesis for the LANs formation is proposed as demonstrated that the LANs could be geosynthesized and jointly formed by the isotopic heavier naphthalene and lighter unsaturated alkyl chains. The ratio of total methyl substituted naphthalenes against total LANs, expressed as $\Sigma\text{MNs}/\Sigma\text{LANs}$, show consistent change on the profile with the profile variations of Pr/Ph, TOC and HI. These suggest that the formation of LANs are likely controlled by redox condition of sedimentary environments as a reduced condition is favourable for LANs' formation and an oxic condition favourable for the formation of methylated naphthalenes.