

Occurrence and distribution of branched alkylbenzenes in Dongsheng sedimentary uranium ore deposits, China

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A series of branched alkylbenzene compounds ranging from C₁₅ to C₁₉ with several structural isomeric forms (2-5) at each carbon number were identified in a number of sediments from the Dongsheng sedimentary uranium ore deposits, Ordos Basin, China. The distribution patterns of the branched alkylbenzenes show significant differences in the samples. Branched alkylbenzenes in sample extracts from carbonaceous argillites and coals range from C₁₅ to C₁₉ homologues, and are dominated by the C₁₇ or C₁₈ homologues. In contrast, in the sandstone/siltstone extracts, the branched alkylbenzenes are dominated by the C₁₉ homologues. The obvious differences in the distribution patterns of the branched alkylbenzenes, along with many other differences in organic geochemical characteristics between the sandstones/siltstones and the interbedded barren carbonaceous sediments, probably indicate their potential use as biological markers associated with particular depositional environments and/or maturity evolution. Possible origins for this series of branched alkylbenzenes include interaction of simple aromatic compounds with, or cyclization and aromatization reactions of, these linear lipid precursors such as fatty acids, methyl alkanates, wax esters or alkanes/alkenes that occur naturally in carbonaceous sediments. The possible simple aromatic compounds may include substituted benzenes, functionalized compounds such as phenols that are bound to kerogen at the benzylic position, and phenols that are decomposition products derived from aquatic and terrestrial sources. Differences in the initial distributions of methyl alkanates and *n*-alkanes, indicating different kinds of organic precursor inputs to the sediments, are probably the main reasons for the resulting distinct distributions of branched alkylbenzenes in the lithologically different sediments.

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Reconstructing hydrothermal vent chemistry through analysis of vein minerals

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The chemical transformation of seawater to hydrothermal vent fluid reflects the integrated water-rock ratio and the temperature of reaction within the hydrothermal system. Quartz-epidote veins that form during discharge from the hydrothermal system record chemical and isotope composition of hydrothermal vent fluids. We use analyses of oxygen isotopes and fluid inclusion filling temperatures in quartz and quartz-epidote mineral pairs to estimate hydrothermal fluid compositions in the Troodos ophiolite and a series of Ordovician ophiolites in Newfoundland and Quebec, Canada and compared our analyses with previously published data. High ⁸⁷Sr/⁸⁶Sr ratios and low δ¹⁸O of epidote allow us to identify the vent fluids with the highest water-rock ratio, which in turn place minimum constraints on the δ¹⁸O of the ocean. The δ¹⁸O of modern vent fluids range from close to seawater to slightly enriched values (1 to 3‰). If the δ¹⁸O of the ocean were significantly different in Earth history, this should be reflected in a different range of δ¹⁸O of vent fluids. In the Ordovician ophiolites, the δ¹⁸O of vent fluids calculated from the δ¹⁸O quartz with temperatures from fluid inclusion is -4 to -1‰ (~170-185°C), whereas those estimated from quartz-epidote pairs are slightly heavier.