

Geochemical characteristics and significances of rearranged hopanes in Jurassic source rocks in the center Sichuan Basin

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The GC-MS analyses of a suite of 24 Jurassic source rock samples from the center Sichuan Basin (SW China) show that they contain variable amounts of rearranged hopanes, including 17 α (H)-diahopanes (D series), 18 α (H)-neohopanes (Ts and C₂₉Ts) and the early-eluting rearranged hopanes (E series). D series have similar distribution patterns to 17 α (H)-hopane series, including a range from C₂₉ to C₃₅ for carbon numbers and presence of 22S and 22R epimers for C₃₁–C₃₅ homologues. In particular, the 17 α (H)-hopanes were not detected in several samples, which have extremely relatively higher abundance of D series. E series extend from C₂₉ to C₃₁, and also have 22S and 22R epimers for C₃₁ homologues.

The relative abundance of E series has a strongly linear relationship with that of D series. The slopes and intercepts for tender line in both C₃₀E/C₃₀H vs C₃₀D/C₃₀H and C₂₉E/C₂₉H vs C₂₉D/C₂₉H plots are less than 0.7 and 0.2 respectively, indicating that E series have similar forming conditions with D series, but probably following different mechanisms. In contrast, the abundance of C₂₉Ts also has a significant linear correlation with that of C₂₉D. The slope and intercept of the tender line for C₂₉Ts/C₂₉H vs C₂₉D/C₂₉H are 1.1 and 0.2, probably implying that 18 α (H)-neohopanes are more readily to form than D series.

Investigation of rearranged hopanes and other parameters suggest that a sub-oxic environment with mixed contribution of terrigenous OM and aquatic organisms contributes to the formation of rearranged hopanes. The abundance of rearranged hopanes in Jurassic source rocks of Sichuan Basin is much higher than that of other Chinese sedimentary basins. The bloom of shellfish or some other biological group in the early Jurassic, may also have an influence on the enrichment of rearranged hopanes. Although the forming mechanism for such high abundance of rearranged hopanes remains unknown, the study of geochemical characteristics of rearranged hopanes may have significant implication in detailed oil-source correlation in the center Sichuan Basin.