

Kinetics of oil generation by closed-system pyrolysis of Ximaling Shale

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The age of tuff and bentonite of the Ximaling Formation determined by high-precision zircon date are 1384.4 ± 1.4 Ma and 1392.2 ± 1.0 Ma, respectively^[1]. A section of oil shale with 30 meters in thickness occurred in the lower member of the formation. The hydrocarbon-generating parent materials were dominated by bacteria, archaea, and simple alga in the oldest oil shale, which were probably constituted by benthonic red algae with spherical biological structures observed within the thin sections of vertical beddings (Fig. 1a). To explore the hydrocarbon generation behavior of Precambrian source rocks, simulation experiments were conducted in the gold-tube confined system since high abundance of TOC and low maturity in the oil shale were suitable.

Kinetic calculations for C_{14+} , C_{6-14} and C_{1-5} components illustrated that the most interesting finding is that the distribution of C_{14+} generation activation energy was quite converged, with a peak value of 49 kcal/mol. This might be attributed to a single and simple hydrocarbon-generating parent material is involved. This means that oil could be generated very early and in a narrow period for those Precambrian source rocks with similar biological compositions, thus, a good preservation condition in subsurface might play an important role for the generated hydrocarbons.

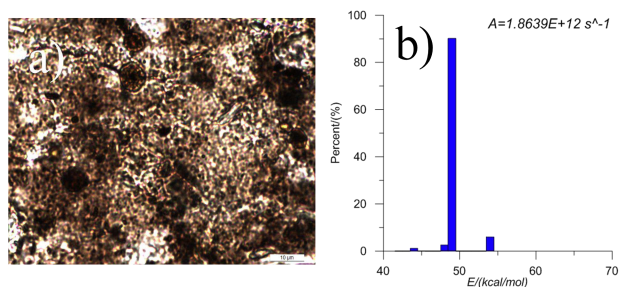


Fig1: a) transmission optical microscope image, b) activation energy distributions and frequency factors for the generation of the C_{14+} hydrocarbons.

[1] Shuichang Zhang et al. (2015) PNAS 112,1406-1413.