Anomalous distribution of n-alkyl-cyclohexanes: A potential biomarker for acidophilic thermophilic bacteria in Mesoproterozoic Hongshuizhuang–Xiamaling shales

CHUNJIANG WANG

College of Geosciences & State Key Laboratory of Petroleum Resources and Prospecting, China University of Petroleum, Beijing, 102249, China (wchj333@126.com)

Prokaryotic microorganisms play an important role in the Proterozoic marine ecosystem. This idea is supported by the biomarker evidence from Barney Creek Fm. (1.64Ga) of the McArthur Group in northern Australia [1], Hongshuizhuang Fm. and Xiamaling Fm. (1.45~1.30Ga) in North China [2, 3], and from Atar Fm. (1.1 Ga) in Taoudeni Basin, Mauritania [4]. However, limited research is not enough for us to understand the ecosystem and evolution of marine microorganisms in the Proterozoic era. Here, we report for the first time that a series of n-alkyl cyclohexanes (NACH) are characterized by C_{16} and C_{18}-predominance in the organic-rich shales of Hongshuizhuang Fm., Tieling Fm. and Xiamaling Fm. in North China Craton. This n-alkyl-cyclohexane anomaly must have been derived from a unique microbial source. It is very interesting that some acidophilic thermophilic bacteria (such as Bacillus acidocaldarius) can synthesize principle membrane lipid components of 11-cyclohexylundecanoic (C_{17}) and 13-cyclohexyltridecanoic (C_{19}) acids [5, 6], which can just be used as precursors for the C_{16} and C_{18} NACH, respecitively. It means that the C_{16} and C_{18} NACH anomaly could be potential biomarker of acidophilic thermophilic bacteria in these Mesoproterozic black shales. If so, this NACH anomaly may indicate that the acidophilic thermophilic bacteria have important contribution to the organic matters in Hongshuizhuang–Xiamaling black shales. Future research will focus on the sedimentary environments and tectonic settings of these Mesoproterozoic shales.

Reference

[1] Brocks J J, et al. (2005) *Nature*, 437, 866-870. [2] Wang C. (2010) *GCA* 74, A1099. [3] Wang C, et al. (2011) *Mineralogical Magazine* 75, P2114. [4] Blumenberg M, et al. (2012) *Precambrian Research* 196-197, 113-127. [5] de Rosa M. et al. (1971) *Chemical Communications* 1971, 1334. [6] Oshima M and Arica T. (1975) *The Journal of Biological Chemistry* 250, 6963-6966.