Carbon and oxygen isotope relations and its significance

CHANGMING WANG*, JUN DENG, SHOUTING ZHANG, DA ZHANG, LIQIANG YANG, QINGFEI WANG AND XIANG SUN

State Key Laboratory of Geological Processes and Mineral Resources, China University of Geosciences, Beijing 100083, China (*correspondence: wcm233@163.com)
Key Laboratory of Lithosphere Tectonics and Lithoprobing Technology of Ministry of Education, China University of Geosciences, Beijing 100083, China

The carbon and oxygen isotopic compositions provide criteria for the evaluation of the depositional environment. Sixteen siderite samples from disseminated, breccias ores and bedding exhalites were analyzed for their carbon and oxygen isotope compositions from the Dajing deposit, China. Depositional settings of limestone can be inferred by the following equation: $Z = 2.048(\delta^{13}C + 50) + 0.498 (\delta^{18}O + 50)$. Samples with Z value above 120 would be classified as marine, while those with Z below 120 as fresh-water ones [1]. The synthetic Z parameter based on both $\delta^{13}C$ and $\delta^{18}O$ shows values characterizing the freshwater carbonates (between 100 and 114) for all the samples from the Dajing deposit, which represents depositional settings of deep lacustrine together with regional geological characteristics. The palaeotemperature is estimated based on the following equation: $T=16.998-4.52(\delta_c{}^{18}O-\delta_w{}^{18}O) + 0.03(\delta_c{}^{18}O-\delta_w{}^{18}O)^2$ [2]. Stable oxygen isotope analysis reveals a higher palaeotemperature with average 117.00°C, comparing with sea surface temperature and lake surface temperature [3], which result from the mixture of volcano-sedimentary fluids and deep lacustrine water, just like the mixture of multi-source fluids in the Yuebei basin, China[4,5].

In combination with geochemical data, detailed geological, fabric, petrographical and mineralogical study on the exhalites, a new type exhalative mineralization is put forward to in this paper, which often observed in marine basins, but scarcely in lacustrine basins. This proposition is useful not only for interpretation of the genesis of the Dajing large Sn deposit but also significant for mineral exploration in the area especially for finding large deposits caused by sedimentary exhalative mineralization processes in the lacustrine setting.

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Biomarker evidence for eukaryote algae flourishing in a Mesoproterozoic (1.6~1.5Gyr) stratified sea on the North China Craton

C. WANG

Lab. of Geochem. and Environ., Facul. of Geosci., China Univ. of Petroleum, Beijing, 730000, China (wangchj@cup.edu.cn)

The Mesoproterozoic Gaoyuzhuang Formation (GF) in the North China Craton (NCC) can be more precisely constrained to a time spanning ~1.6 Myr to ~1.5 Myr, based on new SHRIMP U–Pb ages [1,2,3]. I here present some biomarker evidence for planktonic eukaryote algae flourishing and marine water stratification during the early Mesoproterozoic on the North China Craton. The GF varies from 900m to 1900m in thickness and is mainly composed of shallow-water facies carbonates, with deep-water facies mainly developed in the middle-upper intervals. Biomarker analysis on 43 samples shows that 1) phytane series of isoprenoid hydrocarbons is mostly present at higher concentration; 2) C_{27}–C_{29} steranes are well preserved in most intervals, although argillaceous dolomites are lean in steranes owing to more intense thermal catalysis; 3) 4-me-sterane homologues were detected with higher abundance in some intervals, which are most likely related to some acritarchs. All these imply that some planktonic eukaryote algae well developed and contributed predominantly to the OM in GF during this period; 4) aryl-isoprenoid hydrocarbons derived from chlorobiaceae were detected in most intervals, and especially they are relatively rich in the organic-lean shallow-water facies, indicating that the marine waters in the early Proterozoic NCC were stratified, accompanying episodic sulfide waters intruding into shallow waters. This scenario may be similar to that of the 1.64 Gyr-old Barney Creek Formation [4], but some different.

[1] Lu *et al.* (2008) *Precambrian Research* **160,** 77–93. [2] Su *et al.* (2008) *Gondwana Research* **14,** 543–553. [3] Gao *et al.* (2007) *Geological Bulletin of China* **26**, 249–255 (in Chinese with English abstract). [4] Brocks *et al.* (2005) *Nature* **437**, 866–870.