

Organic carbon proxies in black shales: strontium

H.J. WANG¹, X.M. WANG¹ AND S.C. ZHANG^{1*}

¹Research Institute of Petroleum Exploration & Development, CNPC, Beijing 100083, China (wanghujian@petrochina.com.cn, wxm01@petrochina.com.cn, *correspondence: sczhang@petrochina.com.cn)

Isotopic and elemental proxies are used to discern the original compositions of ancient sediments, which are subject to later diagenetic/thermal alteration, etc^[1]. Recent work about the Mesoproterozoic (1.36 Ga) black shales in the North China Craton showed a high correlation between total organic carbon (TOC) content and the enrichment factors of Sr normalized to upper crust ($Sr\ EF = (Sr/Al)_{sample}/(Sr/Al)_{upper\ crust}$). No matter which paleoredox conditions is, the relatively low Sr EF (< 1.0) and good positive correlation with TOC (Figure 1), means the uptake of Sr is mainly controlled by the availability of organic substrates, not the solubility at the redox boundary. Besides the isotopic compositions of Sr can reflect the evolution of paleocean^[2], thus jointly estimates of original TOC with the content and isotopic composition of Sr in samples spanning the geologic record, should be useful in estimating the of primary productivity of ancient oceans and the distribution of potential source rocks of petroleum.

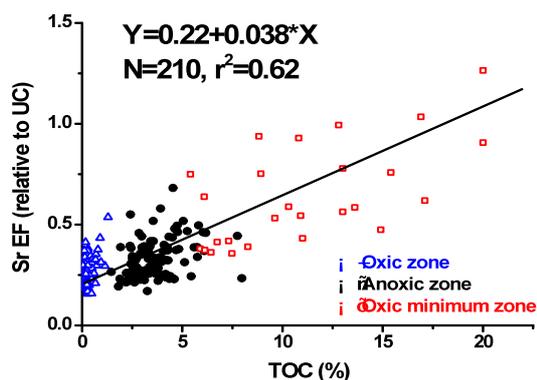


Figure 1: Enrichment factors of Sr (relative to upper crust) versus TOC in Mesoproterozoic sediments.

[1] Wilde *et al.* (2004) *Chem Geol.* **206**, 167-176. [2] Veizer *et al.* (1999) *Chem Geol.* **161**, 59-88.

Simultaneous measurements of C and N Isotopic composition and N abundance in diamonds by NanoSIMS

JIANHUA WANG*, STEVEN B. SHIREY AND ERIK H. HAURI

Department of Terrestrial Magnetism, Carnegie Institution of Washington, 5241 Broad Branch Rd. NW, Washington DC 20015, USA (*correspondence: jwang@ciw.edu)

Diamond, one of the three native carbon minerals on Earth, has been intensively studied for more than 40 years to provide extraordinary information on the cycling of carbon in the Earth's interior. Diamonds are found at the Earth's surface in ultra-high pressure metamorphic terranes, meteorite impact sites, and volcanic eruptions of kimberlite magma or their weathering products. It is the kimberlitic diamonds that provide the largest and deepest specimens - from 150 km to 800 km depth in the mantle. Multi-stage growth patterns are commonly seen in the cathodoluminescence (CL) imaging of diamonds, including those that are large, transparent monocrystals. The SIMS method has been developed to study zonation of carbon and nitrogen isotopic composition and nitrogen abundance in diamonds [1] and is the method of choice for study in the context of the zoning patterns. Separate analytical sessions are required to measure carbon and nitrogen isotopes and nitrogen abundance in the previous method on the Cameca 6f [1] because a single detector must be used at different mass resolution for C and N. We have developed a method to measure both carbon and nitrogen isotopes and nitrogen abundance simultaneously on the same spot using multicollection on the Carnegie NanoSIMS 50L. The NanoSIMS method has a better spatial resolution (15 μ m) with better precisions ($\delta^{13}C$: 2s of $\pm 0.5\%$ and $\delta^{15}N$: 2 σ of $\pm 2.2\%$) and much better transmission of nitrogen ($^{12}C^{14}N$: 1600cts/ppm/nA). We will discuss the details of the NanoSIMS method comparing with the previous method.

Palot *et al.* reported lowest $\delta^{15}N$ values (up to -39.4‰) of terrestrial sample in Kankan (Guinea) diamonds [2]. They interpreted this low N isotopic composition as the primordial heterogeneity preserved in an imperfectly mixed convective mantle [2]. We measured $\delta^{15}N$ value of -29‰ in a peridotite diamond from Liaoning, China. In situ and simultaneous measurements of C and N isotopic composition and N abundance in zoned Liaoning diamonds reveal their complicated growth history and N isotope geochemistry in the deep Earth.

[1] Hauri *et al.* (2002) *Chem. Geol.*, **185**, 149-163. [2] Palot *et al.* (2012) *EPSL*, **357-358**, 179-193.