

## Osmium evidence for relationship between atmospheric oxygenation and Paleoproterozoic glaciation

Y. SEKINE<sup>1\*</sup>, K. SUZUKI<sup>2</sup>, R. SENDA<sup>2</sup>, E. TAJIKA<sup>3</sup>,  
R. TADA<sup>3</sup>, K. GOTO<sup>4</sup>, S. YAMAMOTO<sup>3</sup>, N. OHKOUCHI<sup>5</sup>  
AND N.O. OGAWA<sup>5</sup>

<sup>1</sup>Dept. Complexity Sci. & Engr., Univ. Tokyo, Kashiwa,  
Chiba 277-8561, Japan

(\*correspondence: sekine@k.u-tokyo.ac.jp)

<sup>2</sup>IFREE, JAMSTEC, Yokosuka, Kanagawa 237-0061, Japan

<sup>3</sup>Dept. Earth & Planet. Sci., Univ. Tokyo, Bunkyo, Tokyo  
113-0033, Japan

<sup>4</sup>Disaster Control Research Center, Tohoku Univ., Sendai,  
Miyagi 980-8579, Japan

<sup>5</sup>Institute of Biogeoscience, JAMTEC, Yokosuka, Kanagawa  
237-0061, Japan

Knowledge of the timing and causative mechanism of the rise in atmospheric oxygen is important in understanding Earth's evolution. Several lines of evidence have supported the idea that the largest oxygenation (the Great Oxidation Event) occurred in the Paleoproterozoic between 2.4 and 2.1 billion years ago (Ga) [1,2]. Although repeated and severe glaciations occurred during the time of oxygen increase [2,3], the relationship between the atmospheric and climatic transitions remains poorly understood. Here we found high concentrations of the redox-sensitive element osmium (Os) with high initial <sup>187</sup>Os/<sup>188</sup>Os in a thin sandstone-siltstone interval that spans the transition from glacial diamictite (Bruce Formation) to overlying carbonate (Espanola Formation) in the Huronian Supergroup, Canada. Our findings suggest that immediately after the second Paleoproterozoic glaciation at around 2.3 Ga, atmospheric oxygen levels became sufficiently high (> 10<sup>-4</sup> times present levels) to deliver radiogenic continental Os to shallow marine sediments, indicating that climatic recovery accelerated the process of atmospheric oxygenation during the Great Oxidation Event.

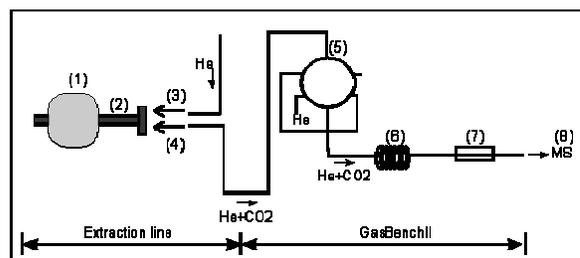
[1] D. E. Canfield, *Annu. Rev. Earth Planet. Sci.*, **33**, 1 (2005);  
[2] A. Bekker *et al.*, *Nature* **427**, 117 (2004); [3] G. M. Young  
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## Carbon isotopic composition in diamonds and crystalline graphite – Continuous-flow GB-IRMS method

D.V. SEMENOVA\* AND V.A. PONOMARCHUK

Inst. of Geology and Mineralogy, Novosibirsk, Koptug st.,3,  
Russia (\*correspondence: semenovadina@gmail.com)

Carbon isotope composition analysis in diamonds and crystalline graphite by the continuous-flow MS (in case of EA-IRMS) requires multiimpulse combustion, and more over, has not high-temperature purification from surface contamination [1]. Such defects are eliminated by using modified continuous-flow method – GB-IRMS (interface the Finnigan GasBenchII + Thermo Finnigan 253 mass spectrometer), shown in fig.1. The system is similar in a number of ways to those constructed by Bebout *et al.* (2007) [2]. Each sample was loaded in quartz reactor and preoxidized at 800-900°C in He stream for about 10 hours to remove surface contamination. Next step – adding the Cr<sub>2</sub>O<sub>3</sub>/V<sub>2</sub>O<sub>5</sub> to the sample and oxidation at 1100-1250°C in He stream (about 1 hour). Final step – CO<sub>2</sub> via sample needle transfer into GasBenchII in an He stream and then, to mass-spectrometer. The Gas BenchII system partially emulates dual-inlet mode in that it is possible to integrate measurement of the sample gas with multiple analyses of reference gas during an analytical run. More over, the system is capable of analyzing multiple aliquots of gas from samples. Practical minimum sample size, taking into account blanks and other factors affected CO<sub>2</sub> transfer, is about 5-10 nmol with the precision of 0.2-0.3‰ for δ<sup>13</sup>C.



**Figure 1:** Schematic illustration of device: 1- furnace , 2 – quartz reactor with septum; (V= 1,6cm<sup>3</sup>), 3- flush needle, 4 – sample needle , 5 - Valco port, 6 – GC column, 7- water removal, 8- to MS.

[1] Talibova *et al.* (2007) *Geochim. Cosmochim. Acta* **71**, 997.  
[2] Bebout *et al.* (2007) *Chem. Geology* **240**, 1-10.