Isotope signatures of fatty acid at a deep-sea hydrothermal system

Y. SUZUKI[1], H. NARAOKA[2] AND T. YAMANAKA[3]

[1,2]Department of Chemistry, Tokyo Metropolitan Univ., JAPAN ([1]suzuki-yaeko@c.metro-u.ac.jp , [2] naraoka-hiroshi@c.metro-u.ac.jp)
[3]Facul. Science, Kyushu Univ.,JAPAN (tyama@rc.kyushu-u.ac.jp)

The deep-sea hydrothermal ecosystem is supported primarily by chemosynthetic bacteria. Although, some previous studies revealved that sulfer-oxidizing bacteria are the main primary producers at the Suiyou Seamount hydrothermal vent in the Ogasawara Islands of the north-western Pacific, spatial distribution of the bacterial activity has not been characterized. In this study, we determined compounds-specific carbon and hydrogen isotopic compositions of fatty acid in gill tissues of 6 mussles (*Bathymodiolus*), sediments and filtrated particulates to understand hydrothermal ecosystems at the Suiyou Seamount, as a part of the "Archaean Park Project".

Result and discussion

Isotope composition of total organic carbon in the gill tissue of 6 mussles ranged from –37.1‰ to –34.6‰ (vs. PDB), which are consistent with the reported values from the sulfer-oxidizing bactera. Carbon isotopic compositions of fatty acids ($C_{16:0}$, $C_{16:1}$ and $C_{18:1}$) in the gill tissue showed a variation ranging from –43.1‰ to –36.2‰. This isotopic variation depending on different vent sites is up to 6 ‰, being probably due to the difference in hydrothermal activities.

On the other hand, a large variation was observed in $\delta^{13}C$ of fatty acids between mussels and sea-water filtrate (Fig. 1). For example, $C_{18:1}$ fatty acid of the mussels is more depleted in ^{13}C (- 43.1‰) than that of filtrate (-21.5‰). The fatty acids of sediments have an intermediate $\delta^{13}C$ value between those of mussels and filtrate. This isotope distribution implies that the sedimentary fatty acids are mixtures between ^{13}C-depleted fatty acids derived from sulfer-oxidizing bacteria and normal ^{13}C-enriched fatty acids free from hydrothermal bacterial activities.

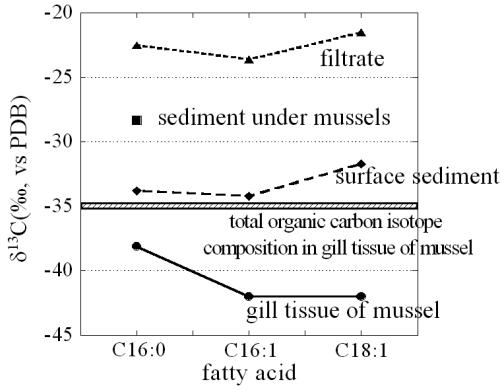

Fig. 1 $\delta^{13}C$ of fatty acid in the mussels, the sediments and the filtrate

Noble gas analyses in two carbonaceous Renazzo type (CR) chondrites: Y-790112 and Y-793495

M. SVETINA[1,2] K. NAGAO[1] AND Y. N. MIURA[3]

[1] Laboratory for Earthquake Chemistry, Graduate School of Science, University of Tokyo, Bunkyo-ku, Tokyo 113-0033, Japan (marta.svetina@guest.arnes.si)
[2] ERICo Velenje, Ecological Research & Industrial Cooperation, P.O. Box 22, 3322 Velenje, Slovenia
[3] Earthquake Research Institute, University of Tokyo, Bunkyo-ku, Tokyo 113-0032, Japan

The chondrites are the most primitive class of meteorites which bring to us the most distant and oldest information about our Solar System. In order to investigate the composition of the trapped noble gases and chronological history of CR2 chondrites, the analyses of noble gas isotopes in two Antarctic meteorites (Yamato: Y-790112 and Y-793495) were performed. Meteorites were analyzed by using a mass spectrometric system (modified - VG5400/MS-II) at the Laboratory for Earthquake Chemistry, University of Tokyo. Two samples of each meteorite were prepared for total melting experiment and stepwise heating experiments. The noble gases were extracted once with single total melt heating up to 1750 °C and once at three different temperatures (500, 1000, and 1800 °C) – stepwise.

Table 1: K-Ar and ^{21}Ne based cosmic-ray exposure ages.

Name	K-Ar age	^{21}Ne	P_{21}	T_{21}
	(Ga)	(*)	(**)	(Ma)
Y-790112	2.5 ± 0.2	2.45	0.33	7.4
Y-793495	1.6 ± 0.2	2.78	0.33	8.4

* 10^{-8} cm^3 STP/g, ** 10^{-8} cm^3 STP/g Ma

K-Ar ages were estimated by using measured ^{40}Ar concentrations and a reported average K concentration (315 ppm) for CR chondrites [1]. The production rate was derived according to the formula given by [2]. T_{21} ages calculated from reported data of six CR2 chondrites [3, 4] are in range 0.6 to 10 Ma. Compared to literature, ours T_{21} (7.4 for Y-790112, and 8.4 Ma for Y-793495) values indicate a rather long exposure age. The He and Ne concentrations and isotopic ratios indicate no solar gas components. The data of Ne scatter within an area defined by Ne-A and cosmogenic Ne components. $^{36}Ar/^{132}Xe$ *vs.* $^{84}Kr/^{132}Xe$ ratios are in range of typical carbonaceous chondrites and concentrations of ^{84}Kr and ^{123}Xe place Y-970112 and Y-793495 in range of C4 to C3 type of chondrite [3].

References

[1] Lodders K. and Fegley B. (1998), Planetary Scientist`s Companion, Oxford Univ. Press.
[2] Eugster O. (1988), GCA **52**, 1649-1662.
[3] Scherer P. and Schulz L. (2000), *Meteorit. Planet. Sci.* 35, 145-153.
[4] Schultz L. and Franke L. (2000), Compilation, CD-ROM.