Japan Geoscience Union Meeting 2012
(May 20-25 2012 at Makuhari, Chiba, Japan)

BPT25-04 会場:201A 時間:5 月 24 日 09:45-10:00

非生物的な黄鉄鉱形成の際の鉄同位体分別のみで、 地球史初期の堆積岩の鉄同位体記録を説明できるか？
Could 'Iron Isotope Biosignatures' be falsified ?

山口 耕生 [1*]
YAMAGUCHI, Kosei E.[1*]

[1] 東邦大学理学部 & NASA Astrobiology Inst
[1]Toho University & NASA Astrobiology Inst

"Iron Isotope Biosignatures" have been a target of considerable debates between two schools (e.g., Beard *et al*., 1999; Bullen *et al*., 2001; Rouxel *et al*., 2005; Yamaguchi and Ohmoto, 2006). One school argues that Fe isotope compositions of certain minerals can be used to distinguish whether they were formed biologically or abiologically. The other school, however, argues that some abiological processes that fractionate Fe isotopes can be solely used to fully explain Fe isotope fractionation in the geologic record. Recently, Guilbaud *et al*. (2011) presented a kinetic Fe isotope fractionation factor for abiological pyrite formation from dissolved and solid FeS, and suggested that low $^{56}Fe/^{54}Fe$ ratio for pyrite from the geologic record could have been produced by this inorganic process. This further implies that Fe isotopes cannot be used to trace ancient biologically mediated redox processes. However, such an interpretation could be wrong because of many reasons (e.g., Czaja *et al*., 2012; see also Guilbaud *et al*., 2012). The Fe isotope compositions of early Precambrian marine sedimentary rocks were produced by numerous processes, including abiological and biological Fe processes involving redox reactions. Interpreting the origin of isotopic variations preserved in the rock record is not an easy task, because it requires systematic consideration of geologic, petrographic, and geochemical contexts. A thorough understanding of the depositional setting, mineralogy, and geologic history of Precambrian sedimentary rocks indicates that the Fe isotope record is likely to reflect biological fractionations and Fe redox processes. In my talk, background information related to Fe isotope geochemistry is introduced first and then some important points of discussion are presented for lively discussion.

References:
Beard *et al*. (1999) Science **285**, 1889; Bullen *et al*. (2001) Geology **29**, 699; Czaja *et al*. (2012) Science **335**, 538c; Guilbaud *et al*. (2011) Science **332**, 1548; Guilbaud *et al*. (2012) Science **335**, 538d; Rouxel *et al*. (2005) Science **307**, 1088; Yamaguchi and Ohmoto (2006) Science **311**, 177.

キーワード: 鉄同位体, 黄鉄鉱, 太古代
Keywords: iron isotope, pyrite, Archean