Japan Geoscience Union Meeting 2013
(May 19-24 2013 at Makuhari, Chiba, Japan)

BPT23-05 Room:301B Time:May 24 12:00-12:15

Field occurrence and geochemistry of the Eoarchean banded iron formations(BIFs) in the Nulliak Assemblages in Nain Provi

Shogo Aoki[1*], SHOMOJO, Masanori[1], SHINJI, Yamamoto[1], AKIRA, Ishikawa[1], SHUHEI, Sakata[2], TAKAFUMI, Hirata[2], KEIKO, Koshida[3], YUSUKE, Sawaki[4], TSUYOSHI, Komiya[1]

[1]Komaba Earth Science Group, Graduate School of Arts and Sciences, the University of Tokyo, [2]Division of Earth and Planetary Sciences, Graduate School of Sciences, Kyoto University, [3]Department of Earth and Planetary Science, Graduate School of Sciences, the University of Tokyo, [4]Department of Earth and Planetary Sciences, Tokyo Institute of Technology

The earth is the only planet where various life exits ubiquitously, thus it is very important to decode the surface environment in the early Earth in order to understand the origin and early evolution of life. Banded Iron Formation (BIF) is one of the chemical sediments in open sea, and consists of interlayering of white silica layers and black or red iron-rich layers. The BIF occurs from the Early Archean to the Paleoproterozoic, and is a key sediment of deciphering chemical evolution of seawter throughout the Preca

mbrian. Particularly, only the BIF provides a record of nutrient contents of sewater in the Eoarchean. However, there are found only few pre-3.6Ga supracrustal belts including BIFs, e.g. the 3.71- 3.81Ga Isua supracrustal belt, >3.75Ga Nuvvuagittuq supracrutal belt and the Nulliak supracrustal rocks in the Labrador. Recently, reassessment of comprehensive U-Pb dating of zircons in the Early Archean Uivak gneisses, Labrador suggested the Nulliak supracrustal rocks were formed >3.9 Ga (Shimojo et al., 2012, Mineral. Mag.). This paper presents geological and geochemical data of the BIFs in the >3.9Ga Nulliak supracrustal rocks in the Nain Complex, Northern Labrador, Canada.

The Nulliak supracrustal rocks comprises ultramafic rocks, mafic rocks, BIF, chert, carbonate rocks, conglomerate, and paragneisses. They underwent the amphibolite to granulite facies metamorphism in the Archean. Especially, the metamorphic grade reached the granulite facies in the western side of the Handy Fault, including the Pangertok Inlet, whereas the metamorphic grade of the eastern side never exceed amphibolite facies, including the Big Island and Nulliak Island. There are two types of BIFs in the area: thin BIF layers associated with mafic rocks, and BIF layers interlayered with carbonate rocks, respectively. The former is a typical Algoma-type BIF, but the latter is associated with shallow-water carbonates, and uncommon in the Archean supracrustal belts. Mineral assemblages of the BIFs are similar each other, and are magnetite + quartz + actinolite + cummingtonite, which are typical of an amphibolite facies assemblage for BIFs (Klein, 2005, Am. Mineral.).

Preliminary chemical analyses show that these BIFs contain >1wt% Al2O3 and relatively high abundances of HFSE (e.g. up to 20ppm Zr). Their high abundances suggest that detritus input was common in the sedimentary environments of the Nulliak supracrustals. On the other hand, their rare earth element (REE) patters display seawater and hydrothermal fluid-like patters, namely positive La and Eu anomalies, and superchondritic Y/Ho ratios. In addition, they contain high Cr, Ni, Zn, Sr and Ba (>50ppm) contents. Particularly, the high abundances of Ni and Zn suggest that the >3.9 Ga seawater were enriched in the transition metals due to high hydrothermal activities or alteration of ultramafic magmas, analogous to the other Archean BIFs, <3.8 Ga (e.g. Konhauser et al., 2009, Nature, Mloszewska et al., 2012, EPSL).

Keywords: the Early Earth, Eoarchean, Banded Iron Formaions(BIFs), Rare Earth Elements