

## Lead, carbon and nitrogen isotope geochemistry of apatite-bearing metasediments from 3.8 Ga Isua supracrustal belt, West Greenland

# Manabu Nishizawa[1], Yuichiro Ueno[2], Yuji Sano[3]

[1] Earth & Planetary Sci., Tokyo Univ., [2] Earth Science and Astronomy, Univ. Tokyo, [3] Ocean Res. Inst. Univ. Tokyo

3.8 Ga sedimentary rocks from Isua supracrustal belt, West Greenland are important for the study of first emergence of life on the Earth. Because these rocks have been affected by successive metamorphic events, it is difficult to find well preserved microfossils with unaltered morphology. However, reduced carbon in the metasediments is a possible candidate for the remains of early life and has been intensively studied (e.g. Schidlowski et al., 1979; Rosing, 1999; Ueno et al., 2002). And it has been shown to be essential to evaluate the origin of the reduced carbon together with the consideration of type of the host rock and its mode of occurrence in the rock (e.g. Oehler and Smith, 1977; Naraoka et al., 1996; Van Zuilen et al., 2002).

Here, we performed two measurements to test for the presence of traces of early life in the Isua sediments. First, we dated apatite from the sediment because association of apatite and reduced carbon is a possible biomarker recently most debated (Mojzsis et al., 1996). Second, we measured C and N isotopes by stepwise combustion at wide range of temperature for the least-metamorphic BIF.

Ion microprobe analysis reveals that apatite aggregate has Pb isotopic ratios that are partly influenced by a component of Pb model age at 1.3 Ga defined by Pb isotopic growth model of Frei and Rosing et al., (2001). While it is unclear whether an age component of 3.8 Ga contributes to the ratios. Therefore we can not evaluate the significance of association of apatite and reduced carbon as a biomarker. Stepwise combustion for the BIF shows that C and N are released at high temperature step (1000~1200 degrees), and probably present within magnetite. It is important to note that the very negative  $\delta^{13}\text{C}$  value,  $\delta^{15}\text{N}$  value and C/N atomic ratio (-30 per mil, -3 per mil and 86, respectively) of gas released above 1000 degrees is comparable to those of Precambrian kerogen from similar grade metasediments (Beaumont and Robert, 1999). Moreover, such significant  $^{13}\text{C}$  depletion is difficult to be explained by carbonate and graphite from siderite decomposition, which is a possible mechanism of abiogenic formation of graphite in the Isua belt. Available Pb-Pb age of magnetite from the same area (3.69 Ga; Frei et al., 1999) suggests that the  $^{13}\text{C}$ -depleted carbon was incorporated by 3.69 Ga, and probably at the time of deposition of the BIF. Therefore, magnetite in the BIF has a possibility to contain primitive kerogen-like matter.