

Mineralogical and geochemical study on sedimentary rock containing microfossils from 1.9 billion years ago(Ga) Gunflint Formation, Canada

*kouhei Sasaki¹, Akizumi Ishida¹, Takeshi Kakegawa¹

1. Graduate School of Science, Tohoku University

The ca. 1.9 Ga Gunflint microfossils are well studied by previous investigators. On the other hand, no agreements exist for primary producers indicated by microfossils, and their living environments. In this study, we performed geological, mineralogical and geochemical studies on samples from Schreiber and Mink Mountain regions. In addition, detailed morphologies of microfossils in stromatolite were observed. In Schreiber region, we discovered the novel microfossils of cyanobacteria colony, akinete, and endospore. Undiscovered microfossil type with radial wall ornamentation is found, indicating eukaryotic affinities. In particular, in situ analysis of microfossils by NanoSIMS discovered multilayered microstructure of cell wall and heterogeneous distribution of carbon, nitrogen and sulfur possibly associated with biological incorporation of those elements followed by later diagenetic modification. At Mink Mountain region, detailed observations and chemical analyses suggest that iron-oxidizing bacteria were dominant around stromatolites. Fe^{2+} and clays were supplied by local and shallow hydrothermal systems along the paleo-coastal lines. Such hydrothermal environments created local anoxic environments, allowing accumulation of Fe^{2+} followed by microbial oxidation. In summary, microbial life at the Gunflint age was more diverse and evolved than previously thought, cyanobacteria were primary producers in most places, but structure of microbial ecosystems in the Gunflint ocean dynamically changed with environments.

Keywords: Gunflint Formation, microfossils, stromatolite