

Description of possible microfossils in 3.5 Ga Barberton Greenstone Belt, South Africa

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The Barberton Greenstone Belt (BGB, ca 3550-3220 Ma) is regarded as one of the best-preserved, middle Archean supracrustal sequence, and is known for occurrences of the oldest microfossils (e.g. Walsh & Lowe, 1985; Walsh, 1992; Furnes et al., 2004). Barberton Greenstone Belt comprises the Onverwacht, Fig Tree and Moodies Groups in ascending order. The Onverwacht Group contains Sandspruit, Theespruit, Komati and Hooggenoeg Formations. The upper Fig Tree and Moodies Groups are mainly composed of pelagic and terrigenous sedimentary rocks, whereas the Onverwacht Group consists mainly of mafic/ultramafic volcanic rocks and pelagic sediments. Although the upper Komati and Hooggenoeg Formations underwent low-grade metamorphism, ubiquitous preservation of relict igneous minerals in basalt/ultramafic lavas and chalcedony and other fine-grained minerals in pelagic sediments indicates that the alteration and recrystallization are still restricted.

Here, we report occurrence of the two types of microfossils; carbonaceous, filamentous microstructures within a black chert at Hooggenoeg Formation (Walsh, 1992) and micrometer-scale mineralized tubular structures at the glassy rims of basaltic pillow lavas at Hooggenoeg Formation (Furnes et al., 2004). Laser-Raman spectroscopic analyses of the carbonaceous filamentous microstructures indicate that the former is composed of mixture of disordered and ordered graphite compounds. And, microscopic analyses of the symbiosis minerals of tubular structures showed aggregates of small titanite and chlorite minerals. The results are consistent to previous works (Walsh, 1992; Furnes et al., 2004)

We made detailed geological maps and some field sketches of fossils-bearing outcrops of black chert on basaltic lavas, and collected hundreds of samples over the area. We described mineral paragenesis of the fossil-bearing pelagic sediments and the altered glassy basalt, and analyzed composition of the coexisting minerals in order to estimate depositional environment of the pelagic sediments accompanied with the paleo-microbiota. Especially, we focused on the composition and occurrence of carbonate minerals and redox-sensitive minerals for estimate of amount of carbon dioxide and oxygen. The two distinct occurrences of the fossils imply that very wide habitat for microbiota were already present.

Walsh, M.M. and Lowe, D.R., 1985. Filamentous microfossils from the 3,00-Myr-old Onverwacht Group, Barberton Mountain Land, South Africa. *Nature*, 314: 530-532.

Walsh, M.W., 1992. Microfossils and possible microfossils from the early Archean Onverwacht group, Barberton mountain land, South Africa. *Precambrian Research*, 54: 271-293.

Furnes, H., Banerjee, N.R., Muehlenbachs, K., Staudigel, H. and de Wit, M.J., 2004. Early life recorded in Archean pillow lavas. *Science*, 304: 578-581.