

Geological and geochemical study of lower-Fig Tree Group in Josefsdal, South Africa

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Accumulating more geological and geochemical data on Archean sedimentary rocks is necessary to constrain the nature of Archean biosphere. For this purpose, geological and geochemical studies are performed on Fig Tree Group (~3.2 Ga) in the Barberton Greenstone Belt, South Africa in the present study. The objectives of this study are (1) to survey lower-Fig Tree Group, which were not described in previous literatures and (2) to constrain paragenesis of silicate, sulfide and carbonate minerals, and (3) to characterize the organic matter in the black chert. In particular, organic matter was examined by the Raman spectroscopy, besides stable carbon isotopic analyses. Result of outcrop survey revealed that strata in studied areas correspond to stratigraphy of Hofmann (2005). Mineralogical investigations showed that Ni-rich sulfide minerals were abundant and some of them were chemically zoned in the black chert. These observations suggest that strata in studied sediments in the lower-Fig Tree Group were silicified by later hydrothermal fluids which contain abundant Ni, most likely leached from ultramafic rocks. Raman Spectroscopic analyses indicate less mature nature of organic matter and the peak temperature lower than $330 \pm 50^\circ\text{C}$. Additionally, $\delta^{13}\text{C}$ values of the examined samples in the Fig Tree Group ranged from -27.9‰ to -23.2‰ (PDB), which is within a range of organic matter produced by Calvin-Benson cycle using atmospheric CO_2 .