Spatial distribution of chromium enrichment in the 3.2 Ga Moodies BIF, Barberton Greenstone Belt, South Africa

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Geochemical data for ferruginous chemical sedimentary rocks (e.g., Banded Iron Formation: BIF) have been used to understand surface environments on early Earth. The 3.2 Ga Moodies BIF in the Barberton Greenstone Belt, South Africa indicated that Cr was enriched in the BIF and was therefore chemically mobile in a shallow marine environment [1]. This finding could be significant because it may indicate the oxidation of the ocean. However, spatial distribution of Cr enrichment in the BIF has not been well understood because the data were obtained from an outcrop and an underground mine. Therefore, the objective of this study is to investigate sedimentary environments and Cr enrichment of the Moodies BIF at other localities.

We conducted new geological surveys at 4 sections in the Moodies Group: a stratigraphically upper section (MdS3) than the previous study (MdS2) at Moodies Hills (MH), and 3 sections (MdS1~3) at a different locality, called the Gate of Paradise (GP) located ~15 km northeast of MH. Whereas the BIF at MH MdS2 and GP MdS1 are overlain by silty sandstone and sandstone, the BIF at MH MdS3, GP MdS2 and MdS3 are overlain by siltstone. Petrographic observation of the Fe-rich layers shows that they are typical oxide-type BIFs and therefore were originally formed as precipitates from seawater. Bulk chemical compositions of the samples were analyzed by WD-XRF or ICP-AES. The Cr/TiO_2 ratios show that the BIF at GP MdS1 was enriched in Cr while the BIF at GP MdS2~3 and MH MdS3 were not enriched in Cr as much as MH MdS1. The results suggest that oxic ocean was limited to very shallow depths such as the sedimentation level of sandstone because the differnce of Cr enrichment is considered to be dependent on the predominant rock types.

[1] Otake et al. (2013) Chromium enrichment in sedimentary rocks deposited in shallow water in the 3.2 Ga Moodies Group, South Africa, *Mineralogical Magazine*, **77**, 1901.