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Formation of Ni-rich smectite in the Tagaung Taung Ni laterite deposit, Myanmar

DR. TSUBASA OTAKE, AYAKA MUROFUSHI, TAKAHIRO DAIMON, RYOSUKE KIKUCHI AND TSUTOMU SATO

Hokkaido University

Presenting Author: totake@eng.hokudai.ac.jp

The Tagaung Taung deposit is the only Ni laterite deposit that is currently mined in Myanmar. Although Myanmar has a drier sub-tropical climate than countries that typically host Ni laterite deposits, the Tagaung Taung Ni laterite deposit produces high-grade Ni ores. Weathering products formed under the drier climatic conditions may play important roles in the enrichment of Ni in the saprolite layers. In this study, geochemical and mineralogical evolution of a weathering profile in the Tagaung Taung deposit was investigated to identify key factors controlling the Ni enrichment during chemical weathering of ultramafic rocks in Myanmar and possibly under similar climatic conditions. The whole-rock geochemical data indicate that Si was retained relative to Fe and Al in the weathering profiles [1], which shows a distinct chemical weathering trend from that observed in weathering profiles of Ni laterite deposits in Indonesia [2]. The bulk NiO contents were as high as 4.89 wt.% in the saprolite layers. The XRD analysis indicates that smectite was abundant in the saprolite layers. The EPMA analysis suggest that smectite is an important host mineral in the saprolite layer. The results of sequential extraction modified for Ni laterite samples support the idea, showing that most Ni in the saprolite layers is present in the residual fraction (e.g., crystalline silicate phases), although some fraction (up to ~20%) of Ni was also likely hosted by low crystalline Fe oxides. Microscopic observations indicate that Ni-rich smectite (>10 wt.% NiO) formed as a replacement product of orthopyroxene. Chemical weathering of pyroxene under oxidized and Si-rich conditions may have caused the formation of the Ni-rich smectite. These results imply that high-grade Ni laterite deposits may develop on unaltered or partly serpentinized harzburgite under the climatic conditions typical of Myanmar.

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