Formation of Ni-bearing minerals during chemical weathering of ultramafic rocks in Myanmar

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Ni laterite deposits are formed by chemical weathering of ultramafic rocks in tropical to subtropical climate regions. Few geochemical studies have been carried out on Ni laterite deposits in Myanmar although they are expected to be explored more in the future. Among various chemical weathering processes, Ni mobilization from the weathered bedrock and fixation to the secondary minerals have been considered as important processes governing Ni enrichment in the ore (i.e., saprolite) zone. In this study, we investigated the formation of Ni-bearing minerals in three profiles with different degrees of chemical weathering to understand the formation processes of a Ni laterite deposit in Myanmar.

The results of mineralogical characterization by XRD and petrography show that minerals formed in the saprolite zones vary depending on the degree of weathering given that all bedrocks are serpentinite. Smectite dominates in the saprolite zone of the least weathered profile while both smectite and secondary formed serpentine (Ser-II) are present in the saprolite zone of the most weathered profile. Moreover, SEM-EDS analysis show that Mn-oxides such as asbolane is the main mineral concentrating Ni in the least weathered profile, suggesting that Ni is preferentially associated with Mn-oxides rather than smectite at the initial stage of weathering. On the other hand, secondary silicate minerals (e.g., Ser-II, smectite, unidentified Fe-Ni silicates) are the main host minerals in the most weathered profile. Therefore, as weathering progresses and Mn-oxides dissolves, Ni is enriched into the secondary silicate minerals. No preferential incorporation of Ni was observed between Ser-II and smectite. Further progress in chemical weathering may result in the transformation of other silicate minerals into Ser-II that is enriched in Ni.