

Change in Co and Mn speciation during the differentiation of a lateritic regolith upon peridotites in New Caledonia

G. DUBLET¹, F. JUILLOT^{1,2}, E. FRITSCH^{1,2}, D.
FANDEUR¹, F. PLOQUIN¹, J. BREST¹, O. PROUX³,
JL. HAZEMANN³, L. OLIVI⁴ AND G. MORIN¹

¹IMPMC, UMR CNRS 7590, UPMC, IRD, MNHN,
France

²IRD, UR 206, Noumea, New Caledonia

³ESRF, Grenoble, France

⁴ELETTRA, Basovizza, Trieste, Italy

Because of their significant cobalt (Co) content, the long-term weathering of peridotites under tropical climate can lead to important accumulation in lateritic regoliths. Assessing the crystal-chemistry of Co in these settings can be useful for optimizing their mining. In addition, considering the potential toxicity of Co (Simonsen et al., 2012), it can also help evaluating the environmental consequences of lateritic Co mining. Co has been long considered to be mainly associated with Mn-oxides in soils (Taylor, 1968), and especially in lateritic regoliths (Becquer et al., 2006; Dzemua et al., 2013). However, this element can also be found associated with Fe-oxides in these settings (Quantin et al., 2002), which raises the question of the actual contribution of Mn- and Fe-oxides on Co speciation in lateritic regoliths upon peridotites.

Here, we report the results of a high-resolution XANES analysis of Co and Mn speciation along a lateritic regolith upon peridotites in New Caledonia. These results indicate a vertical evolution from Mn(II)- and Co(II)-silicates (olivine and serpentine) in the bedrock, to Co(III) associated with Mn(III/IV)-(hydr)oxides in the saprolite and then Mn(III)- and Co(II)-goethite in the laterite. After showing natural evidence for the oxidation of Co(II) into Co(III) by Mn(III/IV)-(hydr)oxides previously reported from laboratory experiments (Manceau et al., 1997), these results emphasize the importance of this reaction on the behavior of Co at intermediate stages of regolith differentiation. In addition, by showing the importance of Co(II) trapping by Fe-(hydr)oxides at the ultimate stage of this differentiation, they also emphasize the role of this mineral species in the long-term scavenging of Co in lateritic regoliths upon peridotites.

Becquer et al. (2006) *EJSS*, **57**, 200-213. Dzemua et al. (2013) *Min. Deposit.*, **48**, 155-171. Manceau et al. (1997) *Am. Min.*, **82**, 1150-1175. Quantin et al., (2002) *Soil Sci. Soc. Am. J.*, **66**, 1797-1804. Simonsen et al. (2012) *Sci. Tot. Env.*, **432**, 210-215. Taylor (1968) *J. Soil. Sci.*, **19**, 77-80.