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# XAS evidence for Ni sequestration by siderite in a lateritic Ni-deposit from New Caledonia

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## Abstract

Mineralogical and spectroscopic analyses were conducted on a lateritic Ni-deposit from Southern New Caledonia. Results show that Ni is incorporated in siderite ($FeCO_3$) found between 37 and 40 m depth in the laterite and saprolite units of the regolith. SEM-EDXS analyses of siderite-rich samples indicate that a significant amount of nickel can be hosted by this crystalline phase (~0.8 wt% NiO). Ni and Fe *K*-edge extended X-ray absorption fine structure (EXAFS) spectroscopic analyses of the siderite-rich samples from the regolith as well as comparison with synthetic Ni-bearing and Ni-free siderites demonstrate isomorphous substitution of $Ni^{2+}$ for $Fe^{2+}$ in the siderite structure. Linear combination fitting (LCF) of the Ni *K*-edge EXAFS data reveals that this Ni-bearing siderite species accounts for more than 90% of the total Ni pool (1 wt% NiO) in the siderite-rich horizons of the regolith. In addition, LCF analysis of the EXAFS spectra indicates that goethite and serpentine are the major Ni hosts in the upper horizons (laterite) and lower horizons (saprolite) of the regolith, respectively. Formation of siderite, an uncommon mineral species in such oxidized environments, is attributed to the development of swampy conditions in organic-rich lateritic materials that accumulated at the bottom of dolines. These results thus show the importance of siderite as a host for nickel in lateritic Ni deposits that have been affected by late hydromorphic and reducing conditions.

**Keywords:** Siderite, XAS, nickel, laterite, speciation