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Highlighting of nickel using the hyperspectral signal of minerals originating from New Caledonia lateritic profiles

Duée Cédric^{1*}, Da Silva Alves Anthony¹, Maubec Nicolas¹, Blaineau Pierre-Gilles¹, Orberger Beate^{2,3}, Bui Thanh², Pillière Henry⁴, Bourrat Xavier¹, Le Guen Monique²

¹BRGM, 3 avenue Claude Guillemin, BP36009, 45060 Orléans Cedex 2, France

²ERAMET-ER-SLN, 1 avenue Albert Einstein, 78190 Trappes, France

³GEOPS-Université Paris Sud, Bâtiment 504, 91405 Orsay Cedex, France

⁴INEL-ThermoFisher Scientific, 71 rue d'Orléans, 45410 Artenay, France

*Corresponding author: c.duee@brgm.fr

The SOLSA project (www.solsa-mining.eu) aims to develop an on-line-on-mine expert system coupling sonic drilling, chemical and mineralogical analyses and data treatment. In a first place, this expert system is planned for lateritic profiles of New Caledonia, known to hold nickel.

The latter is found in two forms in these profiles. First, nickel can be adsorbed on the surface or inserted in the structure of goethite (α -FeOOH) present in the limonites and saprolites. Second, Ni may substitute Mg in different silicates of saprolite, like in garnierite, known to be nickel-rich and corresponding to a mixture of phyllosilicates usually occurring as vein or porosity filling.

The SOLSA system will combine several analytical techniques, such as XRD, XRF, Raman spectroscopy, RGB or hyperspectral, and the data collected will be compared to an internal library in order to identify the several minerals present in the lateritic profiles. Therefore, the elaboration of a comprehensive library, taking into account the influence of chemistry on the different signals, is mandatory.

Thus, our study focuses on the evolution of the hyperspectral signal (400-2500 nm) with the quantity of nickel for several Ni-bearing silicates present in the lateritic profile. Among the results, nickel influences the behaviour of the doublet in the 1380-1405 nm region for the specific mineral association constituting the garnierite.

References:

- Faust, G.T (1966) American Mineralogist 5: 279.
Cluzel, D., Vigier, B. (2008) Resource Geology 58: 161.