

Lateritic Ore Deposits: The Last Continent to Discover?

Georges Calas, Institut de Minéralogie, Physique des Matériaux et Cosmochimie, Université Pierre et Marie Curie, Paris, FRANCE

Mineralized laterites form under intense weathering of serpentines in a humid tropical climate with the development of a deep regolith. As developing economies spur a greater need for stainless steel and high-tech devices such as Solid Oxide Fuel Cells and Lithium Ion Batteries, Ni-Co-Sc laterites are receiving increased attention. Laterites account for about 70% of known global Ni resources and are probably the most important primary resource for Sc. The skyrocketing present-day demand of Co makes now this metal a co-product and no more a by-product of Ni-laterites. On the other hand, supergene processes can increase REE concentration, in particular the HREE, which are rarely concentrated elsewhere, leading to "ion adsorption clays" which are intensely exploited in Southern China.

Lateritic mineralizations result from a heterogeneous set of concentration processes, varying not only with the metal considered but depending also with other parameters (local geology, geomorphology...). The mineralogy of these ores is often still debated. This talk will focus on the most weathered part of the lateritic profiles, where prevalent Mn-oxides and Fe-oxides (hematite and goethite) coexist with minor clay minerals. Specific mineralizations include adsorption on clays, substitution into major phases and the formation of original phases by conversion to high oxidation states. Investigating these mineralizations by spectroscopic and microscopic methods provides unique clues on the formation conditions of these concentrations. They also illustrate how element speciation, crystal-chemistry and surface reactivity control element concentration in these finely divided weathering profiles. Close to the surface and with a limited thickness, these deposits are challenging in terms of sustainability, ore processing technologies and environmental constraints.