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Chemical and physical transfers in an ultramafic rock weathering profile: Part 1. Supergene dissolution of Pt-bearing chromite

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Abstract

Chemical weathering and supergene dissolution processes of Pt-bearing chromite have been studied in a lateritic weathering profile developed on ultramafic rocks in New Caledonia (southwest Pacific). The chemical distributions of alkaline earth, transition metals, and precious metals (including Pt and Pd) were determined in a weathering profile varying from bedrock at the base upward through coarse and fine saprolites, and capped by a mottled zone and a lateritic colluvial nodular horizon. Chemical analyses and mass-balance calculations suggest that progressive weathering of the parent rock is characterized by an enrichment of Fe, Co, and Mn, a segregation of Ni at the boundary between the bedrock and the coarse sapolite and in the lower part of the fine saprolite, and a depletion of Mg, Ca, Si, Al, and Cr. The higher concentration of transition metals at the interface between the coarse and fine saprolite is due to vertical transfer and precipitation at the base of the weathering profile. In such a lateritic environment, the Pt-bearing chromite grains are progressively dissolved and the Pt-group minerals (PGM) are released in the weathering mantle with a preferential depletion of Pd with regard to Pt.

Keywords: Lateritic weathering, ultramafic rocks, mass-balance calculation, Pt-chromite, New Caledonia