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Chemical and physical transfers in an ultramafic rock weathering profile: Part 2. Dissolution vs. accumulation of platinum group minerals

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Abstract

The chemical weathering of ultramafic rocks has resulted in eluvial concentration of Pt-group minerals (PGM) in lateritic weathering profiles of southern New Caledonia. The Pt mineralization interpreted as being primary consists of Pt-group minerals included within chromite crystals. The occurrence of PGM as free particles in the weathering profile results from the supergene dissolution of Pt-bearing chromite (Traoré et al. 2008). Following their release in the profile, supergene dissolution processes variably affect the PGM particles. The behavior of Pt-group elements in the weathering profile is characterized by significant loss of Pd and relative enrichment of Pt indicating that Pd is more mobile than Pt in the exogenous cycle. Unstable Pt-Fe-Cu-Pd alloys and PGE oxides undergo chemical and mineralogical changes to acquire the chemical configuration of isoferroplatinum (Pt_3Fe), which is the most stable Pt phase in a lateritic environment. The isoferroplatinum phase may also be dispersed throughout the weathering mantle and/or accumulated in the lower parts of profiles according to a translocation mechanism of residual Pt-rich fine particles driven by percolation of water through the connected pore spaces.

Keywords: Platinum group minerals, platinum group elements, lateritic weathering, ultramafic rocks, New Caledonia