LATERITIC WEATHERING OF THE YUBDO ULTRAMAFIC MASS, WOLLEGA, WESTERN ETHIOPIA: EVIDENCE FOR THE HYPOGENE BEHAVIOUR OF PLATINUM GROUP ELEMENTS

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The Yubdo ultramafic mass, covering an area of 30 sq.km., is a late Proterozoic (Pan-African) ophiolitic structural belt in western Ethiopia. It represents one of an array of ultramafic complexes defining a suture along which the island arc/backarc terranes and continental microplates of the Arabian-Nubian Shield are welded together. An enigmatic problem is the origin of the platinum group element (PGE) deposit in the lateritic weathered mantle overlying the ultramafic rocks.

The rock consists of serpentinized dunite in the central part grading along the margins into altered peridotite, lherzolite, olivine-pyroxenite and gabbro. Mineralogical and chemical compositional studies of three typical lateritic profiles from the flanks of old excavations of Kilinto, Melka Alati, and Nordi is presented. The characteristic feature of the deposit is the presence of a presumed reaction zone known as Birbirite developed between the serpentinized dunite and granitoid intrusive. Lateritic profile range from 2m to 20m thickness and contain kaolinite, halloysite, illite group (hydromica, smectite), sericite, finely dispersed varieties of silica and iron hydroxide (geothite, haematite, limonite), chromite-magnetite-ilmenite complex minerals, and traces of zircon, apatite, magnesite and sphene.

The PGE in the laterite is found mainly in the form of small grains of sperrylite (Pt: 77.6%, Os: 1.7%, Ir: 0.6%, Rh: 0.7%, Pd: 0.3%, Au: 2.1%, and Fe: 15.2%) with cores of chromite and ferroplatinum coated with iron oxyhydroxides. However, significant amounts are also chemically linked into the lattices of the hydrated silicates (clay minerals and serpentine). The platinum content of the lateritic layers average about, in descending order: 0.25 g/m3 in Wockassa, 0.53 g/m3 in Chierecha, 0.28 g/m3 in Bondo, 0.432 g/m3 in Kuwa and estimates of about 0.776 g/m3 in the bedrock. In conclusion, PGE enrichment in the Yubdo lateritic layers is interpreted as a complex process of accumulations due to hypogene mineralogical transformations (as in hydromica and smectite) aided by hydrothermal and metasomatic activity, and in still unweathered serpentine minerals. Other concentration mechanisms include percolating pneumatolytic solutions.