

Geochemistry and PGE mineralogy of chromitite seams of the eastern Bushveld complex, South Africa

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With the increasing interest in chromitites of the Bushveld complex as platinum-group element (PGE) ores, the need to characterize these layers and their PGE mineralization has grown. This is particularly true for the eastern limb, which in general has been under-explored relative to the western limb.

The whole-rock PGE geochemistry of the eastern limb chromitites was investigated in the 1980s [1, 2]. These studies indicated that the PGE concentrations in the chromitites increased with continued fractional crystallisation. It was also found [2] that the Pt/Pd ratio remains constant right up to, and including, the Merensky reef.

This geochemical investigation was based on borehole core samples, comprising a complete section through the Middle Group (MG) chromitite layers in the central part of the eastern limb [3]. The mineralogical study was supplemented by data from Lower Group (LG) and MG chromitite xenoliths which were associated with the Onverwacht and Tweefontein dunite pipes [4]. The whole rock PGE patterns of all the layers show the same positive Rh anomaly which typically is displayed by the UG2 chromitite. The MG layers display an increase of the HT-PGE (Os, Ir and Ru) relative to the LT-PGE (Pt, Pd and Rh) with stratigraphic height. The individual groups both correlate positively with the Cr₂O₃ concentration.

High magnification ore microscopy and back-scattered electron imaging indicate that very fine-grained (generally $\leq 10 \mu\text{m}$) laurite is by far the major PGE mineral. The laurite composition does not vary significantly from the bottom of the LG to the top of the MG layers, indicating constant S fugacity. This is in contrast with the Upper Group (UG) layers, in which a great variation of PGE minerals is found. A peculiarity of the MG layers is that laurite is often associated with rutile.

[1] Lee & Tredoux (1986) *Econ Geol* **81**, 1087. [2] Lee & Parry (1988) *Econ Geol* **83**, 1127 [3] Kottke-Levin *et al.* (2009) *Appl Earth Sci (Trans Inst Min Metall B)* **118**, 111. [4] Zaccarini *et al.* (2002) *Can Min* **40**, 481.

Trace element mobility during spheroidal weathering of dolerite dykes from central Portugal

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This study focused in an outcrop of central Portugal where several dolerite dykes, intercalated in granite, show a characteristically well developed spheroidal weathering pattern, forming concentric shells of decayed rock. The trace element mobility during weathering of four rounded boulders of decomposition, from three dolerite dykes, is analyzed. Each of them was separated in a clay-rich external shell, two intermediate shells and a core. Their chemical and mineralogical composition was obtained by neutron activation analysis and X-ray diffraction, respectively.

Primary minerals (Ca-plagioclase, augite and biotite) predominate over secondary phases (chlorite, smectite, kaolinite and talc) in the inner parts of the boulders. The more external shells present abundant clay minerals, especially smectite, being the primary minerals accessory or inexistent.

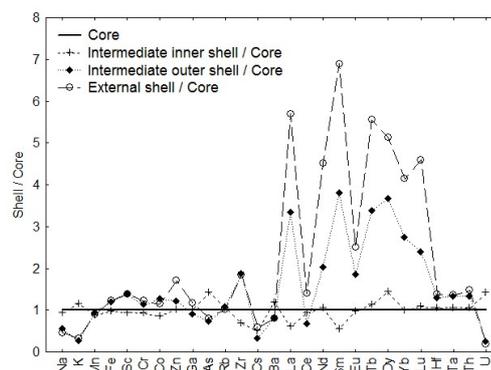


Figure 1: Chemical variability in one rounded boulder.

Weathering promoted the release of REE³⁺ from primary phases, mobilization by meteoric waters, and incorporation in secondary phases, especially smectite, the most abundant clay mineral. Ce and minor Eu were retained, causing negative anomalies. Hf, Ta, Th, Zr, Fe, Sc and Zn were also mobilized into secondary phases. The impoverishment of the outer shells in Na, K, Cs, Ba and U shows they were mobilized out of the system during alteration.