Biotite oxidation in the weathering profiles of granitic rocks: chemistry, mineralogy, and implications for elemental behavior

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Biotite was oxidized in the deep saprolitic weathering profiles of granitic rocks in a humid temperate climate. The mineralogy and chemistry of oxidized biotite were characterized by chemical analysis, electron microscopy, X-ray diffraction, thermal analysis, and radiogenic Ar analysis. The results showed that b_o-dimension decrease, radiogenic Ar loss, and vermiculite formation are fairly synchronized with oxidation degree of ferrous iron. The chemical composition of oxidized biotite was modified by a non-stoichiometric removal of cations in the order Fe > Mg _ K to compensate for the charge imbalance induced by iron oxidation. The pervasive loss of cations and radiogenic Ar suggests their diffusion through oxidizing biotite in a non-expanded state. Iron oxidation and cation loss caused decrease in the b_o-dimension with the formation of discontinuities as a conduit of the weathering solutions, resulting in partial vermiculitization (< 10%). The iron oxidation was nearly completed at the lower part of the profile concomitantly with rapid mineralogical and chemical modification to oxidized biotite which persists throughout the profile without further notable modification. Less-soluble oxidized biotite persisting in the weathered profiles may be one of the factors related to the discrepancy between laboratory and field dissolution rates of biotite. Cation release from biotite is governed in early stage by the formation of oxidized biotite, and later by its decomposition.

Correlation between Morphology and Isotopic Composition of Oxygen and Carbon of Calcite from Mezica Mines, Slovenia

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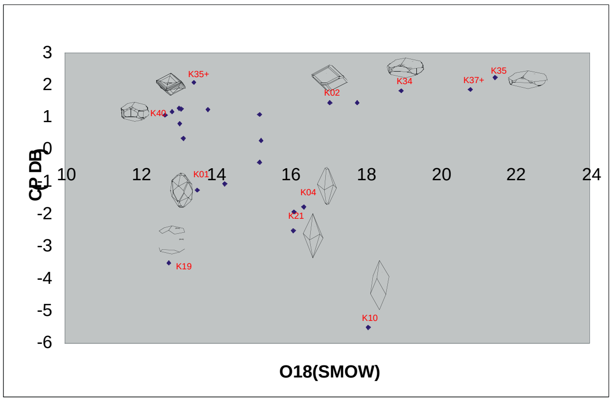
Stable oxygen and carbon isotopic analyses of calcite from open carbonate veins, also containing wulfenite crystals, in Pb-Zn deposit Mezica indicate a close connection between morphology of calcite crystals and their isotopic composition (Fig.1).

Calcite crystals enriched with light oxygen isotope, which most probably precipitated from relatively high temperature hidrotermal solutions of non magmatic origin, show much more developed forms relative to low temperature calcites enriched with heavy oxygen as well as light carbon isotope.

Figure 1. Morphology of calcite crystals related to isotopic composition of oxygen and carbon.



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