

Extreme enrichment of Arsenic and Antimony during formation of Ni-Cr-rich jasper and quartzite from serpentinized peridotite

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Alteration of serpentinised peridotites of Highland Border Complex in Scotland take place in two steps. Listvenite-like dolomite-quartz rocks are formed by addition CaO and CO₂ at constant MgO and SiO₂ involving a mass-increase of ca 140 %. Stage-two involves dissolution of dolomite evinced by the abundant pores and rhombohedral-shaped grains of quartz to form Cr- and Ni-rich jasper and quartzites. Formation of the jasper-quartzites involve a mass-reduction of ca 80%. The listvenite-like and jasper-quartzite rocks have enrichment in the fluid mobile elements Ba, Sr, Cs, As and Sb. The As is present in the Aluminium Phosphate-Sulphate group of minerals formed during alteration of Cr-spinel. Cr-spinel also alters to porous hematite and ferrihydrite with patches containing up to 5 wt% As₂O₃. Enrichment of As, related to alteration of chromite, is previously unknown from natural rocks, but strongly resembles efficient methods used for remediation of this potential toxic element. Formation of quartzite and jasper from peridotite and their common presence as pebbles both in the Devonian Old Red conglomerates, in the Highland Border Complex and in Devonian Basins in the Scandinavian Caledonides, highlights their importance and potential for provenance- and tectono-stratigraphic correlations.