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Li-rich zincostaurolite and its decompression-related breakdown products in a diaspore-bearing metabauxite from East Samos (Greece): An EMP and SIMS study

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ABSTRACT

Li-H-rich zincostaurolite locally formed at a metabauxite-marble contact along the eastern coast of Samos during early Alpine high-*P*, low-*T* metamorphism. The staurolite, which probably grew from gahnite, cookeite, kaolinite/pyrophyllite, diaspore, and minor Fe-oxide, occurs as prismatic crystals (up to several mm long) in a calcite matrix. It has an unusual composition with 7.5–12.9 wt% ZnO, 1.0–4.9 wt% FeO, 0.66–0.82 wt% Li_2O, up to 2.6 wt% NiO and 0.59 wt% CoO, and ≤ 0.32 wt% MgO. Calculated structural formulae point to high H_2O contents (≥4.14 H atoms per 48 oxygen atoms). During late-Alpine uplift of the Samos rocks, the staurolite was, at greenschist-facies conditions, variably replaced by bluish cobaltoan gahnite (X_{Zn} > 0.82), white Na-Ca-Li mica, Ni-rich chlorite (X_{Ni} = 0.42–0.59), zincohögbomite (X_{Zn} = 0.68–0.80), diaspore, and Fe-(hydr)oxide. Detailed EMP work and determination of Li in staurolite and mica by SIMS indicates systematic Zn-Fe-Mg-Ni-Co-Li partitioning between staurolite and its decomposition products, implying local-scale chemical equilibrium. Balanced reaction equations based on mineral-chemical data indicate that the breakdown of staurolite occurred largely isochemically with only introduction of water, Na, and Ca into the reacting system. The breakdown of high-*P* staurolite during uplift and decompression is thought to be related to the sensitivity of its complex crystal chemistry to changes in physico-chemical conditions.