From rare metal granite to Sn-W-Li-Nb-Ta mineralizations: results on Argemela (Central Portugal)

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Strong enrichments in metals such as Li, Sn, Nb, Ta can occur in rare-metal granites (RMG), leading to magmatic crystallization of cassiterite or columbite. Although W can be also enriched, magmatic crystallization of wolframite is generally not observed. Nevertheless, RMG can be spatially associated with vein-type Sn and W mineralizations in the granite aureole. Mechanisms of transfer of metals from highly evolved granitic stocks are being studied on the example of Argemela (Central Portugal). The Argemela granite is a typical RMG with about 1600 ppm Li, 680 ppm Sn, 46 ppm Nb, 47 ppm Ta and 13 ppm W in bulk rock. Li, Nb and Ta enrichments in the RMG are respectively expressed as disseminated Li-phosphates (amblygonite-montebrasite) and as Mn-columbite. Sn is expressed as primary disseminated magmatic Ti-enriched (30-600 ppm) cassiterite and as secondary Ti-depleted (0-5 ppm) cassiterite containing zoned Mn-columbite -tantalite inclusions. No wolframite occurs in the granite. The RMG intrudes schists with various mineralizations in rare metals. Several mineralizing events can be recognized all distributed in a N170°E dextral-shear corridor. The intrusion crosscuts both older Sn-Li-bearing veins and one W-bearing vein. However, the Argemela RMG hosts intragranitic veins which contain wolframite, sometimes in large amounts. In some veins, wolframite is associated with K-feldspar, quartz and Li-phosphates whereas, in some others, wolframite is closely associated with cassiterite. Both the early wolframites (~38% ferb) in the schist-hosted vein and the wolframites (~30% ferb) in the intragranitic veins are hübnerites with rather low Fe contents compared to wolframites from the spatially close Panasqueira deposit (~85% ferb). The occurrence of hübnerite in intragranitic veins strengthen the possibility of a genetic relationship between RMG and perigranitic W deposits. Overall, our results document the behaviour of Sn, W, Li, Nb and Ta at the magmatic-hydrothermal transition and highlight the mineralizing potential of RMG for W.