

Abstract

# Multi-scale and interdisciplinary approaches to the granite-related ore-forming systems in the Segura-Argemela-Panasqueira-Góis belt (Portugal); insights for innovative exploration surveys †

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**Abstract:** The Segura-Argemela-Panasqueira-Góis belt (Portugal) extends for ca. 150 km, including various granite-related ore-forming systems: Sn(-Nb-Ta) and Li(-Sn-Nb-Ta) aplite/pegmatite-types and Sn-Li, Sn(-W), W-Cu(-Sn) quartz vein-types.

The pre-Ordovician metasediments are affected by many shear zones and intruded by voluminous Cambrian-Ordovician and Carboniferous-Permian (Variscan) plutons and different arrays of dykes. The Average Shale-normalized composition of metapelites denotes variable enrichments in Li, Cs, Sn, Hf, Bi, As and Sc. Variscan granite suites are more fertile than those of Cambrian-Ordovician age; among them, the strongly differentiated and ferroan leucogranites indicate the most promising targets. The latter two granite groups and related magmatic-hydrothermal ore-forming processes can be traced by Nb/Ta, K/Rb, Y/Ho, Sr/Eu, Eu/Eu\*, Zr/Hf, and Rb/Sr ratios. Also, the lanthanide “tetrad effect” parameter (TE1,3) co-varies positively with magmatic differentiation and metal-enrichment. The geochronological data obtained confine to ca. 310-290 Ma the mineralizing events within the surveyed belt.

Segura aplite-pegmatite dykes are compositionally close to the Argemela granites, depicting the involvement of highly differentiated, Na<sub>2</sub>O-rich magmas. Compared to Panasqueira granites, Segura aplite-pegmatite dykes are characterized by excess P not linked to apatite but to amblygonite-montebrazite and to Fe-Mn rich phosphates. These dykes also include Nb-Ta- and Sn-oxides, often displaying complex compositional zonings. The composition of several minerals (e.g., muscovite, tourmaline, and zircon) in different settings, including contact metamorphic aureoles encircling “fertile” granites, are being successfully tested as finger- and footprints to different mineralization types. Similarly, the abundance and composition of alluvial TiO<sub>2</sub>-polymorphs, cassiterite, wolframite, and scheelite produce anomaly haloes useful to geochemical exploration in the belt.

**Keywords:** granite-related ore systems; mineral exploration; Portugal

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