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Geochemistry and ore-forming processes of multistage granitic magmatism in the Central Iberian Zone: Segura-Panasqueira Belt (Portugal) case study

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Granite-related ore deposits are major resources of many critical metals and have been one of the major targets of mineral exploration over the last decades. The Segura-Panasqueira Belt, located in the Central Iberian Zone (ZCI), is one of the several well-defined belts that form a Sn-W-Li world-class province of Paleozoic age in Iberian Variscides, comprising several long-lived granite-related ore systems. Despite the growing interest in these ore systems, several aspects remain poorly understood. Our ongoing work aims to understand the processes controlling the different degrees of differentiation and metal enrichment during the generation of silicate melts, using some examples from the Segura-Panasqueira belt as case studies. For that purpose, a comprehensive multi-elemental whole-rock geochemical characterization of the main (composite) plutons within the belt was conducted, representing the two major regional magmatic pulses: Cambrian-Ordovician and Carboniferous-Permian (Variscan). Preliminary results show that: (i) the majority of Cambrian-Ordovician tonalites and granodiorites are weakly peraluminous I-type, calcic to calc-alkalic and magnesian rocks; (ii) the Carboniferous-Permian monzogranites and granites are highly peraluminous S-type, calc-alkalic to alkali-calcic and magnesian to ferroan rocks; and (iii) the Variscan magmatism is clearly more fertile, especially the strongly differentiated and ferroan leucogranites from the Penamacor-Monsanto and Segura plutons, which were generated by high-T partial melting of pelitic rocks. The granitic facies of the Penamacor-Monsanto and Segura plutons are characterized by degrees of differentiation (Rb/Sr up to 18.93 and 14.53, respectively) and metal enrichment (up to 391 and 48 ppm Sn, 661 and 305 ppm Li, 27.3 and 32.7 ppm Nb, 8.83 and 10.5 ppm Ta, respectively) close to granitic rocks related to ore-forming processes at reference places such as Panasqueira (W-Sn) and Argemela (Sn-Li).

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