Rare-metal mineralization associated with a Variscan breccia pipe (Borralha, N Portugal)

A. GONÇALVES*, F. NORONHA

Departamento de Geociências, Ambiente e Ordenamento do Território – Instituto de Ciências da Terra (ICT), Pólo-Porto, Faculdade de Ciências, Universidade do Porto, Rua do Campo Alegre 687, Porto, Portugal (*anagoncalves.geo@gmail.com)

Borralha deposit is located at the Northwest of the Iberian Variscan Belt. In Borralha were exploited quartz veins with wolframite and scheelite. After Panasqueira, it was the second tungsten mine of Portugal. In addition to the mineralized veins, Borralha has the specificity to have two breccia pipes where the Santa Helena breccia (SHB) is the most important. In the European Variscan Belt, it is rare the occurrence of W mineralization in breccia pipes. SHB corresponds to a sub-vertical structure, with N-S major axis, cutting the contact between synorogenic Variscan granites and metasedimentary rocks (Silurian in age). In this contribution, we present some new data about the mineralization features in SHB based on the study of new drill-core samples. The ore occurs disseminated in the breccia elements, in the quartz cement and in late fractures. In the mineral assemblage, we can distinguish two main stages of deposition in a quartz-sericite-chlorite matrix: an oxidic stage and a sulphidic stage + native Bi. The oxidic stage is mainly characterised by the occurrence of wolframite and scheelite; the sulphidic stage is less expressive. We distinguish two generations of wolframite: wolframite I occurs in well-developed anhedral to subhedral crystals (≈500 μm) with MnO ranging from 2 to 11%, and wolframite II occurs in small euhedral crystals (≈10 μm) in late fractures cutting wolframite I and is characterised by an enrichment in MnO (>12% MnO). Wolframite I occurs associated with scheelite (≈200 μm) and also contains very fine crystals (5-20 μm) of niobium-tungstate, columbo-tantalite, monazite and fluorite. This mineral phases exhibit a complex internal texture characterised by a compositional zoning at the micrometer scale, resulting from successive episodes of crystallization caused by fluid circulation. The breccia pipe with rare-metal mineralization suggests a magmatic-hydrothermal history related with a intrusion still unknown at depth.

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