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Assessment of tourmaline composition as a vectoring tool for Sn-W deposits - The Góis-Panasqueira-Segura belt (Central Portugal)

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Abstract

Tourmaline is a common accessory mineral in Variscan S-type granites and their metasedimentary host rocks and is often present in hydrothermal alteration haloes associated with Sn-W deposits, where tourmalinization can locally develop tourmalinites. About 2000 Electron Probe Micro Analyser (EPMA) data were compiled for tourmaline from the Góis-Panasqueira-Segura Sn-W belt, to assess its potential as a vectoring tool for Sn-W deposits. Granite tourmalines are typically schorlitic with low #Mg ($\text{Mg}/(\text{Mg}+\text{FeT})$) and #Ca ($\text{Ca}/(\text{Ca}+\text{Na}+\text{K})$), whereas metasediment tourmalines are dravitic with higher #Mg and #Ca. #Mg vs. #Ca plots highlighted: magmatic differentiation trends for composite granites, with progressive decrease in #Mg and #Ca; compositional variability within metasediments; and mixing lines, for each individual hydrothermal system, between tourmaline compositions buffered by metasediments and by magmatic-hydrothermal fluid sources. The mixing line spread discloses the hydrothermal system magnitude (time, space, and mineralizing fluid volume), as shown by the wider trend for the Panasqueira deposit when compared to smaller deposits such as Góis or Segura. However, full interpretation of mixing lines, or deviations from it, require detailed petrography and careful microprobe spatial and compositional control, to address aspects such as multiple tourmaline generations, compositional zoning, or even diffusion mechanisms. In general, hydrothermal tourmaline documents a progressive increase in #Mg and #Ca reflecting a concomitant rise of the magmatic-hydrothermal fluid component. Except for Panasqueira, tourmalinites at the Penamacor-Monsanto batholith exocontact record the lowest #Mg values denoting its proximity to the intrusion. For systems like Góis, where no granites are known in the vicinity, the trend starts at higher #Mg values and a more distal position relative to a causative granitic intrusion is believed. Tourmaline composition by EPMA, a cost-effective routine method, holds promise as an exploration tool for Sn-W deposits.

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