Electron- and ion-microprobe analyses, and genetic inferences of tourmalines of the foitite-schorl solid solution, Elba Island (Italy)

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Abstract: The Li, B and H contents of foitite were investigated for the first time by means of secondary ion mass spectrometry (SIMS). The studied foitite occurs in the pockets of Elba pegmatites, not only as previously described, acicular and fibrous crystals, but also as black-violet, fibrous-to-prismatic overgrowth at the terminations of elbaitic, polychrome tourmalines. A variety of compositions, belonging to the foitite-schorl solid solution, were recognised. Foititic compositions observed as overgrowths of polychrome crystals are associated with the crystallisation of zeolites at the beginning of a zeolite hydrothermal stage. Morphologically similar overgrowths, but richer of schorlitic component, are associated with later hydrothermal circulation along late-stage fractures that crosscut the pegmatites and the host monzogranite.

The agreement between the stoichiometric boron concentrations (as B₂O₃ wt.%), calculated assuming 3 B apfu, and in-situ SIMS data are good, with discrepancies generally within the estimated uncertainty of the ion-probe analytical procedure (3 % rel.). In the case of H, the SIMS values are, mostly, a little lower compared to values calculated assuming 4 H apfu. However, such a discrepancy is in the most cases within 5 %, and for the rest, within 7 % rel., and is comparable to the SIMS analytical uncertainty in this tourmaline compositional range. In the case of Li, the ion microprobe values closely match those derived by calculation of the Li required to fill the $Y$ site. The results testify the high potential of SIMS for light-element, accurate analysis of compositionally complex samples.

Key-words: foitite, tourmaline, SIMS, Li, B, H, pegmatite, Elba.

Introduction

Foitite, an X-site-vacant tourmaline, was described as a new mineral by MacDonald et al. (1993). These authors discovered foitite while studying some bluish-black, tourmaline single-crystals free of matrix, from southern California. More recently, the mineral has been discovered in a pegmatite dike at S. Piero in Campo, Elba (Pezzotta et al., 1996), and in other localities in the world (Novák & Selway, 1997). The foitite in Elba has been described as acicular and hair-like, fibrous crystals of grey-blue colour in small pockets in a miarolitic pegmatite.

During a detailed analytical work on Elba tourmalines (Aurisicchio & Pezzotta, in preparation),