Major and trace element composition of tourmaline in aplites and granites as indicator for magmatic and hydrothermal evolution (eastern Elba, Italy)

CHARLOTTE REDLER[1], MARIKA VESPA[2], MEINERT RAHN[13]

[1]Institute of Earth and Environmeltal Sciences, University of Freiburg, Albertstr. 23b, D-79104 Freiburg, charlotte.redler@minpet.uni-freiburg.de
[2]Karlsruhe Institute of Technology, Institute for Nuclear Waste Disposal, Hermann.van-Helmholtz Platz 1, D-76344 Eggenstein-Leopoldshafen,
[3]Eidgenössisches Nuklearsicherheitsinspektorat–ENSI–, Industriestr. 19, CH-5200 Brugg,

Aplites of granitic composition occurs widespread on Elba Island and are characteristic in the development of the magmatic suite. They contain tourmaline as a typical major mineral.

Three major types of tourmaline are found: (1) prismatic crystals within aplite that cross cut the crystalline basement (Calamita schists); (2) tourmalines occurring within K-feldspar of the La Serra-Porto Azzurro monzogranite; and (3) black, very fine-grained zones of variable size occurring within the Calamita schists and the monzogranite, which are themselves completely impregnated with tourmaline. The three types of tourmaline differ in their major element contents. Magmatic tourmalines in the aplites (type 1 = Group A) have in general low alkali (Na + Ca) and calculated Li contents together with high Fe and Al contents, and are mostly schorl and foitite. Tourmalines of hydrothermal origin (types 2 and 3 = Group B) have higher Ca, Na, Mg, and calculated Li contents, and are more variable in composition (schorl, dravite and magnesiofoitite). Accumulations of fibrous, blue tourmalines (BTA) occurr within cracks and at rims of earlier tourmaline crystal and show compositions similar to the corresponding tourmalines of group A and B. They indicate a second hydrothermal episode and are developed from local circulating fluids as a recrystallization of earlier tourmalines.

The trace element compositions of tourmalines show in general lower Li, Ga, Pb, Zn and Sc, but higher Sn, Sr and Co contents in the BTA than in group A and B tourmalines. REE in the BTA show enriched HREE and occasionally a positive Eu anomaly, whereas group A and B tourmalines have negative or none Eu anomalies.