SOME GEOCHEMICAL FEATURES OF METASOMATIC TOURMALINE RELATED TO PEGMATITES FROM ROMANIA

STUMBEA, D.
Department of Geology-Geochemistry, University "Al. I. Cuza", 20A Carol I Bvd., Iasi, Romania
E-mail: dstumbea@yahoo.com

The present paper deals with a geochemical comparison between the tourmaline hosted by metasomatic veins, crossing some pegmatite bodies from Romania and the so-called proto-pegmatitic tourmaline. In Romania, pegmatite bodies occur as veins and lenses in the medium-grade metamorphic terranes (micaschists, gneisses, migmatites etc.) of Southern, Western and Eastern Carpathians; generally, they have a simple mineralogy as follows: quartz, feldspars, muscovite as principal minerals, biotite, garnets and tourmaline as subordinate minerals. Pegmatites show a granite-like chemical composition; genetically, it seems that the pegmatites formed by both metamorphic differentiation and anatectic processes (MÂRZA, 1980; MURARIU, 2001; STUMBEA, 2001).

The study we carried out is based on electron microprobe analysis (major elements) performed on a CAMECA SX 50-Link Systems device; the analysis focused on the rim as well as on the core of tourmaline grains.

In terms of the variation of major elements from core toward the grain rim, a decrease of SiO_2, FeO and Na_2O and an increase of Fe_2O_3 and MgO has been found in metasomatic tourmaline; as for proto-pegmatitic tourmaline, the chemical composition of zoned grains showed a decrease of Al_2O_3 and FeO and an increase of Fe_2O_3, MgO and Na_2O amounts from core toward the grain rim.

The analyses performed on tourmaline grains show also some differences between the chemical features of metasomatic tourmaline cores/rims and those of proto-pegmatite core/rims. Thus, the core of metasomatic tourmaline has higher amounts of SiO_2 (36.60%), TiO_2 (0.60%), FeO (9.00%), MnO (0.40%), MgO (4.50%) and Na_2O (2.70%) than the core of proto-pegmatite tourmaline (35.30% SiO_2; 0.28% TiO_2; 8.40% FeO; 0.10% MnO; 2.80% MgO and 1.80% Na_2O). On the contrary, the amounts of Al_2O_3 and CaO are lower in the core of metasomatic tourmaline (33% Al_2O_3 and 0,10% CaO) as compared to the amounts of the same oxides in the core of tourmaline from proto-pegmatites (35.4% Al_2O_3 and 0.25% CaO).

The variation of chemical composition is almost similar when focusing on the rims of tourmaline grains, which proves that the distribution of major elements between the core and the rims of zoned tourmaline is the same, no matter the genesis of tourmaline is.

The mineralogical composition of tourmaline grains (mol%) reveals the presence of schorl, dravite, uvite, tsilaisite, ferridravite and alkali-deficient tourmaline end members. In terms of the mineralogical composition of cores *vs.* rims, both metasomatic and proto-pegmatitic tourmaline show higher amounts of schorl (58.7 mol%) and tsilaisite (1.2 mol%) end members and lower amounts of dravite (5.9 mol%), ferridravite (8.2 mol%) and uvite (4.3 mol%) in cores, than in the rim of grain. On the other hand, the core and the rim of metasomatic tourmaline contain lower amounts of schorl (52% in core, 45% in rim), ferridravite (7% in core, 8% in rim) and uvite (2% in core, 1% in rim) as compared to the core of proto-pegmatitic tourmaline.

Structural formulas of tourmalines reveal a smaller deficit in *X* sites (about 0.15 *pfu*) as well as in *Y* sites (about 0.16 *pfu*) than the proto-pegmatitic tourmaline (about 0.25 *pfu* in *X* sites and about 0.21 *pfu* in *Y* sites).

The present study revealed also three type of chemical substitution: Tschermak substitution – $(Mg, Mn, Fe^{2+})^Y + Si^T = Al^Y + Al^T$, alumino-buergerite substitution – $(Mg, Mn, Fe^{2+})^Y + OH^- = Al^Y + O^{2-}$ and alkali-deficient substitution – $Na^X + Mg^Y = Al^Y + \square^X$.

Starting from Ca : Fe_{tot} : Mg and Al : Fe_{tot} : Mg ratio, both metasomatic and proto-pegmatitic tourmalines belong to the group of tourmaline from Li-poor granitoids and their associated pegmatites/aplites.

References

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