

## Tourmaline, an indicator of external Mg-contamination of granitic pegmatites from host serpentinite; examples from the Moldanubian Zone, Czech Republic

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Tourmaline is considered a perfect indicator of geochemical processes in rocks due to its refractory behaviour and compatibility with many elements. Dominant primary solidus and minor subsolidus tourmalines from a variety of granitic pegmatites enclosed in serpentinites of the Moldanubian Zone, Czech Republic were examined, mainly by electron probe micro-analyser, to reveal the degree of external Mg(Ca)-contamination from their host rocks.

The rocks include: (i) homogeneous to slightly heterogeneous nests of plagioclase-tourmaline rocks (group A) of anatectic or metasomatic origin, (ii) subhomogeneous to simply zoned barren pegmatite dikes (group B), and (iii) Li-bearing zoned pegmatite dikes of rare-element class (group C). The plagioclase-tourmaline rocks (group A) show spatial relation to pegmatites of the group B. Mostly black primary tourmalines (dravite, oxy-dravite, uvite, schorl, oxy-schorl, fluor-schorl) show extensive Mg- and Ca-contamination (group A), moderate Mg- and locally minor Ca-contamination (group B plus the locality Věžná I of the group C) and weak Mg-contamination of the tourmaline solely from outermost pegmatite units (group C); tourmalines from internal units of the pegmatites are typically Mg-free.

The substitution mechanisms include  $\text{MgR}^{2+}$  ( $\text{R}^{2+} = \text{Fe}^{2+} > \text{Mn}^{2+}$ ) in all groups,  $\text{NaR}^{2+}$  ( $\square\text{Al}$ )-<sub>1</sub> and  $\text{R}^{2+}$  (OH) (AlO)-<sub>1</sub> in Ca-poor tourmalines and  $\text{CaO}$  (NaOH)-<sub>1</sub> combined with the substitution  $\text{CaR}^{2+}$  (NaAl)-<sub>1</sub> in Ca-enriched tourmalines (group A). Both Mg- and Ca-contamination events were very likely contemporaneous. The extent of contamination is higher in small and texturally simple plagioclase-tourmaline rocks (group A). Larger and more highly evolved Li-bearing pegmatites (group C) with zoned internal structure show a high degree of undercooling; consequently, rapid crystallization of outer zones with biotite and/or tourmaline depleted melt in almost all Mg and isolated the pegmatite body from further external contamination during solidus crystallisation. The granitic pegmatites (group B and group C) were open to the host serpentinite during early solidus crystallization immediately after emplacement of melt and then in early and/or late subsolidus crystallization (hydrothermal stage); in plagioclase-tourmaline rocks (group A) the system was likely continuously open to host serpentinite. This study affirms tourmaline as a very useful indicator of external contamination and elevated contents of Mg in tourmaline or in other Fe,Mg-minerals are the most reliable sign of external contamination in granitic rocks.

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