Distribution of Li among magmatic Fe-Mg silicates in granitic rocks

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Lithium is widely used element to trace geological processes, but little is known about distribution of Li among individual minerals in granitic rocks. Lithium was analyzed by LA-ICP-MS in associated magmatic Fe-Mg bearing alumosilicates (garnet, tourmaline, muscovite, biotite and staurolite) from several samples of peraluminous granites and pegmatites (primitive to highly evolved) of the Moldanubian Zone. Later minerals in pegmatites, (e.g. elbaite or Li-micas) crystallizing from exsolved melt-derived fluids or liquid enriched in fluxing components, were not included. Staurolite represents the oldest mineral; garnet (AlmSps) and tourmaline (schorl) indicate commonly coeval crystallization and their outer parts seems to be in equilibrium with micas. Biotite could slightly precede muskovite crystallization, but mostly are rather coeval. Lithium contents of coexisting phases range: biotite 531-8210 ppm (0.04-0.56 apfu), muscovite 307-2791 ppm (0.02-0.16 apfu), garnet 26-565 ppm (up 0.04 apfu), tourmaline 21-586 ppm (up 0.09 apfu) and staurolite 2588-3017 ppm (avg. 0.32 apfu). Lithium partions into these Fe-Mg silicates in the order: biotite > staurolite > muscovite > garnet > tourmaline. Similar Li partitioning, biotite > muscovite > tourmaline, was described from Li-rich granites [1]. Slightly different sequence was observed in metapelites: staurolite > biotite > muscovite > garnet,tourmaline > chloritoid. [2,3]. Even higher Li contents (≤0.59 wt.%) were described from staurolite in metapelites [2] [3], where staurolite shows 2-5 times higher Li contents than in biotite [2]. Magmatic schorl shows surprisingly the lowest Li contents, even systematically lower (1.1-2.0 times) than simultaneously crystallizing garnet and this trend was observed in primitive to highly evolved rocks.

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[1] Wilson & Long (1983), *Mineral Mag* **47**, 191-199 [2] Dutrow, Holdaway & Hinton (1986), *Contrib Mineral Petrol* **94**, 496-506 [3] Dutrow (2011), *Geol Soc Amer Abstracts with Programs* **43**, 5, 150