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Rare-element pegmatites of the Keivy-Kolmozero zone, NE Baltic shield: classification, age distribution, sources

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The Keivy-Kolmozero zone, NE Baltic shield, is composed mainly of basic-intermediate-acid metavolcanic suites of 2.83-2.87 Ga age, metamorphosed at amphibolite facies during 1.8-1.7 Ga. Younger igneous events are represented by voluminous intrusions of 2.73 Ga plagioclase-microcline granites and of 2.65 Ga peralkaline A-type granites, and small stocks of 2.52 Ga tourmaline granites.

Four pegmatite fields with total amount of more than 100 bodies are confined to Kolmozero subzone. The pegmatites intrude amphibolites and rarely associated gabbro-anorthosite and are of 50-700m long and of 10-35m thickness. Quartz-albite-microcline pegmatite bodies are extremely enriched in rare element minerals: spodumene (up to 20-50 vol %), pollucite, tantalite, microlite, lepidolite, beryl. The Kolmozero pegmatites are of complex type, spodumene subtype with Li, Cs, Be, Ta, Sn geochemical signature and belong to LCT family by classification of Cerny and Ercit [1]. They crystallized at relatively high pressure (3-4 kbar) with peraluminous S-type granite as the source magma. We assume that the 2.52 Ga Kolmozero tourmaline granite is the most possible source granite that is corroborated by pegmatitic microlite dating at 2457 Ma [2].

Several tens of pegmatite bodies from Keivy subzone are confined to inner and outer apical parts of peralkaline granite intrusions. They are of few tens meters long and of several meters thickness, sometimes are of oval and irregular shape (so-called quartzolites). Keivy pegmatites are subdivided on quartz-microcline, quartz-feldspar-astrophylite and quartz-(magnetite-aegirine-arfvedsonite) mineral species. Most abundant rare-element minerals are zircon, fergusonite, gadolinite, chevkinite, britholite, aeschinite, thorite. Keivy pegmatite are of gadolinite type with Y, HREE, Zr, Ti, Nb>Ta, F signature indicating on its NYF nature. Undoubtedly peralkaline A-type granites are the source of Keivy pegmatites, that is confirmed by the same age of pegmatitic zircon – 2656 Ma. Keivy pegmatites formed at moderate pressure (1.5-3.7 kbar).

A unique pegmatite body of amazonite-quartz-albite composition (Ploskaya Mnt) intrudes the Keivy gneiss complex. It is of several hundred meters long and several tens meters thickness. The rare-element mineralization is represented by microlite, betafite, pyrochlore-(W), keyviite, fluorite-(Y), xenotime, monazite, hingganite, tenerite, genthelvite, polyolithionite, kainosite, cassiterite and has the Y, Yb, Nb, Ta, F, P, Li, Sn (Pb, W, Mo) geochemical signature, indicating on mixed NYF-LCT family. The ages of zircon, monazite and xenotime from the pegmatite are about 1700 Ma [3]. No granite of the same age is known in the zone and genesis of pegmatite via metamorphic remobilization of rare elements from peralkaline granite and hosted gneissic rock is suggested.

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References:

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