Comparative Geochemical Evolution of Paleozoic and Mesozoic rare – metal Granites in Baikal Region and Central Mongolia

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The Central Asian Orogenic Belt is characterized by intense Phanerozoic granitoid magmatism, including Early Paleozoic collision stage of the geologic development of the region and intraplate granitoids of Late Paleozoic and Mesozoic age that form large batholiths (Angara-Vitim, Daurian-Khentei) surrounded by rift zones with subalkaline and rare-metal granite plutons.

Late Carboniferous rare-metal granites (311–321 Ma) resulted in the formation multiphase intrusions (Kharagul, Bitu-Dzhida, Urugudei) in the Baikal Region with exposed areas of approximately 10 km^2. The early intrusive phases are made up of biotite sometimes fluorite-bearing granites, which are changed during the late stage by typical rare-metal topaz-bearing amazonite-albite with zinnwaldite rarely lepidolite granites and pegmatites. The evolution of these magmatic rocks promoted an increase of F, Li, Rb, Cs, Sn, Be, Ta, Pb and a decrease of Ba, Sr, Zn, Zr, Th, U contents in rare-metal granites of the late stages. The same geochemical evolution is common for subvolcanic rocks (ongonites), which indicates the genetic relation ongonites and rare-metal Li-F granites of the Khamar-Daban province in Baikal Region (Antipin, Perepelov, 2011).

Early Mesozoic granitoid province in the Mongolia covers an enormous area and its central part is occupied by the Daurian-Khentei batholith. Rare-metal granites occur as relatively large multiphase massifs (Baga-Gazryn, Zhanchivlan) and small intrusions in the peripheral zone of the magmatic area. The ages of the Baga-Gazryn granites determined earlier by different methods (K–Ar, Rb–Sr, and Ar–Ar) vary from 192 to 212 Ma. The pluton center is dominated by coarse-grained biotite granites, medium- and fine-grained granites are more abundant in endocontact zone. The process of magma differentiation is terminated with formation of greisens with topaz (zwitters) and muscovite greisens. Another type of metasomatic rocks in the Baga-Gazryn were composed of microcline–albite–fluorite rocks called microclinites. Sn-W mineralization as ore-bearing veins and greisens, as well as Li-Ta mineralization associated with rare-metal granites (Antipin et al, 2018).

The rare-metal granites of studied Baikal Region and Central Mongolia provinces are intraplate formations. The geochemical characteristics and evolution of different age rare- metal rocks of these regions discloses their reference to the same geochemical type of Li-F granites. The petrological data suggest magmatic genesis of rare-metal Li-F granites, and the process of magma differentiation ends by topaz-bearing amazonite-albite, lepidolite-albite granites, and metasomatic mikroklinites and greisens, with associated rare-metal mineralization. Rare - metal granites formed in the periphery of the Late Paleozoic and Early Mesozoic magmatic belts, often as a part of intrusive-dyke complexes. Origin of the granites can be initiated with exposure to the continental crust of the deep mantle source, which causes melting of crustal substrate followed by magma differentiation and enrichment by many incompatible elements. The development of these massifs could have led to the formation of rare-metal granites with concentrations of ore elements (Li, Ta, Sn, W, etc.) as early as at the magmatic stage, with the formation of metasomatic rocks (greisen, microclinite, and albitite) producing rare-metal mineralization at the postmagmatic stage.

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