Geophysical Research Abstracts
Vol. 18, EGU2016-2090-2, 2016
EGU General Assembly 2016

Granitoids of different geodynamic settings of Baikal region (Russia) their geochemical evolution and origin

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In the southern folded framing of the Siberian craton the granitoid magmatism of different ages involves batholiths, small low-depth intrusions and intrusion-dyke belts with diverse mineral and geochemical characteristics of rocks. Granitoid formation could be related to the Early Paleozoic collision stage and intra-plate magmatism of the Late Paleozoic age of the geologic development of Baikal area.

The Early Paleozoic granitoids of Khamar-Daban Ridge and Olkhon region revealed their closeness in age and composition. They were referred to syncollision S-type formations derived from gneiss-schistose substratum of metamorphic sequences. The magmatic rocks were classified into various geochemical types comprising formations of normal Na-alkalinity (migmatites and plagiogranites), calc-alkaline and subalkaline (K–Na granitoids, granosyenites and quartz syenites) series. It is significant, that plagiomigmatites and plagiogranites in all elements repeat the shape of the chart of normalized contents marked for trend of K–Na granitoids, but at considerably lower level of concentrations of all elements. This general pattern of element distribution might indicate similar anatectic origin of both granitoid types, but from crustal substrata distinguished by composition and geochemical features. Comparative geochemical analysis pointed out that the source of melts of the Early Paleozoic granitoids of the Olkhon (505-477 Ma) and Khamar-Daban (516-490 Ma) complexes of the Baikal region could be the crustal substratum, which is obviously the criterion for their formation in the collisional geodynamic setting.

Using the Late Paleozoic subalkaline magmatism proceeding at the Khamar-Daban Range (Khonzurtay pluton, 331 Ma) as an example, it was found that the formation of monzodiorite-syenite-leucogranite series was considerably contributed by the processes of hybridism and assimilation through mixing of the upper mantle basaltoid magma derived melts of granitic composition. The involvement of the deep source is indicated by low Rb/Sr ratios and 87Sr/86Sr ratio (0.70592±0.00021) in rocks (Kazimirovskiy, 2006).

The intra-plate biotite granites and leucogranites are represented by rare-metal geochemical type of rocks (311-321 Ma). Geochemical evolution promoted an increase of F, Li, Rb, Cs, Sn, Be, Ta, and Pb and a decrease of Ba, Sr, Zn, Zr, Th, and U contents in rare-metal granites, that reflects their formation from deeply differentiated residual magma. The substance of the lower crust could have the composition of biotite-bearing granulites rich in lithophyle rare elements. It is noteworthy, that the composition and isotope-geochemical features of the supposed magma-forming substratum correspond to the characteristics of the ancient Precambrian continental crust of the Southern Baikal region. These conclusions agree with the results of preceding studies of rare-metal granites in the other regions of Central Asia (Kovalenko et al, 1999).

Research has been supported by RNF grant № 15-17-10010.