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Genesis of rare-metal pegmatites and alkaline apatite-fluorite rocks of Burpala massi, Northern Baikal folded zone

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Burpalinsky rare metal alkaline massif in the Northern Baikal folded zone in southern margin of Siberian Platform, is a of intrusion central type, created 287 Ma covering area of about 250 km2. It is composed of nepheline syenites and pulaskites grading to quartz syenites in the contacts. Veines and dykes are represented by shonkinites, sodalite syenite, leucocratic granophyres, alkali granites and numerous rare metal alkaline syenite pegmatites and two dykes of carbonatites. All rocks except for granites are cut by a large apatite-fluorite dyke rocks with mica and magnetite, which in turn is cut by alaskite granites dyke. The massif has been studied by A.M. Portnov, A.A. Ganzeev et al. (1992)

Burpalinsky massif is highly enriched with trace elements, which are concentrated in pegmatite dykes. About 70 rare-metal minerals we found in massif.

Zr-silicates: zircon, eudialyte, lovenite, Ti-lovenite, velerite, burpalite, seidozerite, Ca- seidozerite, Rosenbuschite, vlasovite, katapleite, Ca-katapleite, elpidite.

Ti- minerals:- sphene, astrophyllite, ramsaite, Mn-neptunite bafertisite, chevkinite, Mn-ilmenite, pirofanite, Sr-perrerit, landauite, rutile, anatase, brookite;

TR- minerals - loparite, metaloparite, britolite, rinkolite, melanocerite, bastnesite, parisite, ankilite, monazite, fluocerite, TR-apatite;

Nb- minerals - pyrochlore, loparite.

Other rare minerals leucophanite, hambergite, pyrochlore, betafite, torite, thorianite, tayniolite, brewsterite, cryolite and others.

We have proposed a new scheme massif: shonkinites - nepheline syenites - alkaline syenite - quartz syenites – veined rocks: mariupolites, rare-metal pegmatites, apatite, fluorite rock alyaskite and alkaline granites and carbonatites (Sotnikova, 2009).

Apatite-fluorite rocks are found in the central part of massif. This is a large vein body of 2 km length and a 20 m width cutting prevailing pulaskites. Previously, these rocks were regarded as hydrothermal low-temperature phase. New geological and thermobarometric evidence suggests that apatite-fluorite rocks were formed from the residual fluid-melt, separated after crystallization of rare-metal pegmatites. Petrochemical and geochemical data Burpalinsky are in accord of general trend of crystal differentiation of alkaline magma containing small concentrations of CO_2 and higher P2O5 and F, which accumulated significantly separated from the pegmatite melts. In some pegmatites fluorite with rare-metal minerals (flyuocerit etc) are separating in schlieren.

Apatite-fluorite rocks are cut by leucogranite dyke, having genetic connection with rare-metal pegmatites. Late granitic phases has its own association of rare-metal minerals described by A.A. Ganzeev (1972).

Thermobarometric geochemical study of apatite-fluorite rocks Burpala massif found a large number of primary fluid inclusions (15-50 micrometers). Thermal and cryometric research of 60 individual fluid inclusions in fluorite showed the domination of Na, Ca, Mg chlorides and high temperatures salt inclusions in fluorites (above 550C) and melt inclusions in apatites (800C).

Apatite-fluorite rocks in massif are similar to foskorites in carbonatite complexes, with similar high Ca content, but instead fluorite, together with other "foskoritovymi" minerals - apatite, magnetite, mica, and pyroxene were formed instead for calcite.

Isotopic studies (Sr-Nd) indicate the mantle source of primary magma Burpala massif close to EM-2, which is characteristic of alkaline intrusions in the folded belts (Vladykin 2009). RBRF grant 14-45-04057