Aillikites and alkali picrites of Beloziminsky carbonatite massif, East Sayan mountains

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A complex of HFSE – mainly Ta, Nb, REE, P, Th, U associated with the Beloziminsky carbonatite massif (BCM) in East Sayan. The major concentrators are late ijolite-urtites melteigites and carbonatites. Alkali picrites (AP) - melilitites and aillikites were intruded in several stages. AP rock affinity including melilitites and aillikites relates to the most ancient of their manifestations but they also cut ijolite-urtites of the latest stage. Primordial primitive melts were considered - 645 (666) million (Travin et al., 2002), within the array and at a distance of 10-15 km (the pipe "Yuzhnaya"). Phlogopite from carbonatite ankerite dates back to 645±6 Ma (40Ar/39Ar) (Doroshkevich et al., 2016; 2017).

Bulk rock of 20 samples of AP was analyzed by XRF and ICP MS and electronic microscope TESCAN MIRA3. 87 AP samples were analized by gamma-spectrometry determined U, Th, K, and divided to > 10 groups. Primitive rocks of Yuzhnaya contains abundant xenocrystic olivine (dunite fragments) (Fe#Ol=11-16%) in intergrowths with sulfides, Cr-spinel (20-25% Cr2O3), Cr-diopside and a significant amount of phlogopite cemented by intergranular kaersutite and diopside-hedenbergite, apatite etc. Other AP compiled by variations of carbonates, phlogopite, pyroxene (diopside), amphibole; olivine, melilitte, Ti - magnetite with Na and Nb; common Ta-Nb oxides, pyrochlore, Sr-REE apatite, zircon. Sulphides represented by pyrrhotite, chalcopyrite, galenitea, sphalerite and other rare minerals.

The separation of Th-K and Th-U and REE patterns of PK is mainly due to TRE variations determined by the amounts of zircon, Apatite, pyrochlore, Ti-magnetite and phlogopite.

Variations of CO3- SiO2 in AP are somolr to aillikites of Labrador (Tappe et al., 2007) and other locations. BCM alkali picrites of are more fractionated and enriched in REE and TRE with high CO2, H2O. The REE patterns (La/Ybn = 7 to 12; La - 100/PM) separated to groups: 1 - the most primitive rounded REE spectra of aillikites meet 1% melting of primitive mantle (PM) with unfractionated HFSE Zr, Hf, Ta, U, but pronounced Sr, Pb picks; 2 – close to 1 -st REE spectra with minima HFSE and LILE, 3 - with sharply elevated REE (La- 8000- 2000/PM), and lowered HFSE (Ta=Nb; Zr=Hf); 4 - intermediate group with La-1000-500/PM group and fractionated HFSE; 5 - enriched LILE with low REE (La -10/PM), flattened spectra and enrichment of Rh, Cs, Zr, Nb, Th-U deficit. Primitive AP (Fe#= 14 –16 and) were formed by melting metasomatized and carbonatized mantle (carbonate inclusions in olivine) (Andreeva, 2014 ). Immiscibility splitting of carbonatite and silicate magma is not confirmed due to the presence of near-continuous bulk compositions. Formation of carbonatite massifs along the periphery of Siberian craton corresponds to enrichment of mantle due to subduction melts-fluids and melting by plume during breakup of Rodinia, formation of dike Nersinky complex and a series of carbonatite alkaline massifs (Gladkochub et al., 2010). RFBR 16-05-00860a, 16-05-00737a, 15-05-06950; .