



Mineralogy and magmatic evolution of PR alkaline Tiksheozerskiy massif (Northern Karelia, Russia).

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Tiksheozerskiy massif belongs to a formation of the ultrabasic alkaline massifs with carbonatites. It is interesting for Proterozoic age (1.8-1.9 billion years) and different postmagmatic processes. Massif was investigated firstly in the second part of last century in connection with the problem of apatite-magnetite ore deposit research. It was shown, that Tiksheozerskiy massif is consisted of three groups of rocks: ultrabasic rocks, alkaline rocks, carbonatites. All rocks of massif were changed during regional metamorphic processes and have different degree of change. Regional metamorphism had taken place in this region 1.6-1.7 billion years ago. With the purpose of definition of mineralogenesis features of Tiksheozerskiy massif alkaline rocks and their difference from ones of other alkaline complexes of Karelia-Kola alkaline province we investigate the rock-forming and accessory minerals in different samples of rocks of massif.

We studied the change of composition of minerals. Thus, clinopyroxenes change their composition from diopside-hedenbergite $Di_{78-85}Hed_{15-25}$ in ultrabasic rocks (altered pyroxenites and olivinites) to aegirine-augite $Aeg_{5-15}Di_{45-70}Hed_{15-35}$ in alkaline rocks (ijolite-urtites and syenites). Amphiboles change their composition from pargasite to richterite-kataphorite in the same sequence of rocks. Also we have considered REE-containing accessory minerals: orthite, apatite, pyrochlore et. al. These minerals are concentrators of light REE- elements which is typical for alkaline rocks. All these factors show that alkaline components (Na and K) are concentrated in melt during the formation of Tiksheozerskiy massif rocks. Due to the composition of different minerals we had estimate temperatures of formation of the following parageneses: $Cpx + Amf$; $Cpx + Phl$; $Phl + Amf$ in pyroxenites and ijolite-urtites of Tiksheozerskiy massif. Temperatures of formation of pyroxenites are estimate in the interval

710-980°C. Carbonatites of massif are represented by two types of rocks: calcite and calcite-dolomite carbonatites. The calculation of temperatures of calcite-dolomite carbonatites formation is near 450°C (by the double-carbonate geothermometer). Therefore calcite-dolomite carbonatites were crystallized on postmagmatic stage of massif formation. Genesis rocks of Tiksheozerskiy massif (olivinites and pyroxenites) were formed by crystallization differentiation (it is specified by their structures). During their formation such components as Na and K were concentrated in fluid, which mainly consist of H₂O and CO₂.

For the purpose of experimental modelling of mineralogenesis of Tiksheozerskiy massif, we prepare runs to synthesize minerals in system diopside-hedenbergite - annite with the excess content of Na. Experiments were carried out using capsule technique in hydrothermal conditions at temperatures 650 and 750°C and pressure 1.5 kbar.

Using the compositions of associate garnet and biotite of enclosing rocks (gneisses) we had estimated temperature of regional metamorphism as 550°C.

After our studying we propose the scheme of Tiksheozerskiy massif formation:

The ultrabasic central part (olivinites and pyroxenites) is formed by crystallization differentiation process. 2. Alkaline rocks of massif (ijolite-urtites, syenites, nepheline syenites), which are locate around ultrabasic rocks, were crystallized under influence of H₂O fluid bearing of Na⁺, K⁺ and CO₂. 3. Tiksheozerskiy massif has undergo changes during regional metamorphism 1.6-1.7 billion years ago.

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