



Composition and genesis of clinopyroxene and feldspar megacrysts from alkaline basalts of Mongolia

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A large diversity and abundance of megacrysts of pyroxene, amphibole, garnet, mica, feldspar, ilmenite, etc., are typically for alkaline basalts from many volcanic localities all over the world. Different hypotheses have been proposed concerning their origin. They have been considered as high-pressure phases crystallized from liquids parental to their host rocks or as disaggregated inclusions of upper mantle and crust rocks. In eastern Asia Neogene-Quaternary intraplate alkaline basalts are located from Northern Mongolia to Southern Vietnam. These basalts made up of huge lava flows with various safety domes. Basalts are basanites with high TiO_2 , P_2O_5 , alkaline and low MgO . Megacrysts of clinopyroxene and K-Na feldspars were studied from alkaline basalts of Tarjat, Orkhon-Selenga, Dolinozernii and Dariganga volcanic fields in central and south-eastern Mongolia.

Clinopyroxenes (CPx) are Al-augites with high contents of Al_2O_3 (6.6-9.6 wt.%), Na_2O (1.7-3.4 wt.%), TiO_2 (1-2.1 wt.%) and with no chromium. CPx composition examination show dependence between composition of CPx megacrysts and host basalts. Most magnesian CPx megacrysts are found in most magnesian basalts. This dependence is found in other components (Ca, Na, Al). For example, most alumina, sodium and calcium CPx were founded in Tarjat basanites with the high content of these elements as compared with Dariganga basalts. Pressure estimates for CPx can be obtained by using the structural geobarometer of Nimis [1]. Estimated pressures for CPx megacrysts are 1.5-1.7 GPa. According to experimental data CPx similar to CPx megacrysts in composition can be crystallized from alkaline basaltic melt at 1.4-1.6 GPa and 1200°C.

K-Na feldspar (Fsp) megacrysts from alkaline basalts of Mongolia are anorthoclase (Or_{22-40}) and sanidine (Or_{41-78}). Fsp megacrysts are subdivided into two groups. One group of Fsp is characterized high Rb, Cs, Ba, Sr content correlated with high K_2O (9.4-12 wt.%). Another group have low K_2O (5-6 wt.%) and LIL elements content. Such variety is due to different genesis of Fsp megacrysts. Depleted in these elements Fsp crystallize from residual melt after clinopyroxene, amphibole, ilmenite crystallization. Enriched Fsp were formed as a result of interaction between basalt melt and lower crustal rocks.

By our researching megacrysts composition depends on chemistry features of host alkaline basalts. It is one more evidences of cognate relation basalts and megacrysts. Cpx megacrysts are a result of crystallization of alkaline basalts in intermediate magmatic chamber at pressure 1.5-1.7 GPa (about 56 km) at depth levels close to the mantle-crust boundary for Eastern Asia.

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1. Nimis P. Clinopyroxene geobarometry of magmatic rocks. Part 2. Structural geobarometers for basic to acid, tholeiitic and mildly alkaline magmatic systems // Contribution to Mineralogy and Petrology. 1999. V. 135. P. 62-74.