

32nd IGC - Florence, 2004

Abstract title

EVOLUTION OF BASALTIC MELTS WITHIN THE FEEDING SYSTEM OF THE KLYUCHEVSKOY VOLCANO

Authors

OZEROV ALEXEY ¹

presenter's e-mail: ozerov@ozеров.ru

1 - Institute of Volcanology, Russian Academy of Science

Keywords

high-magnesia basalt

high-alumina basalt

volcanology

crystal differentiation

computer simulation

Abstract

To determine the conditions for the formation of all the diversity of basalts at the Klyuchevskoy volcano (from high-magnesia to high-alumina ones), complex studies of collateral eruption samples have been carried out. Petrological-geochemical research was focused on the microprobe studies of compositions of solid-phase mineral inclusions (Ol, Cpx, Opx, Pl, Sp, Mgn) hosted by rock-forming phenocrysts (Ol, Cpx, Pl). Analysis of geophysical and seismological materials allowed to specify the model for the feeding system of the volcano.

Based upon petrological data, conclusion has been made that all the observed range of basalts, from high-magnesia to high-alumina differences, presents an integral series formed in the result of similar fractionating processes taking place during the ascending of original high-magnesia magmas (MgO ~ 12 weight %) along the extended vertical magma conduit from the depth of 60 km. Analysis of cotectic mineral interrelations points to natural change of crystallization sequences in the course of ascending.

Ol(Mg#92-90) + Cpx (Mg#91-89) +- Sp(Cr2O3-57 %; TiO2-0,3 %) =>

Ol(Mg#88-87) + Cpx (Mg#87-86) +- Opx(Mg#89-88) +- Sp(Cr2O3-45 %; TiO2 -0,5 %) =>

Ol(Mg#75-73 + Cpx (Mg#75-72) + Opx(Mg#75-73) + Pl(An80-60) + Sp(Cr2O3-17 %; TiO2-5,5 %) =>

Ol(Fo69-67) + Aug(MGN68-66) + Pl(An80-60) + Mgn(Cr2O3 - 0,3 %; TiO2 - 9,5 %).

Evaluation of fractionation conditions have been carried out based on the complex of petrological computer software COMAGMAT. It has been established that optimal model for the formation of the whole magmatic series corresponds to the poly-baric fractionation of original magma with the rate of decompression being 0.33 kilobar per 1% of crystallization, at a content of about 2 mass % of H2O in the primary melt. According to calculations, magma crystallization starts from the separation of Ol и cpx at pressure of about 19 kilobars and temperature of about 1350°C. Water accumulation within the melt results in a significant delay of plagioclase crystallization and formation of high-alumina differentiation products.

Complex studies fulfilled allow to observe in detail the picture of basaltic rocks' formation within the "non-stagnant" feeding system of the Klyuchevskoy volcano, as well as to reveal basic patterns of variations of mineral paragenetic associations with constantly changing compositions, at every stage of evolution of the magmatic matter originating from high-magnesia melts of the upper mantle.

ACCEPTED as Poster Presentation

in session: "G10.07 - Arc magmatism and geodynamics"