

The Role of Hornblende Fractionation in the Generation of Andesitic Lavas of Bezymyanny Volcano: Phase Equilibria Analysis

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A new version of COMAGMAT phase equilibria model was applied for the genetic interpretation of a volcanic suite from Bezymyanny volcano, Kamchatka, Russia. The observed lava range from two-pyroxene andesite, hornblende andesite and dacite, and display typical calc-alkaline trend. Assuming isobaric crystallization of a parental high-alumina magma a set of fractional crystallization calculations at the pressure range from 1 atm to 7 kbar and condition close to water saturation has been carried out. Oxygen fugacity was varied from NNO to NNO+1 during these simulations, and initial water content was about 2-3 wt.%. Results of these calculations and analysis of the water-bearing phase equilibria experiments allowed us to assume that hornblende and magnetite are involved in crystallization assemblages at earlier stage. Crystallization of plagioclase and pyroxenes cannot cause the silica saturation trend and the considerable depletion of FeO and TiO₂ observed in natural lavas. Addition of Mt +/- Hbl seems to change phase proportions of plag preventing rapid depletion of alumina in the modelled liquids. These are in a good agreement with experimental data demonstrating the effect of hb crystallization on the liquid line of descent of melts produced from high-alumina basalts (Higashi-Izu, Japan) at 5 kbar and water saturated conditions. Based on EPMA data of inclusions in phenocrysts of andesites from BZ volcano we conclude that hb can coexist with plag which has compositions An₇₄₋₇₆. In our model, plag of the same composition was precipitated from the liquid of high-alumina parental basalt magma.