

# Boninites as a criterion for the geodynamic development of magmatic systems in paleosubduction zones in Gorny Altai

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## Abstract

© 2018 Institute of the Earth's Crust. All Rights Reserved. Ancient primary boninitic melts of the Gorny Altai (65-105 km, 1410-1590 °C) were studied from the composition of melt inclusions in clinopyroxenes. We estimated their parameters and the conditions for the onset of magma crystallization in an intermediate chamber at a depth of about 30-35 km, which appear similar to the reference boninitic magmatism of the modern Izu-Bonin island arc. A combined analysis of the composition of inclusions and clinopyroxenes from Gorny Altai boninites shows that within a range of minimum temperature values (1140-1120 °C), the crystallizing material continuously ascends from a depth of 12 to 0.6 km. The pattern is different in case of higher-temperature magmas, and three zones of pyroxene crystallization are distinguished: 18.0-13.8 km (1245-1205 °C), 12.0-3.5 km (1240-1185 °C), and 3.3-0.6 km (1185-1145 °C). Actually, these zones correspond to the intermediate deep-seated magmatic chambers typical of modern island-arc subduction zones [Dobretsov et al., 2016]. Based on the detailed study of zonal phenocrysts of clinopyroxene in boninites from the Kuray ophiolites, we established the parameters of the evolution of the ascending boninite melts. Three temperature intervals (1220-1200 °C, 1235-1210 °C, and 1120-1220 °C) and three pressure ranges (1.5-11.5 kbar, 2.0-6.0 kbar, and 2.0-0.3 kbar) are distinguished. One case shows a significant pressure drop (from 11.5 to 1.5 kbar) with a small drop in temperature (from 1220 °C to 1200 °C). In the second case, the pressure rises from 2.0 to 6.0 kbar, and the crystallization temperature decreases from 1235 to 1210°C. In the third case, crystallization begins at a stable temperature (1120-1140 °C) and a stable pressure (1.4-2.0 kbar); then, in the near-surface conditions, the temperature increases to 1220 °C, and the pressure decreases sharply to 0.3 kbar.

<http://dx.doi.org/10.5800/GT-2018-9-1-0336>

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## Keywords

Boninite, Clinopyroxene, Geodynamic process, Magmatic system, Melt inclusions, PT-conditions, Subduction zone

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