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Mineral chemistry and geothermobarometry of the Balıkesir Volcanites (NW Anatolia, Turkey)

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Balıkesir Volcanites (BV) are included into the Balıkesir Volcanic Province and contain various products of Oligo-Miocene volcanic activity in NW Anatolia. BV are formed from trachyandesite, andesite and dacite lavas with associated pyroclastic rocks. In this study, we report the petrographical investigations, mineral chemistry results and geothermobarometry calculations of the Balıkesir Volcanites in order to deduce the magma chamber processes and crystallization conditions. Andesites present a mineral composition of plagioclase (An₃₅₋₅₀) + amphibole (edenitic hornblende) + biotite ± quartz and opaque minerals. The major phenocryst phases in dacite lavas are plagioclase (An₃₉₋₅₃), quartz, amphibole (magnesian hornblende), biotite, sanidine and opaque minerals. The mineral composition of the trachyandesites, on the other hand, is represented by plagioclase (An₃₈₋₅₇) + amphibole (pargasitic hornblende) + biotite + clinopyroxene (endiopside-augite) ± sanidine ± quartz ± opaque minerals. Balıkesir Volcanites present distinct textural properties such as rounded plagioclase phenocrysts with reaction rims, oscillatory zoning, honeycomb and sieve textures in plagioclase, reverse mantled biotite and hornblende crystals. The plagioclase-amphibole geothermobarometry calculations of Balıkesir volcanites indicate that, andesite and dacite lavas present similar crystallization temperature and pressure conditions of 798- 813°C and 1,98- 2.17 kbar. Oppositely, trachyandesites were crystallized under 857°C and 3,72 kbar temperature and pressure conditions. These results show that the andesite and dacite lavas were originated from the same magma chamber with the depth of 7km whereas trachyandesites were evolved in a deeper magma chamber with 13 km depth. Combined mineral chemistry, petrography and geothermobarometry studies indicate that the open system processes such as magma mixing/mingling and/or assimilation fractional crystallization (AFC) were responsible for the textural and compositional variations of the Balıkesir Volcanites.