

Hornblende fractionation of tholeiitic volcanic rocks from Yoneyama Formation originated in high water content magma

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Late Pliocene - Early Pleistocene volcanic rocks from Yoneyama Formation, northern Fossa Magna region, central Japan, consist of basaltic andesitic pyroclastic rocks; they contain frequently hornblende (Hbl) gabbroic xenoliths and Hbl megacrysts. We have reported that most rocks are mainly tholeiitic (TH) series rocks and all rocks characterized by high-K content (Aizawa et al., 2017, JpGU). We present that these rocks are originated from hydrous TH magma through 'cryptic Hbl fractionation' (Davidson et al., 2007).

Whole-rock rare earth elements (REE) content show middle REE depleted normalized patterns. This feature is attributed that Hbl fractionation because Hbls have higher middle REE partition coefficients than other major rock forming minerals. Calculated host rock SiO₂ content restored from Hbl gabbroic xenoliths and Hbl megacrysts chemical composition (Putirka, 2016) range between 50 - 59 wt%, which support that Hbls crystallization begin in basaltic magma. It is thought that these xenoliths and megacrysts crystallize at depths of lower crust because calculation results of geobarometer (Ridolfi and Renzulli, 2012) show up to 1857 MPa. These geochemometric and geobarometric results support 'cryptic Hbl fractionation'. Hbl's solidus temperature decrease with decreasing pressure, thus Hbls decompose during magma ascent.

Hbl (cryptic) fractionation imply that TH series magmas are rich in H₂O contents. The quantitative H₂O contents estimated by plagioclase-melt hygrometer are up to ~5 wt%.

Keywords: Cryptic hornblende fractionation, Tholeiitic rock series, Hydrous magma, Lower crust, Northern Fossa Magna, Ca-amphibole