花崗岩ゼノリスの部分溶融と同化過程
Partial melting and assimilation processes of granitic xenoliths

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Crustal assimilation is one of the important magmatic processes especially for arc magmas. In this study, partially melted granitic xenoliths in Miocene Setouchi volcanic rocks, SW Japan were examined in order to reveal the petrological and geochemical evolution during xenolith assimilation on sub-meter scale. The xenoliths (10-60 cm) contain 20-40 modal% of compositionally heterogeneous fresh glass. In addition, the xenoliths are surrounded by a glassy porphyritic zone where xenolith-derived melts and host andesitic magmas are mingled. Thus, these samples well preserve the melting-assimilation processes of crustal rocks incorporated in intermediate magma.In less-melted xenoliths, glass is distributed along the grain boundary between quartz and other phases such as plagioclase, alkali feldspar, and pseudomorph of hydrous mafic minerals. The glass changes its color and chemical composition depending on neighboring mineral phases. Transparent and brown glasses appear around felsic and mafic minerals, respectively. Overall glass composition varies, 73-79 wt% SiO_2 on anhydrous basis, and both Si/Al and K/Na ratios increase toward quartz within glass sandwiched by quartz and feldspar. On a normative Q-Ab-Or ternary diagram, the glass composition follows a nearly linear trend across the hydrous haplogranite cotectic line. These observations suggest that disequilibrium melting and chemical diffusion in melt played important role for producing the heterogeneity of glass.Minerals also change their texture and composition with melting. Mafic minerals, probably biotite or hornblende, are completely broken down to fine-grained aggregates of Fe-Ti oxide, orthopyroxene and plagioclase. Alkali feldspar (Or60) forms finger-print/sieve textured reaction zone with surrounding melt. . The reaction zone is mainly composed of newly formed feldspar and interstitial glass. The new feldspars change their composition from anorthoclase to andesine as the reaction proceeds. In contrast, most plagioclase is simply melted without significant interaction with neighboring melt. These minerals in partially melted xenoliths are dispersed into the outer mingling zone surrounding each xenolith when melting degree exceeds about 50 modal%. This indicates that disaggregation of xenoliths begins at around the rigid percolation threshold (Vigneresse et al., Jour. Pet. 1996) during assimilation. Setouchi volcanic rocks, including high-Mg andesites, often contain quartz and feldspar xenocrysts, which are probably from Cretaceous granitic basement. Our observation suggests that the volume of granite-derived melts cryptically assimilated in host andesitic magma is more than double of the observed xenocryst abundance.

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