

Geochemical characteristics of late-collisional mafic intrusion of the Kontum Massif, Central Vietnam

Masaaki Owada[1]; Yasuhito Osanai[2]; Nobuhiko Nakano[2]; Hiroo Kagami[3]

[1] Dept. Earth Sci., Yamaguchi Univ.; [2] Earth Sci., Kyushu Univ.; [3] Grad.Sch.Sci.Tech., Niigata Univ.

Asia grew in the Late Permian by the process of continental collision. The Kontum Massif is exposed in a mountain range in central Vietnam and was previously regarded as a fragment of Precambrian craton. Recent geochronological data, however, has revealed that the metamorphic rocks from the Kontum Massif represent middle to lower crust reworked by collisional events during the Late Permian to the Early Triassic ages.

In this study, we report mantle derived mafic magma (fine-grained gabbro) from southern part of the Kontum Massif, where ultrahigh-temperature (UHT) metamorphic rocks occur as relics in granulite-facies metamorphic rocks. This paper presents occurrence, petrography and geochemical features of fine-grained gabbro with discussion on magma processes of mantle derived melt in the collision zone.

The Kontum Massif consists of the high-grade gneisses and intrusive rocks. Intrusive rocks are divided into two types, granite (Grt granite and Opx granite) and fine-grained gabbro. Grt granite locally forms migmatite structure accompanied by pelitic granulite (Grt-Opx gneiss) as a paleosome. Monazite EMP dating for Grt granite and Grt-Opx gneiss reveal that the timing of formation of granitic magma took place during the Late Permian (c. 260 Ma). Considering mode of occurrence and geochronological data for Grt granite and Grt-Opx gneiss, Grt granite can be produced by partial melting of Grt-Opx gneiss. Estimated pressure conditions of Grt-Opx gneiss are c. 5-6 kbar and are fairly low pressure rather than UHT condition (c. 9 kbar). Therefore, formation of Grt granite could occur during decompression stage.

The granitic rocks (Grt granite and Opx granite) are locally associated with fine-grained gabbro. The granitic rocks include fine-grained gabbro and vice versa. In addition, fine-grained gabbro intrudes granitic rocks, whereas leucocratic veins derived from granitic rocks intrude fine-grained gabbro, thereby suggesting the granitic rocks and fine-grained gabbro are coeval intrusive rocks.

Fine-grained gabbro consists mainly of Opx, Cpx, Hbl, Bt and Pl with traces Qtz, Ap, and Oqs. Opx locally shows an elongated shape. Bt and Qtz intergrowth surrounding Opx, suggesting this texture is produced by reaction between Opx and melt during the cooling stage. An euhedral Pl appears as poikilitic inclusions in Opx. Most of Qtz grains occur interstitially, but a few grain is present as inclusions in high-An core parts of Pl. An acicular apatite is present. These textures resemble those of magma mingling.

The geochemistry of fine-grained gabbro shows the subduction related signature such as Rb, K, and Ba enrichment and Nb, Ta, and Ti depletion; however, concentrations of the incompatible elements of fine-grained gabbro are higher than those of arc and continental margin basalts. These geochemical signatures represent post-collisional high-K basalts derived from enriched source, possibly metasomatized lithosphere, occurring in collision zones.

Plume-related basaltic rocks, e.g., Emeishan picrite in south China and Song Da komatiite in northern Vietnam, erupted around the collision zone between the South China and Indochina cratons during the Permo-Triassic. Emeishan picrite is proposed to have been generated by mixing between plume-related magma and lamproitic melt. Fine-grained gabbro is plotted on the different trends in La/Yb-N (normalized to primitive mantle) vs. NdI (corrected to 260 Ma) diagram. One is plume-lithosphere interaction trend defined by Emeishan picrite and another trend makes for crustal contamination. Fine-grained gabbro would, therefore, be originally derived from Emeishan-type basaltic magma, which was produced by plume-lithosphere interaction, and subsequently affected by crustal contamination during the exhumation of the Kontum Massif.