

Petrological study on plutonic rocks in Hakata Island, Ehime prefecture.

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Various types of plutonic rocks and dykes are distributed in the Hakata Island, Ehime Prefecture, Japan. They can be divided into six rock facies including biotite granite, biotite granodiorite, hornblende-biotite tonalite, amphibole syenite, mafic dyke, and granite porphyry dyke.

Biotite granite and biotite granodiorite commonly contain mafic magmatic enclaves. Hornblende-biotite tonalite locally develops mixtures of leucocratic and melanocratic lithologies. Amphibole syenite shows gradual transition from surrounding biotite granite. Under microscope, poikilitic textures are common in granitoids. Granular amphibole aggregates are observed in amphibole syenite.

In terms of whole-rock geochemistry, biotite granodiorite and mafic magmatic enclaves have compositions between biotite granite and hornblende-biotite tonalite. This compositional relationship suggests that the biotite granodiorite magma formed through mixing of biotite granite magma and hornblende-biotite tonalite magma. On the other hand, the biotite granites show a distinct chemical trend in Harker diagrams. The chemical trend of the biotite granites can be explained by fractional crystallization process from the most SiO₂-depleted sample based on major element mass balance modeling. In addition, the amphibole syenite shows distinctive compositional characteristics of Na₂O enrichment. Major element compositions of the amphibole syenite falls in the range of the syenitic rocks in the Seta Inland Sea region, which have been interpreted as metasomatized origin (Murakami, 1976). Therefore, the amphibole syenite in the Hakata Island probably formed through metasomatism of the surrounding biotite granite.

Keywords: Hakata Island, plutonic rocks, granite