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Petrogenesis of Cretaceous tonalite - granodiorite in Kyushu Island, southwest Japan arc

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Kyushu Island in Southwest Japan arc is situated in an active plate margin of East Asian continent. Cretaceous tonalite - granodiorite and gabbros are widely distributed in central to northern Kyushu Island.

The tonalite - granodiorite have the characteristics of calc-alkaline rocks in the SiO2 content ranging from 53 to 68 wt%. The gabbroic rocks are divided into three types: high-Mg diorite, pyroxenite, and hornblende gabbro. The high-Mg diorite and the hornblende gabbro have similar chemical compositions to those of basalt and high-Mg andesite, respectively.

Kamei and Owada (2000) examined the petrogenetic relations between the tonalite - granodiorite and the gabbros by the batch melting calculation.

The result of the calculations suggests that the high-Mg diorite and the pyroxenite are equivalent to the source and restite of the tonalite - granodiorite magmas, respectively. The degree of partial melting was estimated as about 10-50%.

On the other hand, Kamei et al. (2001) conducted partial melting experiments of the high-Mg diorite. Temperature and pressure of the experiments are 900-1000 degree C and 7-8 kbars. Major element compositions of derived melts in the experiments almost fitted those of the tonalite - granodiorite in Kyushu Island. The mineral assemblage coexisted with the melts almost corresponded to those of the pyroxenite. The partial melting degree 20-50% was estimated from the results of the experiments. The estimated results above almost agree with the result from the batch melting calculation.