Origin of Early Cretaceous adakitic quartz diorites in the Yamizo Mountains, central Japan.

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Plutonic rocks in the Yamizo Mountains are mainly granitic and are classified into older (ca. 105 Ma) and younger plutons (ca. 65Ma). The older plutons are further subdivided into gabbro and quartz diorite plutons. The younger plutons are classified into hornblende-biotite granodiorite and coarse-grained biotite granite plutons.

The older quartz diorites are rich in Sr (606-769 ppm) and poor in Y (13-27 ppm) and mainly plotted in the adakite field on the Sr/Y-Y diagram. Sr initial ratio of the older quartz diorites, calculated from the assumed intrusion age of 110 Ma based on K-Ar ages, are 0.7038-0.7045. These facts seem to suggest slab melting origin of the quartz diorites. However, numerical modeling on geochemistry of the quartz diorites and gabbro indicates that it is difficult to generate the quartz diorites and gabbro directly by slab melting. But the geochemistries of the quartz diorites are explained by ca. 45-75 % fractional crystallization of hornblende (70 %) and plagioclase (30 %) from an undifferentiated magma, and the geochemistry of the gabbro is explained by accumulation of hornblende (70 %) and plagioclase (30 %) from the differentiated magma. The undifferentiated magma can be generated by partial melting of lower crustal amphibolite.

Simultaneous adakitic magmatism is known in the Tamba Belt of Inner Zone of Southwest Japan, about 500 km to the west of the Yamizo Mountains. It is difficult to explain the simultaneous adakitic magmatism by slab melting of young and hot oceanic crust commonly related to ridge subduction. Therefore, the Early Cretaceous adakitic magmatism of the Inner Zone of Southwest Japan can be explained by fractional crystallization of hornblende and plagioclase from the undifferentiated magma possibly caused by partial melting of lower island arc crust.