Nakaoku Composite Dike in Central Kii Penisula, SW Japan: Implication for Mafic and Felsic Magma Chamber Positions

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1. INTRODUCTION

We report a new composite dike in Nakaoku area of central Kii peninsula, SW Japan. In this area many dikes composed of rhyolitic pyroclastics (tuffite), basaltic andesite and quartz porphyry (QP) have been reported (Wada, 1999; Wada et al., 2000; Wada and Iwano, 2001), but from recent observations the QP is regarded as a composite dike with marginal andesite. In this presentation we report field occurrence, petrography and bulk chemistry of this composite dike, and discuss about spatial relationship between mafic and felsic magma chambers feeding dikes.

2. COMPOSITE DIKE OCCURRENCE

Dip and strike of the composite dike are N70W and 60S, respectively. Andesite (0.9 m wide) and QP (30 m wide) compose NE and SW sides of the dike body, respectively.

The andesite has a chilled margin only at its NE side. Apart from the NE margin crystal size increase toward the center. At the SW margin crystal size is same as the center. In NE margin there is a flowage structure parallel to host rock although it is lacked in SW side. The contact plane with QP is wavy. Cooling joints can be observed, but they are discontinuous to the QP.

The boundary plane between QP and host rock at the SW side cannot be observed. In the NE margin of the QP, any macroscopic fine-grained textures also cannot be observed, indicating no chilling against the andesite. Platy jointing parallel to the strike are developed. QP includes irregular-shaped enclaves (several centimeters in length), probably derived from the andesite. Those major axes are subparallel to the contact plane with the andesite.

Above observations support the following model for this composite dike: Before enough cooling of the andesite dike, QP magma intruded into the center or the boundary plane between the andesite dike and host rock, associated with their erosion.

The andesite includes plagioclase and clinopyroxene as phenocryst, similar assemblage to basaltic andesite dikes in Nakaoku area (Wada et al., 2000). Groundmass of NE margin of the andesite is glassy. On the other hand, those of the center and the SW margin are highly crystalline. The latter includes quartz in corroded form, probably derived from QP. Chemically the andesite has 53.30 wt.% SiO2 and 3.73 wt.% Na2O+K2O, classified into basaltic andesite based on IUGS classification (Le Maitre, 1989), quite similar to those of basaltic andesite dikes in Nakaoku area. Although high-Mg andesites (HMA) occur in the region south of the Median Tectonic Line (Miyake et al., 1985; Sato, 1985), the andesite reported here is not HMA, based on its FeO* and MgO contents and their high FeO*/MgO ratio.

The QP includes quartz, plagioclase, cordierite, biotite, muscovite, K-feldspar and garnet as phenocryst, and has 75.48 wt.% SiO2 and 7.85 wt.% Na2O+K2O (Wada et al., 2000), classified into rhyolite. These characteristics coincide with those of S-type granitoids (White et al., 1976). Zonal distribution of the S- and I-type granitoids in the Outer Zone of SW Japan (Takahashi et al., 1980; Suwa et al., 1989) is disturbed in Kii peninsula. Takamiyama acidic rock (Wada and Araki, 1997) and Nakaoku tuffite dikes are classified into S-type granitoids. Therefore the QP confirms the dominance of S-type granitoid in the central Kii peninsula.

3. IMPLICATIONS FOR POSITIONS OF MAFIC AND FELSIC MAGMA CHAMBERS

The composite dike formation indicates that mafic and felsic magmas emplaced in succession, and suggests that both magma chambers existed closely each other in time and space at shallow crustal level, and that the mafic magma emplacement might induce the felsic magma to intrude. While dike magmas of basaltic andesites in Nakaoku area and the QP in this composite dike flowed westward (Wada et al., 2000), the andesite reported here inferred to flow eastward and upward, based on its marginal texture in the dike. Therefore, inferred chamber position of mafic magma may have been different from that of felsic magma.