

Melting Experiments of a basalt from Miyakejima volcano : implication the magma chamber in Ofunato stage

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Miyakejima is an active volcanic island located 200 km south of Tokyo in Izu-Mariana arc. Tsukui and Suzuki(1998) and Tsukui et al.(2001) showed changes in its eruption styles during the last 10,000 years and divided the eruptive activity into five stages. Niihori et al. (2003) proposed a model on evolution of the magma plumbing system during the last 10,000 years on the basis of petrologic study. They recognized four magmatic cycles in the last 4,000 ago, in which whole-rock Mg# (=Mg/(Mg+Fe)*100) decreases and SiO₂ content increases systematically with time. On the other hand, in the oldest Ofunato stage (10,000~4,000 B.P.), magma composition stays constant and it is a less fractionated basalt.

In order to understand the magma plumbing system in Miyakejima volcano, we performed melting experiment with Miogataira lava(MTL), the least differentiated composition in Ofunato stage. About 60 mg of the MTL powder was inserted in a Au75-Pd25 capsule (2.8/3.0 mm diameter and 15mm long), and distilled H₂O of desired amounts measured by a microsyringe were added. Then this capsule was sealed by welding. In addition, we used the MTL-glass powder. The MTL-glass was made at 1 atmosphere under the oxygen fugacity of QFM-1 log unit. The MTL-glass was fused at 1250C above liquidus for 1 hour using a molybdenum bucket. The high pressure experiments were performed at 0.2 GPa and at 1050, 1100 and 1150C using an internally heated pressure vessel KOBELCO HIP-2000.

The result obtained by the present experiments is shown in Fig.1a,b. MTL contains 23.2 vol% of Ca-rich plagioclase phenocryst (An88-100), 0.7 vol% of Fo-rich olivine phenocryst (Fo76-84) and 0.1 vol% of clinopyroxene phenocryst (Niihori et al., 2003). In our experiments, plagioclase, clinopyroxene and magnetite crystallized but olivine was absent (Fig. 1a). Under high activity of H₂O, olivine may crystallize at higher pressures. The anorthite content of plagioclase increases strongly with H₂O content of melt (Fig. 1b). Judging from our experiments and composition of Ca-rich plagioclase (An88-100) phenocrysts, the Miyakejima magma would contain at least 2 wt% of H₂O if the magma chamber is located at 0.2 GPa or 8 km depth. In order to re-produce the magma chamber of Miyakejima volcano at Ofunato stage, we need to perform experiments at higher pressures under controlled temperature and oxygen fugacity.

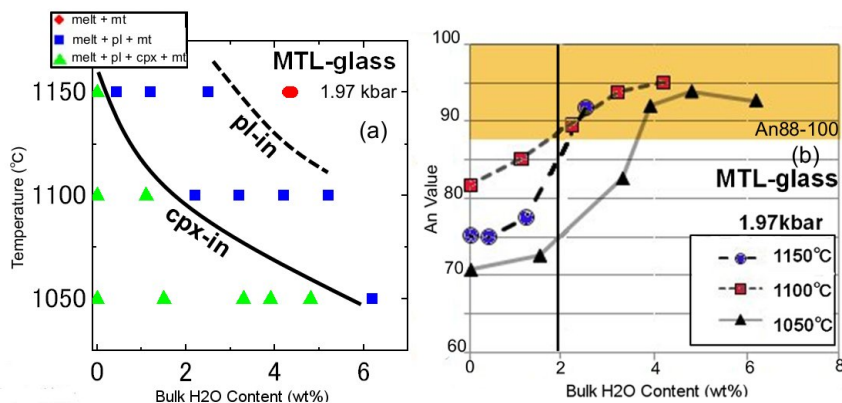


Fig.1
 (a)Phase diagram obtained by the crystallization experiments at 1.97kbar for MTL-glass.
 Abbreviations: mt, magnetite; pl, plagioclase; cpx, clinopyroxene.
 (b)Diagram of An value(An/(An+Ab)*100) vs. bulk H₂O content.