

Olivine stability in melting experiments using mantle peridotite reacted with slab melt

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The partial melting of depleted peridotite plus slab melt at 1.5 GPa was studied for H₂O saturated conditions. Starting materials are 1) synthesized peridotite (H₂O: 12.59%), 2) synthesized peridotite plus 40% of slab melt (H₂O: 7.84%), 3) synthesized peridotite plus 20% of slab melt (H₂O: 10.19%), 4) Ichinomegata lherzolite plus 40% of slab melt (H₂O: more than 10%). In the case of starting materials 1), no glass were observed both at 1000 and 1050°C. Starting materials 2) to 4), the quenched glasses obtained at 1000°C are dacitic in composition (SiO₂ = 67--68%, MgO = 0.5--1.1%), coexisting with olivine (Fo 89--91%), orthopyroxene, and clinopyroxene. The volume of melt was 31%, 18%, and 32%, respectively. The quenched glasses obtained at 1050°C are andesitic in composition (SiO₂ = 61--64%, MgO = 0.5~1.1%), coexisting with olivine (Fo 89--91%), orthopyroxene, and clinopyroxene. The volume of melt was 34%, 20%, and 33%, respectively.

These results indicates the possibility that calc-alkaline dacitic to andesitic melts can be generated by the reaction of slab melts with mantle peridotite. Moreover, this suggests that calc-alkaline dacites to andesites can be formed by direct partial melting of the hydrous upper mantle contaminated with slab melts. These results were not consisting with the previous results (Hirose and Kawamoto, 1995; Hirose, 1997), which probably resulted from higher water content (7.8--12.6 wt%) in starting peridotite.

Keywords: experimental petrology, slab melting, olivine