K133-013 **Room: 301B** **Time: May 17 13:45-14:00**

The occurrence and significance of amphibole-bearing multiphase solid inclusions in olivine crystals, the Murotomisaki Gabbro

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The Murotomisaki Gabbro is a sill-like intrusion of up to 220m thickness exposed near Cape Muroto, Shikoku, Japan. Despite of the small size of the intrusion, it contains well-developed centimeter- to meter-scale layered structures of modal variation of olivine, plagioclase and augite. In addition, stratigraphic variations in grain size and whole-rock composition are pronounced. Because of these features, it is an excellent field for observations of differentiation processes within a magma chamber. Hoshide et al (2006a, b) identified the 'crystal accumulation zone' (~40m from the bottom) that was formed by gravitational settling of olivine crystals and the 'crystal growth zone' (40~100m from the bottom), in which olivine crystals grew significantly. The fine-scale compositional layering is best developed in the 'crystal growth zone'.

Amphibole-bearing multiphase solid inclusions show spherical or convex-polygonal shapes and are common in olivine crystals from both the crystal accumulation- and the crystal growth zones. These 'amphibole clots' inclusions are composed of pargasitic amphibole, biotite and orthopyroxene, with minor amounts of talc, augite, apatite, and opaque minerals (i.e., titaniferous magnetite, hematite and sulfides). The amphibole clots have the following mineralogical characteristics: (1) The amphibole is zoned from Ti-rich and Mg-poor pargasitic core to Ti-poor and magnesian rims. Na and Al become drastically reduced in the outer-most part of the rim. (2) While the amphiboles outside olivine crystals (i.e., matrix amphiboles) are hornblende in compositions, those in the amphibole clots are pargasitic. (3) Bulk compositions of the amphibole clots that were obtained from the mode and mineral chemical compositions, are anomalously rich in MgO content (16~20 wt%). They lie between fractionated melt compositional trend calculated by the MELTS (Ghiorso and Sack, 1995) and the observed olivine compositions. (4) Olivine is absent in the amphibole clots.

Fact (2) suggests that the pargasitic amphiboles probably crystallized from the melt after it was entrapped in the olivine and not formed in equilibrium with the melt in the matrix. Fact (4) suggests a reaction relationship between olivine and the melt. Considering these observations and fact (3), we envisage the following two possibilities for the origin of the amphibole clots:

(A) Olivine-component enriched melt was generated by a dissolution of olivine crystals into a hydrous melt (melt 1). The olivine-component enriched melt (melt 1') was then entrapped by growing olivine crystals, which later crystallized to amphibole clots.

(B) Amphibole and orthopyroxene are reaction products of olivine and hydrous melts (melt 1), which were later trapped by the growing olivine crystal.

In either case, melt 1 was not in equilibrium with olivine. However, melt surrounding the olivine crystal (melt 2) should have been saturated with olivine. Such a disequilibrium situation may have occurred if hydrous melts separated from fractionated melts in lower horizons of the boundary layer ascended to the above high-temperature horizons, where olivine crystals were growing.