Reaction textures between olivine and orthopyroxene in the A.D.864 Aokigahara lava flow of Fuji volcano

Hiroaki Sato[1]

[1] Earth and Planetary Sci, Kobe Univ

http://www.edu.kobe-u.ac.jp/fsci-volcano/hsato/hsato.html

In the A.D.864 Aokigahara lava flow of Fuji volcano, olivine crystals are often included in orthopyroxene phenocryst, and orthopyroxene phenocryst in turn is surrounded by microphenocrysts of olivine. The chemical composition and textural relationship suggest that the crystallization sequence is as follows: olivine + plagioclase; orthopyroxene + augite + plagioclase: olivine + augite + plagioclase; and olivine + augite + pigeonite + plagioclase + magnetite in the groundmass. Phase relationship obtained by MELTS Program indicates that near liquidus olivine + plagioclase crystallized at 100-200 MPa (4-8km depth), followed by crystallization of orthopyroxene + augite + plagioclase at lower pressures with low water contents. It is suggested that crystallization of orthopyroxene + augite + plagioclase requires degassing of magmas. Initial basaltic magma in the chamber at depth of ca. 15km may contain water of 3-4 wt% from the melt inclusion studies by Iida et al.(2004) and high-An plagioclase stability conditions (Sato et al., 1999). When it ascended, and laterally intruded the flank of the volcano, convective degassing may occur in a vertical dike-like magma chamber, i.e., degassed magma descended due to higher density and volatile-rich magmas ascended and degassed at shallow depth within the dike. Orthopyroxene, augite and abundant plagioclase phenocryst may have crystallized from the degassed magma. The reaction corona of olivine around orthopyroxene phenocryst, together with reverse zoning of plagioclase phenocryst indicate mixing of volatile-rich basaltic magmas with the degassed and crystallized magma just before the eruption of the 864 lava flow.