Kilo-year-evolution of magma plumbing system with dominant modes of eruption at Suwanosejima volcano, Southwest Japan

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Suwanosejima volcano is one of the most active volcanoes in Japan since at least 1950’s, but its eruption history had not been established well. In addition, the petrological knowledge of magma plumbing system has been accumulated only for a few decades (Shimano and Koyaguchi, 2001; Ishibashi and Saito, 2009). Shimano et al. (2013) established a rough history of the volcano, that Otake volcano, in the central part of the island, has been active for recent 60-70 kys. The dominant eruption style of Otake volcano was effusive in the first half period until ca. 30 ka, then explosive in the later half. This explosive period can be subdivided into two stages; Plinian pumice eruption stage until around 10 ka with long dormancy for each, and scoria eruption stage with intervening continuous ash emission until now. The mechanisms of such transitions in eruption styles and intervals, and products from pumice dominant to scoria dominant stage are substantially important for understanding long-term forecast of eruption. Thus this study summarizes the petrological features of eruptive materials of this explosive period to understand the magma plumbing system. Eruptive materials of 10 ka pumice eruption, 1813 subplinian scoria, and recent ash have been investigated in terms of EPMA and FTIR to discuss the history by estimating temperature and volatile content for these eruptions. We measured chemical compositions of phenocrysts, groundmass glass, and melt inclusions by EPMA, and glass water content of melt inclusions by FTIR.

The materials of 10 ka eruption are characterized by banded pumice that shows mingling of basaltic and dacitic magmas with wide compositional variation of phenocrysts. In contrast, the 1813 product is very homogeneous basaltic andesite but it also shows some evidence of mixing among similar basaltic andesite. The products of recent activity are a little bit different but rather similar to those of the 1813 but show much lower contrast among mixed magmas. Mineral assemblages are similar for all products with phenocrysts of plagioclase, two pyroxenes, and trace amount of olivine and oxide minerals. EPMA analyses revealed multi-modal characteristics of phenocryst compositions indicating mixing of some end-member components of magmas. On the other hand, the water content of melt inclusions shows that magmas of recent activity are degassed whereas those of 10ka and the 1813 are 2-3 wt.% H2O.

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