

Oxidation texture of pyrrhotite in the eruptive products of the Sakurajima Taisho eruption

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Since sulfur(S) in magmas changes its redox state and chemical species, and thus solubility in silicate melts, sulfide minerals in volcanic rocks may record unique information on eruption processes. In the pumice clasts of the Plinian fall deposits in the Sakurajima Taisho eruption (1914), globular pyrrhotite (Fe_{1-x}S) with 20-50 micrometers in diameter occurs as aggregates with or inclusions in magnetite and less commonly in silicate phenocrysts, and rarely as isolated microphenocrysts. They are often replaced with spongy Fe-oxide that has scarce or low Ti content. Small amount of S was sometimes detected in the EPMA analyses with a broaden beam. The porosity of the spongy part is ca. 60-80%, which is consistent with the decrease in volume fraction of solids (67.3-81.0%) in the desulfidization and oxidation reaction: $\text{FeS} + 3/2\text{O}_2 = \text{FeO} + \text{SO}_2$, or $2\text{FeS} + 7/2\text{O}_2 = \text{Fe}_2\text{O}_3 + 2\text{SO}_2$. These observations show that the sponge Fe-oxide was formed by the oxidation reaction of sulfide.

Hattori (1993) reported similar reaction textures in the dacite of Mt. Pinatubo eruption, and interpreted that they were formed as a result of upward volatile fluxing of an SO_2 -rich fluid. In the Sakurajima Taisho eruption, it has been shown that magma mixing has occurred since A.D. activity (e.g. Yanagi et al.,1991). Sato et al. (this meeting) suggest that an underlying mafic magma supplied CO_2 -rich fluid to the silicic magma, which possibly accompanied influx of SO_2 -rich fluid. The oxidation reaction of pyrrhotite could have been occurred in the magma mixing or the fluid fluxing during or prior to the Taisho eruption.

Keywords: sulfur, pyrrhotite, spongy Fe-oxide, Sakurajima Taisho eruption