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Chlorine content and ferric-ferrous ratio of volcanic ash emitted at Minamidake, Sakurajima in the sequence of eruption

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Decompression of magma by moving toward the surface causes exsolution of volatiles, which provides the driving force for explosive eruptions. Moreover, degassing of volatiles from magma changes its viscosity and density drastically, and these can influence violence of a volcanic eruption.

At Sakurajima volcano, recent eruptive phase at Minamidake has been sustained since October 1955. Strombolian eruptions forerun vulcanian explosions, and vulcanian explosions are often followed by continuous ash emissions, which is the typical sequence of eruptive activity. Change in the mode of its eruptive activity is drastic, which is attributed to difference in source processes affected by the state of the magma conduit including gas phase. Nogami *et al.* (2006) revealed that Cl contents in the volcanic ash emitted by strombolian eruptions are higher than those values of the other modes of eruption, and the difference in the value between vulcanian explosion and continuous ash emission is not recognizable. This previous research examined the behavior of volatile component at different phase of activity. In this study, behavior of volatile components in magma is examined through the analysis of Cl in the volcanic ash collected is the sequence of eruptive activity in 1978 and 1979.

SiO_2 contents of most ash samples fall within the narrow range between 59 and 61 in wt.%, and chemical composition of the ash samples indicates that segregation of constituent minerals rarely occurred during drifting of ash cloud. Chlorine contents in volcanic ash emitted by strombolian eruption are significantly higher than those of the ash ejeceted by vulcanian explosions and continuous ash emissions, and decrease corresponding to the change in the mode of eruption.

These results indicate that volatile-rich magma ascend to the bottom of crater and caused strombolian eruption and that the mode of eruption changes due to degassing of volatile components. Degassing process control change in the mode of eruption because chemical composition of volcanic material discharged in the sequence of the volcanic activity is almost uniform. The variation of FeO/Fe_2O_3 ratio indicates that the redox state of magma is relatively reductive at strombolian eruption and become oxidative with the change in the mode of eruption. Temporal change in FeO/Fe_2O_3 ratio of the volcanic ash synchronized with that of Cl content in magma, which may indicate that degassing of HCl affect oxidation state of magma.

Keywords: Sakurajima, volcanic ash, chlorine, ferric-ferrous ratio