

Temporal cycles in glass composition within volcanic ash from Showa Crater, Sakurajima volcano, southern Kyushu, Japan

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Sakurajima in southern Kyushu, Japan, is one of the most active volcanoes in the world. Sakurajima volcano erupted from Showa Crater in June 2006 after a hiatus in magmatic activity of 58 years. We have investigated petrologically the volcanic ash samples erupted from Showa Crater from January 2011 to May 2012. Juvenile clasts within the samples studied are composed of volcanic fragments and orthopyroxene, clinopyroxene, plagioclase, and Fe-oxide phenocrysts. The groundmass in rock fragments is characterized by glass, pigeonite, augite, plagioclase, and Fe-oxides. The volcanic glass within groundmass have compositions of $\text{SiO}_2 = 67.8\text{-}79.7$ wt.%, $\text{Al}_2\text{O}_3 = 10.3\text{-}14.2$ wt.%, $\text{FeO} = 0.8\text{-}7.2$ wt.%, $\text{CaO} = 0.4\text{-}3.6$ wt.%, $\text{Na}_2\text{O} = 2.3\text{-}4.2$ wt.%, and $\text{K}_2\text{O} = 2.1\text{-}5.5$ wt.%, with SiO_2 concentrations showing negative correlations with TiO_2 , Al_2O_3 , FeO , and CaO , and positive correlations with K_2O . Compositional cycles were observed in the eruption sequence from January 2011 to May 2012, with these cyclical changes being most readily apparent in changing SiO_2 concentrations. Early parts of a cycle produce volcanic ash with high SiO_2 concentrations (77-79 wt.%), and volcanic ash SiO_2 concentrations show a gradual decrease during subsequent parts of a cycle. Plagioclase anorthite (An) contents vary widely between An₃₉ and An₈₂, even within the same clasts, and An contents generally increase between January 2011 and May 2012. These results indicate that the compositions of Sakurajima volcanic glass fluctuated in approximately 100-day cycles between January 2011 and May 2012; the variations within each cycle can be explained by fractional crystallization of microcrystals, indicating that this fractionation occurred during magma ascent within Sakurajima volcano.