Oral | Symbol S (Solid Earth Sciences) | S-VC Volcanology

[S-VC54_1AM1]Volcanic and igneous activities, and these long-term forecasting

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Thu. May 1, 2014 9:00 AM - 10:45 AM 411 (4F)

This session focuses on generation and accumulation processes of magmas, magma-crust interaction and degassing, and modes of eruption, long-term forecast of eruption, dispersal and emplacement of the volcanic products. The discussion spans petrological, geochemical, geophysical, and geological processes related with volcanic activity and products in the past, the present and the future.

10:15 AM - 10:30 AM

[SVC54-P15_PG]Magma chamber processes revealed by textures in plagioclase phenocrysts through Taisho eruptions of Sakurajima volcano

3-min talk in an oral session

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Keywords:plagioclase phenocryst, honeycomb texture, textural analysis, crystal size distribution, magma mixing, Sakurajima volcano

Textures in volcanic products record important information about the origin of the rock. Especially, plagioclase phenocrysts have been studied in order to understand the magma chamber processes because they are commonly included in various types of volcanic rocks. Two types of plagioclase phenocrysts are found in lavas by the 1914-1915 eruption of Sakurajima volcano, Southern Kyushu, Japan: (1) honeycomb plagioclase(H-Pl) with large melt inclusions in cores; and(2) clear plagioclase(C-Pl) without any melt inclusions. In Sakurajima volcano, magma mixing has been suggested by bimodal compositions of plagioclase phenocrysts. However, relationship between textures and chemical compositions has not been reported. In addition, the crystal size distributions (CSDs) also may provide essential information for the production environment of the crystals. Therefore, in order to obtain insights into magma chamber and magma mixing processes, we conduct chemical composition and crystal size distribution (CSD) analyses. We carried out chemical compositional analysis by FE-SEM. As a result, it is found that H-Pl phenocrysts have heterogeneous mozaic cores with An75-90 and An55-70 and very low An#(An40-55) around melt inclusions. On the other hand, C-Pl phenocrysts are uniform in compositions while the An contents varies from grain to grain. The histogram of An contents in H-Pl cores shows narrow bimodal distributions around An78 and An86, whereas that of C-Pl cores shows the wide bimodal distribution around An62 and An86. We carried out CSD analysis. It is found that H-Pl and C-Pl phenocrysts showed different trends. CSD of C-Pl is strongly convex-downward showing crossover with two different slopes. We revealed

plagioclase are classified into three types: (1) type-H with an An-rich (An74-89) and heterogeneous core containing large melt inclusions; and (2) type-C-1 with an An62 and homogeneous core not containing melt inclusions; and (3) type-C-2 with an An-rich (An85) and homogeneous core not containing melt inclusions. The results of CSD suggest different formation pocesses between H-Pl and C-Pl, and crossover in the slopes of C-Pl CSDs suggest the mixing of two magmas from which two populations of phenocrysts originate (Higgins, 1996b). In Sakurajima, magma mixing has been suggested, therefore it is important to understand the temperature of magmas. So, we estimated temperature on equilibrium constants by plagioclase- and alkali feldspar-liquid thermobarometers (Putirka, 2008). The results show the temperature on equilibrium constants of the dacitic magma was about 850℃, and that of the basaltic magma was about 1050℃. Since the honeycomb plagioclases are generated by the skeletal growth under high supercooling condition, the H-Pl phenocrysts is formed in the basaltic magmas during cooling at mixing events. In summary, type-H is formed by skeletal growth due to the thermal interaction during mixing events in basaltic magma, type-C-1 is formed under magma chamber with mixed homogeneous magma, type-C-2 is formed under magma chamber with the basaltic magma before mixing, respectively.