

Degree of fragmentation of plagioclase contained in Taisho lava, Sakurajima Volcano

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The 1914-15 Sakurajima eruption is divided into three stages. After the initial, vigorous, Plinian eruption of about 36 hours on both sides (Stage 1, proximal units of T1), extrusion of lava associated with intermittent ash-emitting eruptions lasted for about 20 days on both sides (Stage 2, East-T1 and part of West-T1), followed by an outflow of lava for more than 1.5 years on the eastern side (Stage 3, East-T2). Consequently, the vast lava fields (Taisho lava), which consist of a number of flow units formed on both sides of the volcano.

In order to get information on degree of fragmentation of plagioclase in Taisho lava, ratio of length of broken surface (b) to the total circumference of a crystal (a), b/a value in the 2-D picture was measured. Concerning on the distribution of b/a value on the frequency diagram, smaller values dominate for East-T2. On the other hand, proximal units of West-T1 show higher value more or less than 0.7. East-T1 and some units of West-T1 have intermediate distribution, dominating between 0.3 and 0.5. Data for the 1946 lava is also similar to them. There is a weak negative correlation between average b/a and size of plagioclase. Therefore, highly fragmented crystals rich in broken surface are much smaller in size.

There is a positive correlation between contents of broken plagioclase (BPL) and average b/a. It suggests that individual plagioclase shows high degree of fragmentation in case of specimen rich in broken plagioclase.

Values of BPL and b/a have relation with eruptive style. In case of effusive lava outflow in Stage 3, small amount of broken crystals are contained. It suggests that small-scale fragmentation of crystals occurred prior to eruption in the conduit or deeper level. For Stage 2, Vulcanian eruptions repeated during flowage of lava. Additional fragmentation of crystals due to Vulcanian explosions is expected in the shallow level. For Stage 1, extensive fragmentation of magma during Plinian eruption might have generated abundant broken crystals and concentration of broken free crystals throughout deposition to the proximal area to form clastogenic lava. Correlation between average b/a and size of plagioclase indicates that single crystal experienced plural fragmentations.