

Experimental duplication of glomeroporphyritic plagioclase in basaltic lava flows of the early stage Younger Fuji volcano

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We described and experimentally examined the plagioclase glomeroporphyritic crystal aggregates abundantly found in both Mishima and Saruhashi lava flows erupted in the early stage (ca. 10ka) of the Younger Fuji volcano. Both the lava flows are basaltic, and Mishima lava flow is less differentiated ($FeO^*/MgO=2.0-2.2$) compared with the evolved Saruhashi lava flow ($FeO^*/MgO=2.7-2.9$). Mishima lava flow includes olivine phenocryst of ca. 5 vol% and plagioclase phenocryst of 25-30%, and Saruhashi lava contains only plagioclase phenocryst of 15-20% with sporadic phenocryst of magnetite. Plagioclase phenocrysts of these lava flows characteristically show glomeroporphyritic texture. We provisionally defined glomeroporphyritic as including more than 4 plagioclase crystals in thin sections. About 20-30% of plagioclase phenocrysts in Mishima lava flow constitute glomeroporphyritic texture, whereas 72-82% of plagioclase phenocrysts in Saruhashi lava flow show glomeroporphyritic texture. Plagioclase crystals are parallel oriented in glomeroporphyritic clot in Mishima lava flow, whereas randomly oriented in Saruhashi lava flow. We measured dihedral angles of plagioclase-plagioclase-melt in the natural samples and found 58.3 degree for Mishima lava, and 66.6 degree for Saruhashi lava, which suggest that interfacial energy is well suited for the aggregation of plagioclase in the Saruhashi basaltic melt. In this study, we intended to duplicate the glomeroporphyritic texture by conducting additional experiments to the previous two kinds of experiments presented in the last JpGU meeting (Tokunaga and Sato, 2009, abstract). This year we varied the temperature by 20-30 degree during the cooling. This is just simulating the temperature variation of a crystallizing magma pocket intermittently replenished and/or convecting. The run products contained glomeroporphyritic plagioclase (more than 4 crystals) of about 5% in Mishima lava and 25-32% in Saruhashi lava. When we count more than two crystals adjoined as glomerocrystals, 65-69% of plagioclase in the run products conform glomerocrystals in the Saruhashi basalt. The present experiments together with those reported last year suggest that plagioclase glomeroporphyritic crystals are barely generated in high pressure hydrous conditions, whereas about 19-21% of plagioclase conformed glomeroporphyritic crystal aggregate at 1-atm conditions with or without shear stress. The oscillatory temperature variation during cooling experiment increased the number of glomeroporphyritic crystals. We conceive that temperature variation produced abundant nucleus during crystal dissolution which may be attached to the nearby plagioclase and grown to form glomeroporphyritic plagioclase aggregates in basalts of Mishima and Saruhashi lavas.

Keywords: glomeroporphyritic texture, plagioclase, Fuji volcano, dihedral angle, melting experiments, secondary nucleation