

Possible collateral growth of columnar joints and groundmass crystals in an andesite lava, Iwanuma City, Miyagi PREF.

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Columnar joints occur due to the contraction and cracking during cooling of lavas. Their cross-sections typically shape hexagons. In general, their sizes depend on the cooling rate; small and large sizes indicate fast and slow cooling, respectively.

Peck and Minakami (1968) observed the surface cracks of Makaopuhi lava lake on March 1965 Kilauea eruption, when the cracks opened in the crust that still glowed red, and the measured crust temperature was about 900 degrees C. At this stage crystals still grow in the groundmass because lava does not completely solidified yet. Consequently, the formation of cracks may affect the crystal growth in the groundmass.

The middle Miocene (15-13 Ma) andesitic lavas occur in western Iwanuma City, 20 km south of Sendai City. A large quarry in the Kamigawara district, Iwanuma City, shows well-developed columnar joints of about 1m size. The aim of this study is to discuss the effect of columnar joint formation on crystal growth in the lava. To do this the properties of plagioclase in groundmass are compared between the central and peripheral parts of a column bounded by the joints, measuring their orientation, size, chemical composition and its zoning. In addition, magnetic susceptibility distribution is also mapped to show variation of magnetite crystallinity in a column.

In the center of a column, groundmass plagioclase grows larger (average length: 0.168 mm) than that in the periphery (0.130 mm), although there are some exceptions. Chemical composition of groundmass plagioclase in the periphery shows more diversity (An_{85.0-33.7}) than in the center (An_{71.0-40.8}). Magnetic susceptibility distribution in a column shows higher value (average 38×10^{-3} SI unit) in the center than in the periphery (average 33×10^{-3} SI unit), suggesting larger size of magnetite crystals in the center. These differences between the center and periphery of a column are thought to be mainly due to difference in cooling rate. Formation of joint cracks facilitated vaporization of volcanic gas and circulation of surface water through them, and rapidly cooled down the periphery of a column in comparison with its slowly cooling center, and this difference affected the ongoing crystal growth in the groundmass.

Keywords: columnar joint, plagioclase, magnetic susceptibility