

Corona-forming reaction in the Lutzow-Holm Complex, East Antarctica at Ongul Island

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[Introduction]

Corona is a microstructure that aggregate of one or several species of mineral surrounds another mineral. This suggests that corona was formed by the reaction between the interior mineral and the matrix minerals (Passchier and Trouw 1996). Estimating this reaction enables us to know which component transferred and how temperature and pressure changed. In this study, we estimated corona-forming reaction by describing the microstructure and chemical composition of a corona in the Lutzow-Holm Complex at Ongul Island.

[Geological Outline]

In the Lutzow-Holm Complex, metamorphic grade increases from amphibolites facies in the northeast to granulite facies in southwest (Hiroi et al., 2006). The granulite facies metamorphic rocks are widely distributed throughout East Ongul Island. The rock types are mainly garnet gneiss and hornblende gneiss (Shiraishi et al., 1994). Ultramafic rocks occur as thin layers in the garnet gneiss. The ultramafic rocks analyzed in this study are composed mainly of hornblende and porphyroblasts of garnet. Corona structure forms around the garnet.

[Microstructure]

In the ultramafic rocks, hornblende-rich domain and plagioclase-rich domain occur. Both domains consist of hornblende, plagioclase, brown biotite and orthopyroxene. The corona consists mainly of green biotite and plagioclase, and occurs around the garnet. Plagioclase in the matrix and the corona has twin and chemical zoning. Garnet porphyroblast (about 15mm diameter) shows concavo-convex shape. In the embayed part of garnet, biotite tends to occur with long axis is at right angles to garnet surface.

[Chemical Composition]

Garnet; Rim shows higher Fe and lower Mg than the interior.

Plagioclase; Ca/(Ca+Na) increases in the order of Pl-rich domain, Hbl-rich domain and corona. Ca/(Ca+Na) in every domain increases from core to rim.

Biotite; Mg/(Fe+Mg) decreases in the order of Hbl-rich domain, Pl-rich domain and corona. Rim in every domain shows lower Al than the core.

Hornblende; Hbl-rich domain shows higher Al and Mg/(Fe+Mg) than Pl-rich domain. The rim of both domains shows higher Al than the core.

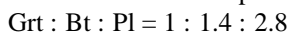
Orthopyroxene; Composition is almost homogeneous within the domain.

[Discussion]

The compositional difference between core and rim of each mineral in the matrix can be regarded as growth zoning. We used the rim-composition in each domain to estimate the corona-forming reaction. The average of analyses was used for plagioclase and biotite in the corona and for garnet. The corona-forming reaction employing the compositions of Hbl-rich domain was given as follows.



On the other hand, the reaction using the compositions of Pl-rich domain expects garnet as products, which is inconsistent with the observation that garnet was consumed. This suggests that K is supplied from the outside through fluid during corona formation. We also compared volume of left side minerals, that is,



Garnet is minimum in amount. Nevertheless, corona formed around garnet. This suggests that diffusion of component from garnet controlled the rate of the reaction.

Keywords: corona, East Antarctica, Lutzow-Holm Complex