

Constraints on formation of corona around garnet in the Lützow-Holm Complex, East Antarctica

*Yuki Mori¹, Takeshi Ikeda¹

1. Department of Earth and Planetary Sciences, Faculty of Science, Kyushu University

Garnet grains in high-grade metamorphic rocks often show corona structures around them. In the Lützow-Holm Complex (LHC) of East Antarctica, the coronas are widespread and have been regarded as important evidence for decompression in a clockwise pressure-temperature path (e.g., Hiroi et al., 1991). On the other hand, corona-free mafic gneisses also occur in the complex. This study reveals the constraints on formation of corona around garnet in the complex.

The LHC is a high-grade metamorphic complex along the Prince Olav Coast and Lützow-Holm Bay in East Antarctica. The metamorphic grade increases progressively from the upper amphibolite facies to granulite facies toward the southwest of the complex. The LHC is divided into three metamorphic zones referred to as the amphibolite-facies zone, transitional zone, and granulite-facies zone (Hiroi et al., 1991).

We examined 4 mafic gneisses from the amphibolite-facies zone, 3 mafic gneisses from the transitional zone, and 14 mafic gneisses from the granulite-facies zone of the LHC. Coronas are found in the 12 gneisses from the transitional and granulite-facies zones, but no in the amphibolite-facies zone. Previous finding of corona is also limited in the transitional and granulite-facies zones. The regional boundary between corona-bearing and -free gneisses locates on the boundary between the transitional and amphibolite-facies zones. The estimated peak metamorphic temperature of Niban Rock, a corona-free exposure that locates near the boundary in the amphibolite-facies zone, did not exceed 720 °C at 4.5 kbar (Mori et al., 2019 NIPR abst.). The metamorphic temperature of Akarui Point, a corona-bearing exposure that locate at near the boundary in the transitional zone, attained over 770 °C (e.g., Kawakami et al., 2008; Iwamura et al, 2013). Wet solidus curves of mafic rocks (e.g., alkali basalt of Yoder and Tilley, 1962) locate between these temperatures. Felsite-nanogranite inclusions (FNIs) are found in garnets surrounded by coronas from Akarui Point, Skallen, and Skallevikshalsen in this study. Garnets in mafic gneisses containing FNIs from Rundvågshetta and Austhovde reported in previous studies (Yanagi et al., 2011 NIPR Abst; Hiroi et al., 2016 NIPR Abst.) are also surrounded by coronas. Therefore, garnet surrounded by corona grew under melt-present conditions. Both inclusion hornblende and FNIs in garnet did not surrounded by the corona. This suggests that neither garnet and hornblende nor garnet and melt can form the corona. Therefore, reaction among garnet, hornblende, and melt makes corona.

Keywords: Corona, Lützow-Holm Complex, Garnet, Mafic gneiss, Felsite-nanogranite inclusion