

Possible polymetamorphism and brine infiltration recorded in the garnet-sillimanite gneiss, Skallevikshalsen, Lützow-Holm Complex, East Antarctica

*Tetsuo Kawakami¹, Tomokazu Hokada², Shuhei Sakata¹, Takafumi Hirata¹

1.Graduate School of Science, Kyoto University, 2.National Institute of Polar Research

The core of garnet porphyroblasts in the garnet-sillimanite gneiss from Skallevikshalsen, Lützow-Holm Complex, East Antarctica, includes Cl-rich ($>0.3\text{wt}\%\text{Cl}$) biotite and nanogranite/felsite inclusions (former granitic melt). These are estimated to be stable at $>1.2\text{ GPa}$ and $820\text{--}850\text{ }^{\circ}\text{C}$. Rare occurrence of matrix biotite suggests almost complete consumption of pre-existed matrix biotite during prograde to peak metamorphism. Brine infiltration during prograde to peak metamorphism is supported by Cl-rich scapolite described in previous studies [e.g., 1]. Brine infiltration and progress of continuous biotite-consuming melting reactions were probably responsible for elevating the Cl content of biotite.

In situ electron microprobe U-Th-Pb dating of monazite and the *in situ* LA-ICPMS U-Pb dating of zircon in the garnet-sillimanite gneiss revealed that both monazite and zircon has the 'older age population' with ca. 650-580 Ma and the 'younger age population' with ca. 560-500 Ma. The REE and trace element pattern of one of the P-rich patches in the garnet core is different from the P-rich garnet rim. The isotope mapping of the same patch by LA-ICPMS revealed that the patch is also observed as a domain depleted in ^{51}V , ^{89}Y , ^{165}Ho , ^{166}Er , ^{169}Tm , ^{172}Yb , and ^{175}Lu . Clear difference in ^{51}V concentration between the patch and the rim of the garnet suggests that this patch is not a continuous part from the garnet rim, but is likely a relic of preexisted garnet. Kyanite included in the patch suggests that medium- to high-pressure type metamorphic rock was the precursor. Presence of the older age population (ca. 650-580 Ma) monazites in Skallevikshalsen and Skallen [2] also suggest that rocks in these areas experienced polymetamorphism, and resetting by the ca. 560-500 Ma metamorphic event was incomplete. Taking into account the presence of Cl-rich biotite inclusions in garnet, infiltration of brine accompanied by partial melting is one probable event that took place at ca. 560-500 Ma in the Skallevikshalsen area, and part of the monazite possibly recrystallized by this brine infiltration.

References: [1] Satish-Kumar et al., 2006, JMG. [2] Hokada and Motoyoshi, 2006, Polar Geosci.

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