Ti solubility in quartz and zircon SHRIMP U-Pb ages of metamorphic rocks from the Sor Rondane Mountains, East Antarctica.

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The Sor Rondane Mountains in, East Antarctica consists of high-grade metamorphic rocks and various intrusions of plutonic rocks which can be divided into the NE and the SW terranes based on lithologies and metamorphic grade. Granulite facies metamorphic rocks which experienced 800-900C and 7-8Kbar occur in the NE terrane (e.g. Asami et al. 1992; Asami et al. 2007). Most of them, however, are intensely retrogressed accompanied by hydration. Rutile exsolutions are often found in quartz and are still preserved in such extensively hydrated rocks. Temperature dependence of Ti solubility in quartz has been confirmed with several experimental studies (Wark&Watson 2006; Kawasaki&Osanai 2008). The presence of rutile exsolution indicates that titanium which had been solved in quartz near the peak temperature condition precipitated as rutile during cooling process. We have measured the Ti contents of two different quartz microdomains - (1) the area including rutile lamellae and (2) the lamellae-free area using the electron microprobe, and evaluated the change of Ti contents in pre-exsolution peak-T quartz and that of the post- exsolution lower-T quartz. As a result, most of the recovered high-Ti quartz in the NE terrane yield 800-850C with a few exception preserving 600-700C as peak metamorphic condition, which indicate that granulite grade metamorphism was widespread in the whole area of this terrane. Contrary to this, the rocks occurring in the SW terrane yield temperature lower than 600C which is consistent with previous studies.

In order to find out the relationships between granulite-facies event in the NE and amphibolite-facies event in the SW terrane, we carried out zircon U-Pb dating using Sensitive High Resolution Ion Micro Probe (SHRIMP-II) at the National Institute of Polar Research. We have obtained metamorphic ages of 650-600Ma interpreted as the granulite facies experienced rocks and 700, 640-540 and 560Ma from the rocks lacking the evidence of granulite condition from the NE terrane. From the SW terrane, 600 and 550Ma metamorphic ages were obtained. Among these results, 650-600Ma of the granulite metamorphism in the NE terrane and 550Ma of the metamorphism in the SE terrane are consistent with Shiraishi et al. (2008). The ages from the rocks lacking the granulite condition in the NE terrane and ca. 600Ma obtained from the SW terrane may rise the necessity to reconsider the geological framework of the Sor Rondane Mountains.