P-T estimations of Kashio mylonite in Oshika, Nagano, Japan: Constraints on the amalgamation of Ryoke and Sambagawa belts

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Sambagawa (*LTHP*-type) and Ryoke (*HTLP*-type) metamorphic belts are classically termed as a “paired metamorphic belt” and closely related to the island arc magmatism and regional metamorphism in subduction zone (e.g., Brown, 2010). Although almost all Ryoke metamorphic belt in SW Japan are not directly in contact with Sambagawa metamorphic belt, Oshika area in Nagano prefecture, Japan, is one of the few examples of the geological field where can be directly observed the amalgamation of Ryoke and Sambagawa belts along the Median Tectonic Line (MTL). Hence, it is the best place for discussing the relationship between metamorphism and deformation related to the tectonic evolution of MTL. Our detailed investigations of both metamorphic rocks lead to be constraints on the exhumation tectonics of *HPLT*-type metamorphic rocks and tectonic evolution from ductile to brittle deformations in subduction zone.

In this area, it is well known that the medium-*T* mylonite (so called “Kashio mylonite”) is widely exposed along the MTL (Takagi, 1986). We newly found that the low-*T* mylonites, as indicated by the Z-maximum *c* -axis lattice preferred orientations (LPOs) of recrystallized quartz, were also distributed. Both Ryoke and Sambagawa metamorphic rocks were deformed by low-*T* mylonitization within ~500m of the MTL. The mineral stretching with a gentle plunge to the NNE or SSW, suggesting the sinistral shearing, are well developed on the mylonite foliation. In the low-*T* mylonite zone, garnet porphyroclasts showed a significant chemical zoning of the grossular (X_{Grs}) from core to rim. The mylonite foliation was composed of white mica (Si in apfu = 3.38-3.49) and chlorite (X_{Mg} = 0.39-0.41). Based on the chemical analyses of recrystallized minerals, we attempted to apply the geothermometry and barometry. The *P-T* conditions of the low-*T* mylonites were estimated at 420~450 ˚C /0.5-0.6 GPa. A part of the Ryoke pelitic gneiss origin mylonites was estimated at ~540 ˚C /0.9 GPa. These *P-T* conditions of the mylonites are consistent of peak *P-T* conditions during Sambagawa metamorphism (e.g., Enami et al., 1994), suggesting the amalgamation of Ryoke and Sambagawa metamorphic belt during mylonitization.

In addition, U-Pb ages of zircons in the Kashio mylonite of Ryoke metamorphic belt were analysed by LA-ICPMS. The prominent age spectra of the mylonite showed 69.0 +/- 0.6 Ma (*n*=10), suggesting the solidification age of host Ryoke granite. Our data on protolith demonstrate a younger age than previously reported ages during mylonitization (>83 Ma, Kubota and Takeshita, 2008; or 95~85 Ma, Takagi, 1997). This suggests that the host Ryoke granite and Sambagawa metamorphic rocks were deformed by low-*T* mylonitization during 58-69 Ma. After the mylonitization and amalgamation of both metamorphic rocks, the exhumation of Ryoke and Sambagawa belts might be occurred owing to the change in plate motion at around 55 Ma (Seton et al. 2015).

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