I019-P007 Time: May 26 17:15-18:45

Quartz veins in the Ryoke metamorphic belt, SW Japan: its occurrence and geological background

Takamoto Okudaira[1], Yuki Beppu[1]

[1] Dept. Geosci., Osaka City Univ.

http://www.sci.osaka-cu.ac.jp/geos/geo2/okudaira.html

Mineralized veins in metamorphic rocks document local or long-distance mass transfer of mineral component. The vein formation occurs by mineral precipitation associated with through-flowing fluids: for example, precipitation from continuous, long-distance upward fluid flow along open fracture networks or episodic precipitation from flowing fluids driven by pressure variation. In the latter case, the abrupt drops in fluid pressure engendered by earthquake faulting episodes seem likely to play an important role in quartz deposition. Therefore, quartz vein in the seismogenic zone is a key to understand relationship between seismicity and fluid flow in the zone (e.g., Otsuki et al., 1998).

The vein systems are hosted dominantly by metapelites of upper greenschist-lower amphibolite facies of the Cretaceous Ryoke metamorphic belt (RMB) of the Kasado-jima Island, SW Japan. Based on their mineral assemblages, the metapelites of the Island can be divided into three mineral zones from north to south: biotite, cordierite, garnet-cordierite zones. The metapelites exhibit a schistosity and a lineation which is defined by an arraignment of hinge lines of the upright folds. The upright folds are identical to the last ductile deformation event (D3) in RMB. The central part of the study area occupied by a coarse-grained biotite granite which is post-tectonic intrusives. Large porphyroblasts of cordierite and/or muscovite are recognized in the periphery of the granite (~300 m in width), and the presence of these porphyroblasts indicates localized thermal effects caused by intrusion of the granite.

An outcrop (500m away from the granite) in the biotite zone occupied by high density of the veins are observed. The mineralized veins truncate the all ductile deformational structures of the metapelites. In the vein systems, R-shear, T and X-shear veins are well recognized. The R-shear veins predominate over T and X-shear veins in the systems. It significant that there is no consistent crosscutting relation among R-shear, T and X-shear veins. This argues strongly for a broad comtemporaneity of the vein set. Many dextral drag folds can be also recognized, and orientations of fold axis the cannot correspond to those of D3 folds. This observation indicates that formation of the drag folds postdates the regional ductile deformation. Thickness of the veins is very variable. Cumulative frequency of vein thicknesses in log-log space; the plot is linear, indicating a power-law distribution (D = 1.15). The veins is composed mostly by quartz. Quartz microstructures systematically change with changes in the vein width. In the thinner veins, the quartz grains are a polygonal and equigranular. By contrast, in the thicker veins, quartz grains exhibit some dynamic recrystallization microstructures: grain boundary bulging, deformation lamella, and wavy extinction. In the veins with moderate widths, the microstructural features of quartz grains are characterized by presence of straight grain boundaries and deformation lamella. The average grain size of infilling quartz in the thinner veins is proportional to the vein width, suggesting that the vein width is governed by the growth rate of infilling quartz. By contrast, in the thicker veins average quartz grain size exhibits a constant value due to dynamic recrystallization. Furthermore, the c-axis orientation of quartz grains in the thick R-shear vein exhibit a pattern produced by plastic deformation. Based on these microstructural observations, the quart veins seem to be formed under the condition of brittle-ductile transition. To clarify the source of the fluids, we will estimates of the temperatures hydrothermal deposition in the vein system from fluid-inclusion study and oxygen and hydrogen isotopic compositions of quartz grains in near future.