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Microstructure of veins: An example from the Cretaceous Shimanto complex.

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Mode and flux of fluid flow will strongly control rock strength, fluid-rock interaction, and mass transfer within the subduction zone. Recently, mineral veins within the accretionary complex has been investigated as the record of ancient fluid flow (e.g. Hashimoto et al.,2002, Lewis et al., 2003). The fluid flow along the crack is closely linked to the crystallozation of vein minerals. Therefore it is important to characterize the vein by means of growth microstructure, and to compare microstructures within the vein stage of the vein formation.

We investigated mineral veins from the Goshikigahama area in the Cretaceous Shimanto Belt, Shikoku. In the Goshikigahama area, a melange zone (the Yokonomi Melange) and a coherent zone (the Susaki formation) are continuously exposed over 600m. The Yokonami Melange is considered as tectonic melange which formed by larger parallel shearing along decollment, and contains oceanic materials such as basalt and chert. The vein formation temperatures estimated by fluid inclusion microthermometry in the Susaki formation and in the Yokonami Melange are about 170 degree and about 240 degree respectively (Sakaguchi,1996). As plastic deformation of quartz and calcite do not occur at such low temperatures, it is expected that the growth microstructures are well preserved.

Following the mode of occurrence, the mineral veins observed in this area is classified into six types.

Susaki formation: TypeI vein appears in sandstone layer and cross to sandstone layer. This type is of thickness below 1mm, and consists of quartz+calcite. TypeII veins also develop normal to the sandstone layer, but intersect TypeI vein. TypeII vein is composed of quartz+calcite or quartz+chlorite assemblage. TypeIII is a thick calcite vein (1cm thick), that develops along the boundary between sandstone and mudstone layers.

Yokonami melange: TypeIV veins occurs in sandstone blocks and thickness is less than 2mm. They are composed of quartz+calcite. Direction of TypeIV vein is at random. TypeV veins occurs associated with shear fracture, which develops along foliation of mudstone or cuts on melange fabric. This types mineral is composed of quartz+calcite, and maximum thickness is 4cm. TypeVI vein is a quartz vein, which cuts to foliation. The thickness is less than 3mm.

According to Bons(2004), microstructures of quartz within vein from this area are blocky to elongate blocky. Blocky quartz grains are observed in TypeI and VI veins. In contrast, elongate blocky microstructure is found in TypeII and IV vein. TypeV vein shows composite texture including blocky and elongate blocky. Quartz+calcite veins (typeII,VI,V) are common in the studied area show similar microstructure that quartz crystal grows from vein wall and calcite crystal fills the central part of the vein. The c-axis of quartz crystal is cross to vein wall, and calcite c-axis along vein wall.

From the relationship between microstructural features and occurrence of individual types of vein, we will discuss how fluid flowed during the evolution of accretionary complex.