Study of fault evolution based on texture and chemical analyses of fault gouge: Case study of the Byobuyama fault, Gifu prefecture, central Japan.

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The Chubu region is one of the most concentrated area of active faults, which forms the complicated fault geometry system. Such active structures affect the formation of riverine and mountain system. It can be said that active structures are important factors to consider the landform development. Although studies of active faults are multi-faceted, geological view is critical in order to consider a certain amount of time scale. In this study, we performed structural and chemical analyses of fault rocks of the Byobuyama fault, as a case study for improving research technique to reveal the history of active faults.

Studied outcrop is located in Rontochi area in Mizunami city, Gifu prefecture. Wide brittle zone along the boundary of the Toki Sand and Gravel Formation (Pliocene) and Inagawa Granite (Cretaceous) is identified in this outcrop. This brittle zone consists of cataclasite zone shows sinistral sense and fault gouge zone shows dextral sense (Katori et al., 2015). In the fault gouge zone, multiple subzones were observed as a difference of their color and deformation texture, and they show different sense of shear between each others (Katori and Kobayashi, 2015). Based on these features, the fault gouge zone observed in this outcrop preserves the several stages of fault activity at shallow depth. To reconstruct the history of the fault activity at shallow depth, we collected samples for structural and chemical analyses from this outcrop. As a chemical analysis, we performed XRD, XGT and EPMA analyses.

Based on these structural and chemical analyses, the following results were obtained.

1. There are zones undergoing significant flow deformation in the fault gouge internal where a porphyroclast showing dextral sense is observed.
2. In the most part of the zone, the matrix of the fault gouge is composed mainly of smectite. In contrast, illite is abundant in the zone observed flow deformation.
3. In the tail (pressure shadow) of the porphyroclast, quartz, K-feldspar and biotite show fragmentation by fracturing, while albite shows eluviation structure of Na.

From the above results, fault gouge zone along the Byobuyama fault has experienced activities of several stages under different stress, and significant differences in the deformation and alteration mechanism exist between these stages. Especially, the flow deformation of the fault gouge indicates that a large amount of fluid was present during the deformation. Abundance of illite infers that such fault gouge was formed by relatively high temperature fluid. In addition, eluviation structure of albite may indicate a deformation under environment such as to promote reaction solution. In this presentation, we discuss the vicissitudes of deformation and alteration mechanism in the fault gouge along the Byobuyama fault.

This study was carried out under a contract with METI (Ministry of Economy, Trade and Industry) as part of its R&D supporting program for developing geological disposal technology.

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Keywords: Fault evolution, Fault gouge, Active fault, Clay mineral, Byobuyama fault

