

Internal structures of the fault gouge zones along the Ikoma active fault zone

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The NNE-SSW-N-S trending Ikoma active fault zone is recognized as a high-angle reverse fault under the E-W compressional stress field in the Quaternary Japan. However, from the rock mechanics point of view, high-angle fault is favorable as normal fault formed under extensional stress regime. The high-angle reverse faults may be resulted from the reactivation of the high-angle normal faults (inversion tectonics). In this study, we examined some fault gouge zones along the Ikoma fault zone (Katano and Ikoma faults).

We found two fresh outcrops of mesoscopic fault zones developed along the Ikoma fault zone at Kuraji of Katano City and Kiyotaki of Shijonawate City. In these fault zones, fault gouge with the width of 20-30 cm can be observed. We collected some oriented samples and made thin sections parallel to the striation and normal to the fault plane. In the samples, many dark seams develop parallel to the main fault plane (striation) to form a distinct foliation within the fault gouges. Many fragments with various sizes are observed and their long axis aligned oblique to the fault plane. The parts where edges of the fragments meet the dark seam the edges tends to be rounded, suggesting that the formation of the dark seam was associated with material transportation due to pressure solution. The fragments with high aspect ratios tend to align oblique to the fault plane, suggesting the rigid-body rotation caused by non-coaxial shear deformation. The asymmetric structures, i.e., preferential orientation of the long axis of fragments, drag folds and shear lenses indicate the top-down-sense-of-shear. Furthermore, fractal dimensions of the fragments in samples near the main fault plane are higher than in samples at the margin of the fault gouge.

Consequently, we found the lines of evidence indicative of normal fault movement in the fault gouges associated with the Ikoma active fault zone, suggesting that the N-S striking Ikoma fault zone is recognized as a high-angle reverse fault under the E-W compressional stress regime are of reactivation of the preexisting high-angle normal faults that may be formed under extensional stress field.

Keywords: Ikoma fault zone, deformation structures, fracture zone, fault gouge, fragments, active fault