

Mechanochemical effects on maturation of carbonaceous materials in faults during earthquakes

*Ichiba Tatsuya¹, Shunya Kaneki¹, Tetsuro Hirono¹, Kiyokazu Oohashi²

1. Osaka University Graduate School of Science, 2. Yamaguchi University Faculty of Science Department of Geosphere Sciences

Frictional heating is thought to occur during an earthquake and the shear stress can be estimated from the temperature recorded in the fault. A new temperature proxy for maturity of carbonaceous materials by using infrared and Raman spectroscopies was recently proposed, but intra-crystal change by shear damage may affect on the maturation. Here we focus on the mechanochemical effect in the process by performing low-velocity friction experiment and spectroscopic analyses.

We performed the friction experiments at 3.0 MPa normal stress and 1 mm/s slip rate, and 10 m slip distance by using the mixture of 90 wt.% quartz and 10 wt.% coal. To reproduce heating during earthquake slip, we heated the samples after experiments at 100-1000 °C. By comparing the spectra on these samples, we confirmed that some reactions, such as breakage of aliphatic chain, occurred at relatively low temperature on sheared samples. Thus, the mechanochemical effect should be considered for deterring the temperature recorded on the basis of the maturation.

Keywords: Fault, Carbonaceous materials, Spectroscopic analysis