High-velocity friction experiments on carbon bearing fault gouge

Kiyokazu OOHASHI[1]; Takehiro Hirose[2]; Toshihiko Shimamoto[3]

[1] Grad. Sch. Sci., Hiroshima Univ.; [2] JAMSTEC; [3] Graduate School of Science, Hiroshima Univ.

Recently, many mechano-chemical reaction(material change) during the earthquake along the natural fault zones were reported. On the other hand, experimental work about frictional heating, thermal reaction and dynamic weakening of fault strength accompanied with seismic slip were also reported. Additionally, it has become clear that amorphization of the rock-forming mineral accompanied with pulverization can occur in various minerals. These studies gradually revealing that intra-fault material is altering mechanically and chemically with seismic slip and these changes likely affect to the physical properties of fault. On the other hand, the author has investigating natural fault zones and fault rocks in central Japan, and reported some black-colored fault rocks contains graphite/low-crystallized carbon. Since the carbonaceous material is relatively abundant material in the earth's crust, if it is possible to use the carbon mineral as seismic slip record, the usefulness is high. And it's also important to investigate the development of carbonaceous material along the fault plane because of its low frictional coefficient and high electric conductivity. Therefore, we conduct high velocity frictional experiment on natural and artificial carbon mineral in air and inert gas condition using high-velocity friction apparatus.

As a result of the high-velocity(1.3m/s) friction experiment on carbonaceous fault gouge in the air condition, the emission of CO_2 was observed during sliding. By Micro-optical/SEM observation of thin-section of recovered sample, we can see the development of narrow slipping zone(deformation concentration zone) which shows development of preferred orientation of clay minerals and decrease of colored mineral(carbonaceous material). These phenomena are explained by thermal oxidation of carbon at oxidation condition[$C+O_2=CO_2$], and it suggest the slipping surface suffered ˜400 degree Celsius frictional heating.