

## Physicochemical characteristics of gouge and the inter-particle bonding

# Koichi Nakagawa[1]

[1] Graduate School of Sci., Osaka City Univ.

Gouges sampled from active fault crop, in general, are composed of very wide range sized mineral grains or rock fragments, and contain much very fine clay minerals up to submicron order. The materials with those grain size distributions may show somewhat different mechanical behaviors from common sediments or rocks. The physicochemical characteristics of gouge materials and the relationship with mechanical behavior, here, are discussed using relatively simple inter particle bonding model.

Electrical polarizations were observed in common fine soil aggregates in the shear deformation in the laboratory. The electric potential is called SIP, shear-induced potential. The SIP can be interpreted as the physicochemical interaction between the surface of clay particles and interstitial water on the kinetics of the electric double layer. The SIP almost could not be detected in a remolded craft clay sample, which was possibly treated with electrically non-dipole oil. A plane strain test under the un-drained condition was carried out in order to reveal the characteristics of the electric polarization accompanying shear deformation, and especially, to clarify the relationships between the polarities of electric charge induced and the deformation pattern. The material for the test specimens was collected from the gouge zone at active fault. The sieved gouge material was remolded with salt water and consolidated axially with K-zero condition. Many electrodes were attached to each surface of the parallelepiped specimen. The electrode for the reference potential was embedded in the center of the specimen. The potential levels induced during deformation changed on the order of several tens of mill volts and was detectable by the electrodes. These potential changes of the electrodes increased as the strain increased. An intensity of SIP to the shear strain depends on the kind of clay mineral, fine particle content, electrolytic concentration of the interstitial water, the compression degree and so on. The detailed mechanism of polarization associated with the shear deformation is not clear. However, it may be hypothesized that breaking the inter-particle bonding by deformation makes disturbance of the electric equilibrium near the particle contacts and subsequently releases cations from the adsorbed layer into the free pore water. Phenomenon of SIP mentioned above may be available to monitor a symptom of the failure and strain states in gouge such as fault sliding caused by earthquake or mass movement, since the SIP for fine soil aggregates is very sensitive to the local strain generated in the body.