Characteristics of SIP(Shear-iInduced Polarization) in fault gauge

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An experimental study on the electrical potential changes induced in fault gouge materials accompanying their shear deformation has been carried out. Some electrical polarizations were observed in common saturated fine aggregates, such as fault gouge during the shear deformation test in laboratory. This phenomenon is called SIP (Shear-Induced Polarization). This phenomenon of SIP can be interpreted in terms of physicochemical interaction between fine particle and interstitial water. However, the SIP was not detected in the remolded clay for handicraft-use which treated with some non-dipole oil.

The electrical conductivity of both the pore water and of the composite could be measured during the consolidation process in clay-water-electrolyte system. The measured variations of the conductivity would provide information to interpret the changes in the physicochemical properties of the system. The variation in shear wave velocity and conductivity during consolidation of kaolinite were consistent. They suggest that the application of an increment of stress to a sample that has undergone structure redevelopment over an extended time under a previous, small stress causes a structural breakdown that is followed be a time-dependant development of structure, with changes in properties that cannot be accounted for by increase density alone. Chemical changes within the pore water are reflected by changes in the electrical conductivity with time.

The phenomenon of SIP in fine particle aggregates is considered to support the above physicochemical process from another point of view.

Accordingly, there is some possibility of detecting the earth current anomaly related to local earthquakes along an active fault.