Seismic time-scale heating and cooling experiment on illite

Haruka Yamaguchi[1]; Kohtaro Ujiie[2]

[1] IFREE, JAMSTEC; [2] JAMSTEC

Short-time heating and cooling experiment of illite was performed in the view point of rapid melting during the seismic slip. Despite the classical melting experiments of clay minerals with constant temperature raise, temperatures were maintained at 800, 900, 1000, 1100, and 1200 C, and illite powder in the graphite capsule were loaded rapidly in and out of the electric furnace. The micro- to nano- meter scale observation revealed the three different processes:

1) disruption of structure, concretion, and less transparency at 800 and 900 C, 2) become amorphous at 1000 and 1100 C, and 3) totally molten and mobilized at 1100 and 1200 C. Finer illite powder tends to melt at lower temperature, however, coaser particle tends to melt earlier within the size mixed illite. Nano-scale newly grown idiomorphic grains of mullite and iron oxide were observed by TEM. These results show that the rapid heating and cooling such as seismic slip would lead illite to melt in their unstable field, approximately 100 to 200 C higher than ordinal disruption temperature (Deer et al., 1966).