Melting process of illite and duration of heating

Haruka Yamaguchi[1]; Kohtaro Ujiie[2]; Kazuko Saruwatari[3]

[1] IFREE, JAMSTEC; [2] JAMSTEC; [3] Univ. of Tokyo

Short-time heating and cooling experiment of illite was performed in the view point of rapid melting during the seismic slip. On the otherhand, traditional melting experiments of clay minerals with constant heating was also performed in order to see the contrast of melting process. Former experiment maintained the temperatures at 800, 900, 1000, 1100, and 1200C, and illite powder in the graphite capsule were loaded rapidly in and out of the electric furnace. Latter experiment raised the temperature of illite powder within platinum capsule from room temperatures to 800, 900, 1000, 1100, 1200, and 1300C with constant rate of 10C/sec.

The micro- to nano- meter scale observation revealed the three different processes: 1) disruption of structure, concretion, and lose transparency, 2) become amorphous and appearance of bubbles, and 3) totally molten, mobilized and transparent with rich bubbles. Third proccess occured at 1100 C in the short-time heating experiment, whereas at 1300C in the long-time eperiment. Appearance of hematite and theta-spinel by XRD which indicates the breakdown of octahedral site of illite occured at 1000C for short-time heating experiment and 1100 C for long-time heating experiment. Nano-scale newly grown idiomorphic grains of mullite and iron oxides were observed by TEM at 1200 C for short-time experiment and 1300C for long-time expereiment. 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 200C higher than ordinally predicted (Deer et al., 1966).