High-speed heating and cooling experiment on illite

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Recently, pseudotachylytes known as the the fossil rocks of seismicity have discovered in the Shimanto accretionary complex, the ancient plate boundary seismogenic zone. All these glass part show the same composition as host rock illite, which is completely different from that of

pseudotachylytes at intracontinental faults or impact walls. Ujiie et al. (2005; this meeting) estimated that viscosity intensely change at 800-1000C and very rapid cooling rate of only 1 second is needed to cool down the 1mm thick melt layer. This cooling time agrees well with the duration times of natural seismic slips. Although illite is known to disrupt its structure at 850-950C, because most of these temperatures were yielded from thermal analysis performed with constant raise of temperature, we cannot extrapolate the results directly into rapid event like seismicity. In this point of view, we carried out high-speed heating and cooling experiment on illite, and investigated the melting condition and change in texture.

Electric furnace of Siliconite TSH-430 in Univesity of Tokyo was used to heat the starting material. Regarding the pseudotachyllite accompanied by illite-rich cataclasite, illite standard powders were prepared as starting material some of which were dried in a oven at 120C for 24hours. The powders were set into graphite capsule, then suspended in the furnace at maintained temperatures of 800, 900, 1000, 1100, and 1200C, with duration time of 70-110 seconds. The suspending time was decided after measurement of temperature-time curve by thermometer buried in the center of starting material, not longer than 10 seconds after it reached to the expected temperature. Experimental production was observed under microscope and SEM then chemically analysed by using EPMA. The results of rapid heating and cooling experiment have revealed that disruption of texture occur between 800-1000C and expansion and vitrification occur at 1100C, regardless whether starting material was dried or undried. It shows that the rapid heating and cooling such as seismic slip would lead illite to melt in unstable field, 200C higher than ordinal disruption temperature.