K131-004 **Room: 301B** **Time: May 25 9:45-10:00**

Electrical conductivity of micas (2)

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Seismic velocity and electrical conductivity give us clues to infer constituent materials and their physical states in the Earth. Electrical conductivity is used to infer the distribution of water in the crust, since it is especially sensitive to the existence of fluids. Dry rocks are generally considered to be electrically insulating under the crustal temperature condition. However, Fuji-ta et al. (2006) recently pointed out that the interconnection of biotite grains might be the cause of the observed high conductivity. Although room-temperature properties of biotite are well known, high-temperature properties are poorly understood. We thus have investigated electrical properties of biotite single crystals up to 700 C. In order to get a good understanding of conduction mechanisms, electrical properties of phlogopite and muscovite have been also studied.

Thin plates (3 mm x 3mm x 0.15 mm) were prepared from single crystals of biotite, phlogopite and muscovite. Plates were parallel to cleavages. By 2-electrode method, the electrical impedance in the direction normal to cleavages was measured with an LCR meter (NF, ZM2353). The applied voltage was 1 V, and measurements were made at 27 frequencies between 40 Hz and 200 kHz. The specimen was kept in the nitrogen atmosphere.

The electrical conductivity of biotite shows remarkable hysteresis. The electrical conductivity at a given temperature is significantly higher after heating than before heating. Neither phlogopite nor muscovite shows such hysteresis in conductivity. In order to investigate the hysteresis of conductivity, we conducted stepwise heating experiments of biotite. The temperature is increased to a certain value. The conductivity increases and gradually reaches a stationary value. The temperature is then increased to the next value. The conductivity increase at a fixed temperature is not significant below 450 C. Remarkable increase (by one order of magnitude) is observed at the temperature of 450-500 C. The conductivity increase is not significant above 500 C. The conductivity at a fixed temperature does not change during cooling. No significant change in conductivity at a fixed temperature is observed at the second heating. Brindley and Lemaitre (1987) reported that Fe^{2+} in biotite changes to Fe^{3+} at the temperature of 450-650 C. The conductivity increase can be related to this change. Since ions Fe^{2+} and Fe^{3+} occupy equivalent sites in biotite, electrons can move easily. The hopping of electrons may be the dominant conduction mechanism of biotite.