Temperature dependence of streaming current coefficient and zeta potential

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To obtain the temperature dependence of the streaming current coefficient, we performed sinusoidal oscillation tests at various temperatures up to 70C using granite specimen. We found that the streaming current coefficient increases with temperature. We evaluated the zeta potentials from the measured streaming current coefficients taking into account the temperature dependence of the viscosity and the dielectric constant. It was found that the absolute value of the zeta potential also increases with temperature.

Yoshida (2001) showed that the electric current is generated prior to rupture of saturated rock, which is caused by an electrokinetic effect due to the water flow associated with accelerating evolution of dilatancy. To estimate the current intensity in seismogenic zones, it is important to study temperature dependence of the streaming current coefficient. To obtain the temperature dependence, we performed sinusoidal oscillation tests at various temperatures up to 70C. Using a granite specimen saturated in pore water, sinusoidal variation in pore pressure is applied to the bottom face of the specimen, and the generated electric current is measured. We found that the streaming current coefficient increases in magnitude with temperature. We evaluated the zeta potentials from the measured streaming current coefficients taking into account the temperature dependence of the viscosity and the dielectric constant. It was found that the zeta potential also increases in magnitude with temperature. This is consistent with the result of Ishido and Mizutani (1981).

References:

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