Characterization of pore structures in deformed granites via electrical impedance spectroscopy

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Electrical impedance spectroscopy was applied to fluid-saturated deformed granites as a non-destructive method of characterizing pore structures. Granite samples were deformed under a condition of brittle deformation (room temperature and 40 MPa confining pressure). The maximum axial stress was systematically varied to make samples with different density and connectivity of cracks. The electrical impedance was measured at the frequency from 20 mHz to 10 MHz. Compressional and shear wave velocities were also measured to infer pore structures. The measured impedance spectrum clearly shows the existence of two relaxation mechanisms. The geometry of connected and blocked fluid paths was evaluated from impedance spectra. We will demonstrate that the electrical impedance spectroscopy is an excellent tool for characterization of pore structures.