

Pressure dependence of electrical conductivity in brine-saturated Berea sandstone and its pore structure

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Electrical conductivity in brine-saturated Berea sandstone (porosity ~20%) was measured under confining pressures of up to 100 MPa. The pore-fluid pressure was kept at the atmospheric pressure (0.1 MPa). Electrical conductivity decreased by 22% as the confining pressure was increased to 40 MPa. Volumetric strain of a dry rock sample was separately measured under confining pressures. The volume change was 0.7% as the confining pressure was increased to 50 MPa. The change in porosity should be only 1%. The observed relatively large decrease in conductivity shows that the connectivity of pores in the porous Berea sandstone was significantly reduced by a small decrease in porosity. In order to understand the nature of the conduction path, the pore structure in Berea sandstone was observed with X-ray CT conducted at Tokyo Metropolitan Industrial Technology Research Institute. 3D images of pores were constructed by processing X-ray CT images to examine the connectivity of pores.

Keywords: electrical conductivity, sandstone, pore structure