

SSS035-P15

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## X-ray CT-based hydrogeological core analysis with CFR-PEEK core holder

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Clarifying hydraulic properties in the Earth's crust is required to understand crustal fluid migration, heat and material transport by the fluid, and accompanying water-rock interactions. For this purpose, we have studied an X-ray CT-based numerical method to analyze fracture flows within core samples at in-situ stress conditions. However, a recent study revealed that it was difficult to be characterized by using commercially available core holders, because noise in CT value was not negligible due to relatively high X-ray attenuation. In this paper, we show a new core holder, and some numerical results of fracture flow analyses for a granite sample under confining pressure. We have developed a core holder whose main body is made of a carbon fiber-reinforced PEEK (CFR PEEK), because of the low density of 1.44 g/cc and the high tensile strength of 236 MPa. The main body of the current core holder was designed for 2-inch core samples, and had the wall thickness of 12 mm. A pressure test demonstrated the core holder could be used at confining pressures of > 30 MPa. A medical X-ray CT scan for a granite sample having a saw-cut fracture demonstrated the detection limit of fracture aperture was smaller than 30 microns even with the core holder. Based on a medical X-ray CT scan at 3-10 MPa with the core holder, it was possible to analyze single-phase flow within a granite sample having a tension fracture. The results demonstrated that fracture aperture and resulting permeability distributions within the sample could be measured, and that hydraulic properties of the sample could be evaluated using the permeability distribution, by using the X-ray CT-based numerical analysis, without any direct experiments on permeability.

Keywords: Core Analysis, X-ray CT, CFR-PEEK core holder, Confining pressure, Fracture flow, Permeability