

Development of simultaneous measurement system of viscosity and permeability for highly accurate evaluation of flow characteristic of Geofluid

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In this study, we will develop a high precision simultaneous measurement system of high temperature - high pressure viscosity and permeability to strictly evaluate the behavior of Geofluid. In this system, we combine high precision viscosity measurement technique and high pressure generation technique of National Metrology Institute of Japan. One of the features of the porous medium like crust is that the fluid can be transmitted through a cavity having a complicated geometric shape inside it. That is, the porous medium has hydraulic properties. Recently, in evaluating the long-term stability of disposal system for high-level radioactive wastes, and also, to reveal the relationship between fluid characteristic and tectonic deformation of crust, the need to know the permeability / substance transport characteristics of the target rock or stratum in detail has been emphasized. A lot of research and development has been done to grasp the flow characteristics of the Geofluid under high pressure, however, the pressure dependence of the viscosity of the crustal fluid tends to be overlooked, and also the permeability coefficient of the rock accompanying it tends to be ignored. So, there are few studies which strictly evaluated of it. Technical development of high precision measurement of permeability in terms of Metrology has not been done so far. In addition, no quantitative study has been done on the generally used Darcy's law from Metrology viewpoint. In this study, we focus on the similarity between flow field descriptions based on Hagen-Poiseuille's law used for highly accurate viscosity measurements by capillary method and Darcy's law. We will develop simultaneous measurement system of high temperature - high pressure viscosity and permeability, leading to an essential understanding of flow characteristics of Geofluid.

Keywords: Hagen-Poiseuille law, Darcy's law, Permeability

