Experimental Investigation on Pore Pressure Sensitivity of Clay-Rich Sedimentary Rocks

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ABSTRACT

Rock strength depends on effective stress (σ') which is a function of total stress (σ) and pore pressure (Pp): $\sigma' = \sigma - \alpha Pp$, where α is the effective stress coefficient which quantifies sensitivity to pore pressure. It is commonly assumed that α is 1, such that effective stress is simply the difference between total stress and pore pressure ($\sigma' = \sigma - Pp$). Deformation experiments have revealed that α is 1 for fracture strength on soils and sandstones. For clayrich rocks, on the other hand, very few studies have investigated on α for fracture strength, but some studies suggested that α is less than 1. To test whether the assumption is applicable to clay-rich mudstones, I will conduct triaxial deformation under a range of confining pressure (Pc) and pore pressure (Pp). Various combinations of Pc and Pp can reproduce the same Pc – Pp of 5, 10, 20, and 30 MPa. If the results of this research reveal that α is less than 1 for clay-rich mudstones, the current estimation of in-situ rock strength and effective stress are underestimated and needs to be reevaluated.