

Geomechanical Properties of Methane Hydrate-Bearing Sediments from Pressure Coring at the Eastern Nankai Trough

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Geomechanical properties are essential parameter for methane gas extraction from methane hydrate to achieve safe and secure production. In this study, natural methane gas hydrate-bearing sediments were subjected to triaxial tests using transparent acrylic cell to investigate the strength and stiffness of sediments from deep seabed in the Eastern Nankai Trough. The samples were recovered using pressure coring which is a progressive technology to maintain the pore fluid pressure from in-situ to the laboratory. Triaxial compression test of hydrate-bearing sediments at in-situ pressure conditions were successfully done without any hydrate dissociation. The digital photographs were taken during the tests and the local deformation of sediments was quantified in each 0.1% of axial strain level by image processing technique. From the results, hydrate-bearing sediments showed brittle failure with shear banding as evidenced by the stress-strain softening response. In contrast, hydrate-free sediments showed ductile failure mode. The shear strength increases with hydrate saturation. This result is consistent with the results of synthetic hydrate-bearing sediments. Local strain which was calculated from local deformation showed that there is the distribution in stiffness in each centimeter due to distribution of hydrate saturation. This study successfully demonstrates the use of pressure core samples to investigate geomechanical and geotechnical properties of intact hydrate-bearing sediments at in-situ pressures.

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