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圧力コアによるメタンハイドレート胚胎層の浸透率特性解析
Pressure Core Analysis on Permeability of Methane-Hydrate-Bearing Sediments

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Permeability is the most important factor affecting the gas productivity of hydrate-bearing sediments. In this study, effective water permeability of hydrate-bearing sandy sediments was measured by core-flooding test. The core samples were recovered under pressure from a methane hydrate reservoir located at the Daini-Atsumi knoll in the Eastern Nankai Trough off the shore of Japan. The cores were shaped cylindrically with liquid nitrogen spray after rapid pressure release and inserted into a core holder to maintain the hydrate phase stable P-T conditions and to apply a near in situ effective stress. The results showed that the effective water permeability in hydrate-bearing sandy sediments was in the range of 1-100 md. After depressurization-induced hydrate dissociation, absolute permeability of host sediments was analyzed. Absolute permeability of sandy host sediments was estimated to be up to 1.5 d. The results indicate that the hydrate-bearing sandy sediments at this location have promising permeability conditions for achieving depressurization-induced gas production. In addition, the change of absolute permeability caused by depressurization-induced gas production was analyzed. It was found that absolute permeability was reduced by the high effective stress and fresh water originating from hydrate dissociation most likely due to the sediment compaction and the clay swelling. Although depressurization is a promising method for the gas production at this location, the results indicate that reservoir formation damage should be considered during long-term gas production.

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Keywords: pressure coring, Nankai Trough, turbidite, flooding test, effective permeability, absolute permeability