



Investigation of the Experimental Fault Permeability in Two Sands using Ring-shear Apparatus

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We used a ring-shear apparatus to examine the perpendicular permeability of different type of sand for evaluating faults around methane hydrate reservoirs. The effect of effective normal stress on the permeability was investigated. We obtained measurements under constant effective normal stress ranging from 0.5 MPa to 8.0 MPa. The grain size distribution and particle shape in sand samples were performed by laser diffraction and optical microscopy method using the Morphologi G3, respectively. The median D50 and of median HSC (High Sensitivity Circularity) were obtained as 215.7 μ m and 0.758 in No.7 silica sand, 231.8 μ m and 0.789 in Toyoura sand. In No.7 silica sand, permeability after ring-shearing substantially decreased with increasing effective normal stress up to an effective normal stress of 2.0 MPa, and became gradually decrease for effective normal stress values greater than 2.0 MPa. In contrast, in Toyoura sand permeability after ring-shearing drastically decreased up to an effective normal stress of 3.0MPa. Although the relationships between the permeability after ring-shearing and the effective normal stress in the both sand samples could be expressed by an exponential equation up to 3.0 MPa, the gradual change in slope was shown in Toyoura sand in comparison with No.7 silica sand. The both permeability in two sands had almost the same values for effective normal stress greater than 3.0 MPa. These results indicate that the influence of single particle crushing strength is more important than grain size and particle shape for understanding of different permeability up to 3.0 MPa between two sands. This study is financially supported by METI and Research Consortium for Methane Hydrate Resources in Japan (the MH21 Research Consortium).