R224-P016 **Room: Poster Session Hall** **Time: May 28**

Relation between Permeability and Pore-Size Distribution of Methane Hydrate Bearing Sediments

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Natural gas hydrates in sediment are expected to be developed as a resource of natural gas and have been studied as a possible future energy resource. These gas hydrates consist mainly of methane and are called methane hydrates. it is very important to clarify the permeability of gas and/or water flow in MH-bearing sediment and the properties of formation and dissociation of gas hydrates. The permeability of MH-bearing sediment is considerably affected by several properties of sediment, i.e., pore-size distribution, porosity, cementing, MH production methods, and MH saturation.

This study used proton nuclear magnetic resonance (NMR) to measure pore-size distribution of sediment in order to characterize methane-hydrate-bearing sediment by pore-size distribution and permeability. Sandy sediment with different grain sizes has been measured as fundamental research and for application of natural methane-hydrate-bearing sediment. The pore-size distribution and porosity of sediment have been measured by NMR and mercury porosimetry. The absolute permeability of sediment measured by water flow based on the Darcy law was compared with the permeability calculated from NMR spectra based on the SDR model. NMR spectra have also been analyzed by a conversion technique in order to obtain pore-size distribution with higher spatial resolution.

The change of pore-size distribution due to MH dissociation was precisely analyzed using these conversion techniques. The effective permeability of sediment with different effective porosities, which had been measured by water flow based on Darcy law, was compared with the permeability calculated by NMR spectra based on the SDR model. The permeability calculated by NMR spectra is similar to the permeability measured by water flow, with a difference between them of less than a factor of 2. Moreover, the tendency of permeability change during MH dissociation measured by water flow is similar to that calculated by NMR spectra.

This conversion technique has been applied for methane-hydrate-baring sediment in order to characterize methane hydrate-bearing sediment based on pore-size distribution and permeability. The relation between pore-size distribution (including porosity) and permeability of methane hydrate sediments was investigated. Pore-size distributions of sediments were measured by mercury porosimetry, and the NMR spectrum was calibrated by this pore-size distribution. The permeability estimated by an SDR model based on the Kozeny-Carmann approximation was consistent with the permeability measured by water flow. Pore-size distribution can be roughly estimated by conventional NMR analysis, and the conversion of NMR spectra by deconvolution enables precise characterization of the pore-size distribution change.

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