

Swapping Methane with Carbon Dioxide in Methane hydrate and Clay Sediment Mixture under Sea water Condition

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A large amount of CH₄ gas in the form of solid hydrates naturally deposits in permafrost zone and sea floor sediments around the world. For recovery of CH₄ in efficient way, we suggested 'Swapping process' to overcome the drawback of conventional recovery methods triggering catastrophic slope failures; external CO₂ and N₂ molecules in the hydrate deposits replaces the CH₄, and consequently CH₄ is successfully recovered, maintaining its own structure. Actually, natural gas hydrate is mixed with clay sediment under sea water condition, but the effect of clay sediment on CH₄ recovery rate has not yet been reported. In this study, we attempted the recovery of CH₄ from the methane hydrate and clay mixture with CO₂ under the sea floor conditions. To calculate recovery rate, the replacement of CH₄ with CO₂ in the hydrate and clay mixture containing 2.7 wt% of NaCl aqueous solution was monitored by gas chromatography and ¹³C solid-state NMR spectroscopy. The result demonstrates that the higher concentration of clay results in the lower recovery rate.