

Gas hydrate-based CO₂ capture from flue gas : Investigation of structural transformation and formation kinetics of 3,3-dimethyl-1-butanol + CO₂ hydrate

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With global warming, various CO₂ capture technologies have been investigated so far. Among the options, gas hydrate-based CO₂ capture is recognized as an emerging technology due to the advantage of low regeneration energy consumption. Gas hydrate is a nonstoichiometric inclusion compound forming the well-known three structures, sI, sII and sH. Among the structures of gas hydrate, sH hydrate exhibits promising CO₂ capture capacity. In this study, we investigated the 3,3-dimethyl-1-butanol (DMB) hydrate with different N₂:CO₂ mixed gas ratios to reveal the structure transformation between sI and sH hydrates. Based on the high resolution powder diffraction(HRPD) analysis and phase equilibria measurement, the structural transition points from sI to sH hydrate were verified. In order to estimate the potential application to the post-combustion CO₂ capture process, kinetic patterns of the sH hydrate were also explored focusing on gas uptake, induction time, and separation factor.