

Storing methane into *tert*-Butyl alcohol clathrate hydrate: thermodynamic and spectroscopic analysis for application to energy gas storage and transportation

박영준, 차민준, 이 혼*
KAIST
(h_lee@kaist.ac.kr*)

A *tert*-Butyl alcohol, a monohydroxyl alcohol with a hydrophobic group that appears to be fully miscible with water at any concentration, forms complex crystal structures with water. However, *tert*-Butyl alcohol solution by itself doesn't form a clathrate hydrate. In this experiment, we firstly synthesized clathrate hydrate by pressurizing methane gas. The complex structural and guest dynamic characteristics were identified by employing ^{13}C solid-state NMR and Raman, as well as X-ray diffraction technique. The synthesized structure was revealed as sII type clathrate hydrate (cubic, $Fd\bar{3}m$). Thermodynamic stability and storage capacity were also measured. Its methane storage capacity exhibits higher than that of tetrahydrofuran that is known to be one of the most powerful hydrate promoters. The present results provide several key features for better understanding of inclusion phenomena occurring in the complex hydrate systems and further developing methane or other gas storage methods.