

Phase Equilibria and Spectroscopic Observation of Various Alcohol Hydrates

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Many studies focus on the methods of recovering huge amount of methane gas from the natural gas hydrates stored on the deep sea ocean. And many researchers are considering injecting various types of alcohols as part of inhibiting the hydrate formation for flow assurance and natural gas recovery. The hydroxyl group in alcohols reduces the activity of water molecules owing to the water-methanol hydrogen bond, however, the increase in number of hydrocarbon groups in alcohols inhibits the effect of the water-alcohol hydrogen bond, and then the hydrophobic balance is dominant. Herein, we attempt to identify the structure and phase behavior of the various alcohols + CH₄ hydrate system and demonstrate that free OH existence might be a key role in determining cage dimension as well as hydrate structure type through spectroscopic observation such as solid-state NMR spectrometer, Raman, and powder X-ray diffraction methods.