

Thermodynamic and Spectroscopic Analyses of Cyclopentane Hydrates in the Presence of Small Gas Molecules

_____, _____, _____, _____, _____*

(ywseo@unist.ac.kr*)

As water scarcity has been an urgent problem in the world, desalination has recently received a lot of attention in environmental field. Accordingly, potential application of desalination based on gas hydrate formation was also suggested with novel apparatus and experiment methods. Among the potential guest molecules for hydrate-based desalination, cyclopentane (CP) is considered to be promising because CP endathrates under atmospheric pressure and room temperature. However, in order to apply CP hydrate to desalination process, more investigations of characteristics of CP hydrate are required in terms of thermodynamic and structural characteristics and influences of various gas molecules. In this study, four-phase (hydrate-liquid water-liquid cyclopentane-vapor) equilibria were measured to determine the stability conditions of the gas hydrate systems: pure CP, CP + CO₂, and CP + CH₄ hydrates. In order to investigate structural properties, gas molecules in the mixed hydrates were analyzed using NMR and Raman spectroscopy. The experimental results revealed by thermodynamic and spectroscopic analyses can be utilized as fundamental data for hydrate-based desalination.