

Guest distributions and dissociation behaviors of CH₄ hydrates in the presence of Na-montmorillonite (Na-MMT)이준섭, 서용원[†]

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CH₄ hydrates are crystalline compounds that form at high pressure and low temperature and have a large potential of future clean energy resources. In addition, CH₄ hydrates show self-preservation effect, which means that CH₄ hydrates are not fully dissociated below a thermodynamic equilibrium line and 273.15 K. Recently, it was reported that the presence of MMT can affect cage occupancy of CH₄ hydrate. However, the dissociation behavior of CH₄ hydrate in presence of MMT has not been well studied. In this study, the effect of Na-saturated MMT on the thermodynamic equilibria of CH₄ hydrate was measured. The cage occupancy of CH₄ hydrates with different MMT concentrations were analyzed using ¹³C NMR. In addition, the hydrate dissociation behaviors of self-preservation guest (CH₄) and non-self-preservation guest (CHF₃) in the presence of MMT were observed by collecting temperature-dependent powder X-ray diffraction (PXRD) patterns. The results demonstrated that Na-MMT does not affect three-phase equilibria of CH₄ hydrates, but can contribute to retarding the dissociation of CH₄ hydrates below 273.15 K.