

Raman spectroscopic Investigation of Guest Dynamics in Clathrate Hydrates: CH₄, CO₂, N₂ in sI and sII Hydrates.

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For practical applications of gas hydration in environmental and technological processes, considerable knowledge regarding the thermodynamic stability, structural analysis of hydrates and occupation behavior of a specific component of gas mixture is essential. The hydrate phase equilibria of CH₄/CO₂/N₂ (55/40/5)+ liquid solutions (water+ 5.56 mol% acetone) was determined in the temperature range 274 to 284 K and pressure of up to 5MPa. In addition, the compositions of hydrate phase were obtained under the following variables: (1) hydrate-forming temperature, (2) formation area of the hydrate where CH₄+acetone hydrates were formed, but CO₂+acetone hydrates cannot be formed (3) hydrates structure types: (a) structure I, (b) structure II. In addition, structural identification of the CH₄+CO₂+N₂+acetone hydrates was monitored under the different acetone mol fractions [(0, 0.01, 0.03 and 0.0556) mol fraction]. Furthermore, temperature-dependent occupation behaviors of CH₄ and CO₂ in clathrate II hydrate cages were studied in the temperature range 140 to 260 K.