

Structural Transition of structure H Hydrate to structure I hydrate in the CO<sub>2</sub> + N<sub>2</sub> + 2,2-dimethylbutane + Water System

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Natural Gas Hydrates have promising potential as a possible new clean energy source and appropriate materials for sequestering CO<sub>2</sub>. Research has been recently conducted on the injection of flue gas to sequester CO<sub>2</sub> without separating stage, and to exploit a new energy source effectively. Although these natural gas hydrates predominantly exist as sI and sII in nature, it was verified that sH hydrates also naturally occur. In this study, 2,2-dimethylbutane was added as a sH hydrate former to confirm its effect on the three-phase (H-Lw-V) equilibria of CO<sub>2</sub> + N<sub>2</sub> + water system. To verify the structural transition, the gas hydrate samples were analyzed via Raman spectroscopy and X-ray diffractometry (XRD). The dissociation enthalpies of these systems were also measured using a differential scanning calorimeter (DSC) to confirm the formation of sH hydrate and the co-existence of sI and sH hydrates. From the thermodynamic and microscopic analyses, it was verified that CO<sub>2</sub> functions as a co-guest of sH hydrate in the N<sub>2</sub>-enriched system, and structural transition of sH to sI occurs in the CO<sub>2</sub> + N<sub>2</sub> + 2,2-dimethylbutane + Water System.