

Thermodynamic and structural analyses of pure SF₆ and SF₆+N₂ gas hydrates formed in various reaction media고 결, 서용원†

UNIST

(ywseo@unist.ac.kr†)

SF₆ is one of the most potent greenhouse gases due to its remarkably high global warming potential which is 23900 times larger than that of CO₂ and long lifetime in the atmosphere. Accordingly, SF₆ should be captured from the emission sources of industries. In this study, hydrate-based SF₆ separation was suggested as a novel method. Three-phase (hydrate (H)-liquid water (Lw)-vapor (V)) equilibria of pure SF₆ and SF₆+N₂ hydrates formed in various reaction media (bulk water, hollow silica, and porous silica gel) were measured to determine hydrate stability conditions. The inclusion of SF₆ in the hydrate phase resulted in significant equilibrium pressure reduction. The reaction media used in this study did not affect the stability conditions of SF₆ and SF₆+N₂ hydrates. The separation efficiency of SF₆ was examined through gas chromatography. The structures of the pure SF₆ and SF₆+N₂ hydrates were identified via powder X-ray diffraction and were found to be sII for all cases. The experimental results obtained in this study will be helpful to understand the hydrate-based SF₆ separation process.