

Influence of promoter concentrations on CO<sub>2</sub> capture characteristics in the hydrate-based gas separation from sour natural gas or biogas

목정훈, 서용원<sup>†</sup>, 임지연, 최원중  
UNIST  
(ywseo@unist.ac.kr<sup>†</sup>)

The CO<sub>2</sub>/CH<sub>4</sub> mixed gas represents sour natural gas and biogas, and CO<sub>2</sub> can be one of the main contaminants because it reduces the calorific efficiency of the fuels. In this study, hydrate-based gas separation (HBGS) method was applied to separate CO<sub>2</sub> from CO<sub>2</sub>/CH<sub>4</sub> mixed gas. Simulated CO<sub>2</sub> (50%) /CH<sub>4</sub> (50%) mixed gas and thermodynamic promoters such as tetra-n-butylammonium chloride (TBAC) and tetrahydrofuran (THF) were used for the experiments. The effect of the promoter concentrations on separation efficiency was investigated at 1.0 mol% and stoichiometric concentration of each promoter. In order to identify thermodynamic stability of CO<sub>2</sub>/CH<sub>4</sub> mixed gas hydrate, three-phase equilibria (H-L<sub>w</sub>-V) were measured for the pure water and promoter-added systems. Thermodynamic promoters significantly increased the phase equilibrium temperature at a given pressure. The compositions in the vapor and hydrate phases were measured to observe the separation efficiency. The overall experimental results demonstrated that the concentrations of the promoters have a significant influence on thermodynamic stability and CO<sub>2</sub> capture characteristics of gas hydrates.