

## Effects of CO<sub>2</sub> injecting pressure on replacement behavior and replacement efficiency in sI and sH hydrates

목정훈, 최원중, 서용원<sup>†</sup>

UNIST

(ywseo@unist.ac.kr<sup>†</sup>)

Recently, the CH<sub>4</sub>-CO<sub>2</sub> replacement using CO<sub>2</sub> injection into natural gas hydrates has been considered as a promising gas production technology. In this study, structure I and H hydrates which were formed with methane and methane + methylcyclopentane (MCP), respectively, were replaced with pure CO<sub>2</sub> gas. To identify the effect of the replacement pressure on the replacement behavior, the injecting pressure of CO<sub>2</sub> was controlled within pressure ranges where pure CO<sub>2</sub> hydrate is thermodynamically stable. To observe the replacement efficiency of each experiment, the compositions of hydrate phase were measured by gas chromatography. Additionally, Raman spectroscopy, <sup>13</sup>C NMR, and powdered X-ray diffraction were used to examine the occupancy changes of guest molecules and structural information. For sI hydrate, the replacement efficiency was found to be about 70 % irrespective of the CO<sub>2</sub> injecting pressure. However, for sH hydrate, the replacement efficiency was increased up to 80% with increasing the CO<sub>2</sub> injecting pressure, which was attributed to a larger portion of a structural transition to sI hydrate.