

## Swapping Phenomena on Various Structures of Natural Gas Hydrate Layer for Methane Gas Recovery

차민준, 신규철, 박영준, 박근필<sup>1</sup>, 허대기<sup>1</sup>, 이재형<sup>1</sup>, 김세준<sup>1</sup>,  
이 혼\*

KAIST; <sup>1</sup>한국지질자원연구원  
(h\_lee@kaist.ac.kr\*)

Natural gas hydrates, which has been expected as future energy sources and considered as an important component of the global carbon cycle, exist in the deep sea ocean and the permafrost region. According to the estimates of many researchers, the amount of natural gas accumulated on earth in hydrate phase are at least twice as much as the energy contained in the total fossil fuel forms. Therefore, many researchers attempt to recover the natural gas from the natural gas hydrate layer in the deep sea ocean. In this study, we attempt to investigate the swapping phenomena occurring in deep sea ocean between guest molecules such as CO<sub>2</sub>, N<sub>2</sub> and natural gas in various structures of natural gas hydrate. In sI type of methane hydrate, we can get 64% of CH<sub>4</sub> recovery rate from the sI methane hydrate by using CO<sub>2</sub> molecule. However, in the case of swapping phenomena on sII, sH types of natural gas hydrate, we observed the higher recovery rate of CH<sub>4</sub> and structure transition to sI type. To identify the swapping phenomena on various structures of hydrate, we used the spectroscopic identification such as NMR and Raman spectroscopy.