

## Sequestering Carbon Dioxide into Complex Structures of Naturally Occurring Gas Hydrates

박영준, 김도연, 이종원<sup>1</sup>, 허대기<sup>2</sup>, 박근필<sup>2</sup>, 이재형<sup>2</sup>, 이 혼\*  
한국과학기술원; <sup>1</sup>공주대학교; <sup>2</sup>한국지질자원연구원  
(h\_lee@kaist.ac.kr\*)

Large amounts of CH<sub>4</sub> in the form of solid hydrates are stored on continental margins and in permafrost regions. We explore here the swapping phenomenon occurring in sI and sII CH<sub>4</sub> hydrate deposits through spectroscopic analyses and its potential application to CO<sub>2</sub> sequestration at the preliminary phase. The present outcome of 85% CH<sub>4</sub> recovery rate in sI CH<sub>4</sub> hydrate achieved by the direct use of binary N<sub>2</sub> + CO<sub>2</sub> guests is quite surprising when compared with the rate of 64 % for a pure CO<sub>2</sub> guest attained in the previous approach. In addition, the simultaneously-occurring dual mechanism of CO<sub>2</sub> sequestration and CH<sub>4</sub> recovery is expected to provide the physicochemical background required for developing a promising large-scale approach with economic feasibility. In the case of sII CH<sub>4</sub> hydrates, we observe a spontaneous structure transition of sII to sI during the replacement and a cage-specific distribution of guest molecules. A significant change of the lattice dimension due to structure transformation induces a relative number of small cage sites to reduce, resulting in the considerable increase of CH<sub>4</sub> recovery rate.