

Hydrocarbon compositions and crystallographic structure of natural gas hydrates recovered from Nankai trough

Masato Kida[1]; Hiroyuki Suzuki[2]; Jiro Nagao[1]; Hideo Narita[3]

[1] MHRL, AIST; [2] Nihon University;MHRL, AIST; [3] MHRL,AIST

Natural gas hydrates are crystalline clathrate compounds, which encage a large amount of natural gas. The crystallographic structure of natural gas hydrates depends on the encaged natural gas components. The hydrate cages can contain C₁ - C₇ hydrocarbons.

During the drilling program of METI 'Tokai-oki to Kumano-nada' in 2002, natural gas hydrate-bearing sediment cores were recovered from three different study areas, the Offshore Tokai, Daini-Atsumi Knoll, and Kumano Basin in the eastern Nankai trough area. In the present study, hydrocarbon compositions in dissociated gases from the natural gas hydrate-bearing sediment cores were measured by a gas chromatograph equipped with a flame ionization detector with a capillary column. We also attempted to determine the crystal structure of the natural gas hydrates using powder X-ray diffraction (PXRD) and ¹³C NMR technique.

The methane content in natural gases released from the gas hydrate-bearing sediment cores was more than 98.8%. The samples contained heavier hydrocarbons up to C₅ hydrocarbons at trace levels.

The XRD patterns of the samples recovered from the eastern Nankai trough area indicated that all samples include structure I hydrate crystals. The hydrate crystals were of cubic structure with a lattice constant ranging from 1.183 nm to 1.208 nm. The ¹³C NMR spectrum of the samples showed signals from methane encaged in structure I hydrate cages, supporting the PXRD results.

We thank Profs. N. Takahashi (Kitami Institute of Technology) and T. Tsuji (Nihon University) for their fruitful discussions. This work is conducted by the Rsearch Consortium for Methane Hydrate Resources in Japan (MH21).