オホーツク海網走沖新地点での天然ガスハイドレートの発見
Discovery of gas hydrate at the new point off Abashiri, the Sea of Okhotsk

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To understand environment of near-surface gas hydrates at the sea floor, HKS16, HKS17, and HKS18 cruses were conducted using RV Hokushin-Maru (255t) of the Kushiro Fisheries Research Institute off Abashiri, the Sea of Okhotsk, in a framework of joint research between Kitami Institute of Technology and Hokkaido Research Organization. We report success in retrieval of hydrate-bound sediment cores using a research vessel belonging to Hokkaido Prefecture. In this area, natural gas hydrates have been recovered in the NT13-20 and C020 cruises using RV Natsushima and TS Oshoro-maru, respectively. We also observed gas hydrate crystals with many crabs at the seepage sites using a remotely operated vehicle (ROV, KAIYO3000) in the 1KY17 cruise. In the cruise of HKS18, we got gas hydrate samples from a gas seepage site, located 2 km south from the 1KY17 site.

In the HKS18 cruise, we used a hydrostatic corer optimally tuned for a small vessel and a transponder to know exact position of the corer. We obtained nine sediment cores, including two hydrate-bound cores. Gas hydrate crystals were preserved in liquid nitrogen, and sediment gases were obtained by a headspace gas method. Raman spectroscopic analysis was conducted to know crystallographic structure, hydration number and cage occupancies. Molecular and isotopic compositions of gas samples were measured using a gas chromatograph and an isotope ratio mass spectrometer, respectively.

Crystallographic structure of gas hydrate samples belonged to the structure I, and hydration number was estimated as 6.00±0.02. Hydrate-bound H_2S molecules were also detected in the Raman spectra. Hydrate-bound gas was mainly methane, and C_1 / (C_2 + C_3) distributed between 30,000 and 60,000. C_1 $\delta^{13}C$ and δD were -66‰ and -197‰. These molecular and isotopic compositions of hydrate-bound hydrocarbons suggested microbial origin. The depths of sulfate-methane interface (SMI) in HC1807, HC1808, and HC1810 cores were less than 30 cm, indicating high gas flux. Concentrations of H_2S in the headspace gas samples were in the same order (around 1 mM), therefore process of anaerobic oxidation of methane was active. C_1 / (C_2 + C_3) of headspace gases in the hydrate-bound cores (HC1807 and HC1808) distributed between 4,000 and 9,000, and those of other sediment cores were relatively small, indicating that they are in the oxidation layer above the SMI depth. Headspace gas in the HC1808 core contained a lot of isobutane. It is possible that thermogenic gas supplied from deeper sediment layer partly mixes with microbial gas.

キーワード：ガスハイドレート、オホーツク海、ガス起源
Keywords: gas hydrate, Sea of Okhotsk, gas origin

