

Chemical/isotopic analyses of hydrate/pore water samples from gas hydrate-bearing sediment cores at Lake Baikal: 2005-2007

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The international cooperative field investigations with the aim of natural gas hydrate studies at Kukuy K-2 (central basin) and Malenky (southern basin) mud volcanoes in Lake Baikal, Russia were conducted during 2005 - 2007. The gas hydrate-bearing sediment cores were retrieved from the bottom of the lake floor by using steel gravity corers.

The purpose of this presentation is to report scientific results of the chemical analyses such as ion concentration analyses and the stable isotopic analyses ($\delta^{18}\text{O}$ and δD) of hydrate- and pore- water samples from gas hydrate-bearing sediments cores. Our intent is to present chemical data based on the development of the sampling method to obtain hydrate water samples to estimate the origin and the composition of water involving the accumulation of the shallow (sub-bottom) gas hydrates at the mud volcanoes in Lake Baikal.

The pore water sampling was conducted onboard by using a squeezer designed and constructed at KIT. The gas hydrate water samples were obtained onboard by the dissociation of the hydrates. The concentrations of ions such as sulfate, chloride, and hydrogen carbonate ions in the samples were determined by an ion chromatograph (Waters Co. Ltd., Japan). Stable isotope ratios of oxygen and hydrogen of the water samples were analyzed by using a mass spectrometer (Model Finnigan Delta plus XP, Thermoelectron Co., Germany) equipped with a gas-bench system (Model Gas-Bench II, Thermoelectron Co.). The $\delta^{18}\text{O}$ and δD values of the hydrate water samples (Kukuy K-2) were up to +2.7 ($\delta^{18}\text{O}$) and +10 (δD) per mil heavier than those of the lake bottom water sampled from 50 cm above the lake floor. The concentration ratios of $\text{HCO}_3^-/\text{Cl}^-$ of the hydrate water samples were less than 1% (minimum) of those of the lake water sample and up to 6 times higher than those of the pore water samples, respectively. It was appeared that the original gas hydrate-forming fluid was different from the present pore water and lake bottom water, and the estimated chemical and isotopic characteristics of the original fluid will be presented and discussed.