Isotopic composition of structure I and II gas hydrates and sediment gas in Lake Baikal

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Gas hydrates exist in the bottom sediment of Lake Baikal. The structure I and II gas hydrates were observed in the sediment cores of a mud volcano in the Kukuy Canyon (Kida *et al*., 2006). The structure II gas hydrate, which determined by CP-MAS ^{13}C NMR spectroscopy by Kida, contained about 14-15% of ethane, whereas the structure I gas hydrate contained about 3% of ethane and placed beneath the structure II in the same cores. We measured isotopic composition (^{13}C and D) of dissociation gas from both type gas hydrates and sediment gas obtained by the headspace gas method to understand the formation process of the different crystal structures of gas hydrate.

Seven cores of hydrate-bearing sediment were retrieved at water depths of 908-923m in the Kukuy K-2 sites in September 2006. Gas hydrates were found at the depth from 90cm to 330cm. All gas samples were obtained on board: dissociation gas samples from hydrate were separated from dissociation water and filled into 5ml vial bottles, and those in the sediment were obtained by the headspace gas method.

Ethane delta D of structure I gas hydrate (from -196 to -211 permil) was larger than that of structure II (from -215 to -220 permil). On the contrary, delta D of methane and delta ^{13}C of methane and ethane in both hydrate structures were almost same. Delta ^{13}C of methane and ethane in gas hydrate seemed several permil smaller than that of sediment gas, and delta D of methane in gas hydrate was larger than that of sediment gas. From our experimental results by using synthetic hydrocarbon hydrates, delta D of hydrate phase is smaller than that of gas phase at their formation process though delta ^{13}C of both phases are same. Therefore, we conclude that the current sediment gas is not the source of these gas hydrates of both structures and the difference of ethane delta D may provide information to understand the formation processes of different crystal types.