

Regional characteristics of isotopic composition of gas hydrates in Lake Baikal

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In the international collaborative investigation of Lake Baikal with Limnological Institute SB RAS, Russia since 2002, we got gas hydrate samples in the lake bottom sediment obtained from mud volcanoes and methane seep sites; Malenky, Bolshoy, Malyutka, Peschanka, Goloustnoye Flare and Kukuy K-0 & K-2. We would like to focus on isotopic composition of guest gas in gas hydrates to understand their formation process and gas origin. Whiticar *et al.* (1986) proposed a genetic classification diagram for natural gas using delta ^{13}C and delta D of methane. In the diagram, large and small delta ^{13}C values of methane indicate thermogenic and microbial origins, respectively, and delta D of methane provides information on methyl-type fermentation or CO_2 reduction in the microbial region. Kida *et al.* (2006) measured the isotopic composition of hydrate gas obtained in Kukuy, Lake Baikal and revealed that the guest gas is of microbial origin due to methyl-type fermentation and contains thermogenic methane and ethane.

For the isotopic analyses of carbon and hydrogen, a mass spectrometer (DELTA plus XP; Thermo Finnigan) was used. Methane delta ^{13}C and delta D were in the range of -70 to -55 permil and -330 to -300 permil, respectively, and indicated a microbial origin produced by methyl-type fermentation. Methane delta ^{13}C of Kukuy K-2 mud volcano was rather large (from -60 to -55 permil) and contained much ethane. Goloustnoye Flare, where gas hydrate discovered in 2007, also showed high concentration of ethane and similar isotopic compositions of methane and ethane to those in Kukuy K-2, respectively. We conclude that the hydrate gas of Kukuy K-2 and Goloustnoye Flare is mainly microbial origin and partly contains thermogenic methane and ethane. New diagram of delta ^{13}C and delta D of ethane showed regional characteristics and will provide information to know how these hydrocarbons accumulate in the lake bottom sediment.