# Stable Isotope Analysis of Natural Gas Hydrate in the Sea of Okhotsk

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Natural gas hydrates have been recovered from the seepage structures offshore Sakhalin, in the Sea of Okhotsk. Field cruises were executed from 2003 to 2007 within the framework of the CHAOS project (hydroCarbon Hydrate Accumulations in the Okhotsk Sea). Hydrate-bearing sediments were retrieved by gravity coring in CHAOS1 (Oct. 2003) and CHAOS2 (May 2005). A genetic classification diagram for natural gas using methane isotopes was proposed [1] and applied it to interpret origin of gas hydrates in the world [2]. In this diagram, large and small $\delta^{13}C$ of methane indicate thermogenic and microbial origins, respectively, and $\delta D$ of methane also provides information on methyl-type fermentation or $CO_2$ reduction in the microbial origin. We would like to show characteristics of the seepage structures offshore Sakhalin from the viewpoints of isotopic composition and gas concentration. Gas hydrate samples were obtained from six seepage structures named Hieroglyph, Kitami, CHAOS, KOPRI, VNIIOkeangeologia and GISELA. $\delta^{13}C$ and $\delta D$ of dissociated gases were measured by using GC-IRMS (DELTA plus XP; Thermo Finnigan) in Kitami Institute of Technology. Methane $\delta^{13}C$ and $\delta D$ were in the range -65 to -62‰ and -205 to -195‰, respectively. These results indicate a microbial origin produced by $CO_2$ reduction according to Whiticar's diagram. Ethane concentration was 30-150ppm for hydrate-bearing sediments and 10-100ppm for non-hydrate sediments, and depended on each seepage structure. We discussed the formation process of gas hydrate in the shallow sediment cores according to the experimental results of isotopic fractionation at the formation of gas hydrates [3].

Keywords: gas hydrate; stable isotope; seepage structure; Sea of Okhotsk

## References

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