[JJ] Evening Poster | M (Multidisciplinary and Interdisciplinary) | M-IS Intersection

[M-IS17]Gas hydrates in environmental-resource sciences

convener:Hitoshi Tomaru(Department of Earth Sciences, Chiba University), Akihiro Hachikubo(Kitami Institute of Technology), Atsushi Tani(神戸大学　大学院人間発達環境学研究科, 共同), Shusaku Goto(Institute for Geo-Resources and Environment National Institute of Advanced Industrial Science and Technology)

Tue. May 22, 2018 5:15 PM - 6:30 PM Poster Hall (International Exhibition Hall7, Makuhari Messe)

An increasing number of researches focusing on natural gas hydrates has recently been conducted from the environmental, material, and resource scientific viewpoints. This session aims to share and discuss the latest research results to understand and examine the nature and potential of gas hydrates in the past-present-future of the Earth. Because the researches on gas hydrates are interdisciplinary, broad topics from field and experimental researches, modeling, etc. will be presented in this session.

[MIS17-P01]Effect of crystallographic structure on hydrogen isotopic fractionation of ethane

*Jumpei Matsuda[1], Takahiro Ozeki[1], Akihiro Hachikubo[1], Satoshi Takeya[2] (1.Kitami Institute of Technology, 2.National Institute of Advanced Industrial Science and Technology (AIST))

Keywords:gas hydrate, ethane, hydrogen isotope, Lake Baikal

Mixed-gas hydrate composed of methane and ethane forms the cubic structure II in appropriate gas composition. We found "double structure gas hydrate" composed of the structure I and II in a same sediment core at the central and southern Baikal Basin. The structure II gas hydrate contained 13-15% of ethane, on the contrary, the structure I has only several % of ethane. Hachikubo *et al.* (2009) showed that δD of hydrate-bound ethane in the structure II is smaller than that in the structure I, whereas δ^{13}C of methane and ethane, and δD of methane are the same between the structure I and II. These results might be explained by the difference in hydrogen isotope fractionation between formation processes of the structure I and II. In this study, we synthesize methane and ethane mixed-gas hydrates and checked the isotopic difference between gas and hydrate phases.

We put 0.7g of fine ice powder into a pressure cell (volume: 30mL), introduced methane and ethane mixed-gas, and formed a gas hydrate at 273.4K. Before the retrieval of gas hydrate sample, residual gas was sampled, and then gas hydrate was cooled at the temperature of liquid nitrogen and retrieved the hydrate-bound gas. We controlled the ethane composition of hydrate-bound gas from 2% to 98%, covering the area of methane-rich structure I, ethane-rich structure I, and their intermediate structure II. We measured compositions of methane and ethane by a gas chromatograph, and hydrogen isotopic composition (δD) of ethane using CF-IRMS. Crystallographic structure of gas hydrate was determined using a Raman spectrometer; the Raman spectra of C-C stretching mode of ethane in hydrate phase provides information of the crystallographic structure.

δD of hydrate-bound ethane was about 1-2‰ smaller than that of residual ethane in the case of the structure I, agreed with the previous report for pure methane and pure ethane hydrates by Hachikubo *et al.* (2007). On the contrary, these isotopic difference increased to 9-12‰ in the case of the structure II, those ethane compositions distributed around 15-34%. These results support the idea that the structure II hydrate at Lake Baikal formed by the dissociation of the structure I hydrate.

Reference

Hachikubo A, Kosaka T, Kida M, Krylov A, Sakagami H, Minami H, Takahashi N, Shoji H (2007) Isotopic fractionation of methane and ethane hydrates between gas and hydrate phases. Geophys Res Lett 34: L21502. doi:10.1029/2007GL030557

Hachikubo A, Khlystov O, Manakov A, Kida M, Krylov A, Sakagami H, Minami H, Takahashi N, Shoji H, Kalmychkov G, Poort J (2009) Model of formation of double structure gas hydrates in Lake Baikal based on isotopic data. Geophys Res Lett 36: L18504. doi:10.1029/2009GL039805