

Isotopic fractionation process of guest gas at the formation of nitrogen hydrate

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Gas hydrates are crystalline clathrate compounds composed of water and gas molecules that are stable at low temperature, high partial pressure of each gas component, and high gas concentration. Nitrogen hydrate exists in Greenland and Antarctic ice sheets as an air (N₂ and O₂ mixed gas) hydrate. Recently, existence of nitrogen hydrate has been expected in the Titan (the largest moon of the Saturn). On the other hand, isotopic fractionation of carbon and hydrogen in methane and ethane during the formation of gas hydrates was reported by Hachikubo *et al.* (2007). In this study, we report isotopic fractionation of nitrogen during the formation of nitrogen hydrate. The samples of nitrogen hydrate were experimentally prepared in a pressure cell and isotopic compositions of both residual and hydrate-bound gases were measured. $\delta^{15}\text{N}$ of hydrate-bound molecules was about 0.2 permil higher than that of residual gas molecules in the formation processes. Temperature effect on the isotopic fractionation was small between 226K and 273K.

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

Keywords: gas hydrate, stable isotope, nitrogen