

Experimental study of CO₂ hydrate phase equilibrium in sediments

*Tatsuki Iwamoto¹, Hitoshi Tomaru¹

1. Chiba University

Gas hydrate is ubiquitously formed under the seafloor where the gas (methane) concentration exceeds its solubility within the equilibrated pressure-temperature condition. The equilibrium condition, however, readily changes to reflect the surrounding environments such as compositions of water, gas, and sediment. In this study, we experimentally determined the phase equilibrium pressure-temperature condition using carbon dioxide with natural sediments to examine the physical/chemical effects of sediment particles on the CO₂ hydrate stability, of which physical properties are similar to those of methane hydrate. The phase equilibrium of CO₂ hydrate with 10 wt% sediment changed to lower temperature (high pressure) region compared to the pure water system. This is because the clay minerals such as kaolinite absorb efficiently water molecules and form a structure similar to the hydrate lattice, preventing the formation of hydrate. In addition, ion dissolution from clay minerals may result in the depression of freezing point of hydrate, which also reduces the hydrate stability. The properties of host sediment as well as gas and water chemistry are important factor for assessing the distribution and amount of gas hydrate in natural environment.