

Dissociation mechanism of methane clathrate hydrate in different size of pore spaces

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Dissociation processes of methane hydrate synthesized with glass beads were investigated using powder X-ray diffraction technique. Although understanding of methane hydrate dissociation within natural settings, not so many studies were performed on methane hydrate dissociation within pore spaces from microscopic point of view. Recently, it was revealed that methane hydrate formed with hydrophilic glass beads less than a few microns in size show very high stability up to just below the melting point of ice, even though this temperature is well outside the zone of thermodynamic stability of the hydrate.[1] In contrast, methane hydrate formed with hydrophilic coarse glass beads (> 10 micron) dissociate quickly at 150-200 K; in this temperature range methane hydrate dissociates at the atmospheric pressure.

In this study, we performed observations of methane hydrate dissociation process using hydrophobic glass beads with sub-micron and several microns in size. In this case, kinetic high-stability of methane hydrate was not observed. Thus the experimental results obtained suggest that the dissociation rate of methane hydrate strongly depended on the surface property of glass beads used.

Reference

[1] Hachikubo et al., Phys. Chem. Chem. Phys., 13 (2011) 17449-17452.

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