Investigation on dissociation process of mixed gas hydrate of methane and propane

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The existence of enhanced preservation phenomena for structure I methane (CH_4) hydrate in the temperature region below ice point (273 K) is one remaining puzzle. This phenomenon has been termed "self-preservation" of gas hydrate. So far, this phenomenon has been observed for CH_4 hydrate upon dissociation by rapid pressure-release from high pressures at which CH_4 hydrate is stable (Stern et al., 2001). It is also reported that reduction of dissociation rates of gas hydrates by temperature ramping depends on neither the thermodynamic stability nor the crystal structure, but the nature of the guest molecules (Takeya & Ripmeester, 2008). The reduction of dissociation rates of gas hydrates was observed for gas hydrates such as oxygen hydrate, argon hydrate and carbon dioxide hydrate as well as CH_4 hydrate. However, the rate reduction was not observed for ethane (C_2H_6) hydrate, propane (C_3H_8) hydrate, and mixed gas hydrates of CH_4 and C_2H_6 (Takeya & Ripmeester, 2010).

In this study, powder X-ray diffraction (PXRD) studies of structure II mixed gas hydrates of CH_4 and C_3H_8 as guest with different compositions were performed. Kinetic stability of these mixed gas hydrate was examined by temperature ramping method by means of PXRD. It was revealed that none of them do not show of reduction of dissociation rates. These results may be useful for further understanding of natural gas hydrates.

References

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