

Phase-Equilibrium and Structural Characteristics of Gas Hydrates with Pinacolyl Alcohol and tert-Amyl Alcohol

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In this study, we focused on the large molecular alcohols, which have not been discussed in detail, as inhibitors of gas hydrate formation. Gas hydrates were synthesized with pinacolyl alcohol (3,3-dimethyl-2-butanol) and tert-amyl alcohol (2-methyl-2-butanol) as large guest molecules, in the presence of two kinds of gases (CH_4 and CO_2) as small guest molecules. From phase-equilibrium curves, pinacolyl alcohol showed a great promoting effect in forming hydrate with CH_4 , but no effect with CO_2 . Tert-amyl alcohol showed a slight promoting effect in the low-pressure region and an outstanding inhibiting effect in the high-pressure region with CH_4 , whereas it showed an inhibiting effect with CO_2 . Through microscopic analyses using NMR and Raman spectroscopy, structures of each hydrate were confirmed. Both of pinacolyl alcohol and tert-amyl alcohol with CH_4 formed sH gas hydrates. On the other hand, with CO_2 , sI gas hydrates were detected from both hydrates. Even though these alcohols do not affect the structure of gas hydrates with CO_2 , it is meaningful to find out that they change the structure of CH_4 hydrate from sI to sH.