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Gas separation properties of semiclathrate hydrates for CH₄ + CO₂ mixed gas
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Abstract (less than 300 words)
<p>In recent years, the usage of several semiclathrate hydrates is expected for gas storage, separation, and transportation. It has been reported that the structure of the cage changes depending on the gas contained in the semiclathrate hydrate, and the ease of entering the cage differs depending on the kind of the guest gas. In this study, semiclathrate hydrates were created using four types of ionic substances (tetra-<i>n</i>-butylammonium bromide, tetra-<i>n</i>-butylammonium chloride, tetra-<i>n</i>-butylphosphonium bromide, and tetra-<i>n</i>-butylphosphonium chloride) and separation properties of CH₄ + CO₂ mixed gas were acquired. Measurements were made at three different concentrations (10wt%, 20wt% and 30wt%) and two different pressures (3 MPa, 5 MPa). The gas phase before and after hydrate formation were collected, and the composition was analyzed using a gas chromatograph. The results showed that at a gas pressure of 5 MPa, the gas incorporated into the TBA-based hydrate had a higher CO₂ composition than the TBP-based hydrate at any concentrations. It was also shown that the hydrates with low-concentration of ionic substances have a higher CO₂ composition than that with high concentration of ionic substances.</p>
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