

Nitrogen Pretreatment for Gas Hydrate in Porous Material

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In various fields, such as gas storage and transport, sequestering carbon dioxide in the ocean, separating carbon dioxide from multicomponent mixtures, seawater desalination, gas hydrates now attract much attention as a next-generation energy source. However, gas hydrates still have some problems including blockades in oil/gas pipelines, seafloor collapse, and environmental impact of excess gas. Also, natural gas hydrates contain many constituents such as mineral particles, organic debris, remnants of fossils, and so on. So, it is important to assort the role of each constituent. Therefore, there are many reports about the effect of porous material on the hydrate formation. And it is proven that the hydrate induction and growth are significantly faster in the suspension of silica particle.

But, in this study, to quicken the hydrate formation and growth, I pretreated nitrogen in porous material. In water-saturated silica gel, before injecting methane gas, nitrogen pretreatment step is inserted. Then, nitrogen gas makes the gas diffusion path and methane hydrate can be made faster. Induction time of nitrogen pretreatment case, methane pretreatment case, and non-pretreatment case are compared.