

Gas Hydrate Nucleation & Growth in Confinement and Its Application

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June 18, 2020

Abstract

Massive amounts of gas hydrates occur naturally in the pores of sediments or fractures in permafrost regions and beneath the oceans. For hydrate formation in confinement, the equilibrium condition can shift to harsher conditions, lowering the water activity, and subsequently depressing the hydrate freezing temperature at a given pressure. Conversely, the nucleation and rate of hydrate formation, as well as hydrate conversion can be increased in confinement. Therefore, reliable assessment of the hydrate distribution in nature requires accurate thermodynamic and kinetic models of hydrate formation; however, these models tend to be based upon the properties of bulk hydrates. Hydrate formation and growth promotion in confinement are potentially interesting for hydrate technological applications, such as gas separation, energy storage, and flow assurance. This paper reviews the thermodynamic and kinetic properties and their interrelations of gas hydrates in confined spaces.

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