

Cyclopentane Hydrate Seeds for the Promotion of Methane Hydrate Formation

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This study employed a small amount of cyclopentane (CP) hydrate seed to promote sl CH₄ hydrate formation. Clathrate hydrates are one of the prominent materials for natural gas storage due to their high volumetric storage capacity and safe features. In general, a crystal layer of clathrate hydrates is preferentially created on the surface of an aqueous phase, which results in both low hydrate conversion and a slow reaction rate without mechanical agitation. When CP hydrate seeds were added to an unstirred reactor, there is negligible induction time and the hydrate growth is dramatically enhanced with SDS. To determine the amount of CP in the system for rapid formation of sl CH₄ hydrates, several hydrates formed with various amounts of CP in the hydrate slurry were characterized by powder X-ray diffraction and Raman spectroscopy. The visual observations of hydrate growth behavior at the interface showed that the direction of hydrate crystallization significantly affected the hydrate growth and conversion rate.¹ The actual storage density of methane gas in the sl methane hydrates reached 160 vol./vol. within one hour.

References:

[1] S. Baek, Y.-H. Ahn, J. Min, H. Lee, and Jae W. Lee, Enhanced Methane Hydrate Formation with Cyclopentane Hydrate Seeds, Volume 202, 15 September 2017, Pages 32–41.