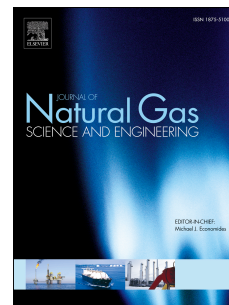


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Recalcitrance of Gas Hydrate Crystals Formed in the Presence of Kinetic Hydrate Inhibitors

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Abstract

Kinetic hydrate inhibitors (KHIs) are used to manage the risk of gas hydrate plug formation in oil and gas transmission pipelines and facilities. However, under severe conditions, hydrates can be formed in the presence of these additives. It is important to understand how these inhibitors would affect gas hydrate remediation. Here, the impact of different concentrations of polyvinylcaprolactam (PVCap), Luvicap® Bio and type III antifreeze proteins (AFP III) on the dissociation of propane hydrate formed in the presence of these additives has been evaluated using a high pressure micro differential scanning calorimeter. Remarkably, hydrates formed in the presence of these inhibitors were dissociated at different temperatures than those expected from hydrate equilibrium calculations as well as at higher temperatures. However, gas hydrates formed in KHI-free solution melted at the equilibrium temperature and multiple-melting points were not observed. Interestingly, an increase in inhibitor concentration decreased the amount of gas hydrate that dissociated at the equilibrium temperature. Consequently, larger amounts of hydrate were dissociated at higher temperatures. These results indicate that since remediation of hydrates in the presence of KHIs requires higher melting temperatures, more energy is required

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