# Natural Gas Capture and Storage by Hydrates in the Presence of Promoters

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Gas hydrates are non-stoichiometric crystals where guest molecules are trapped in cages formed by hydrogen bonding between water molecules. Many guests, including methane, ethane and carbon dioxide, can form hydrate crystals with water at high pressure and low temperature conditions. Due to the large amount of gas that can be enclathrated in hydrate crystals, they have potential applications in gas capture and storage, which can be more advantageous compared to common methods such as liquefaction, especially for flammable gases in terms of safety. Despite this prospect, slow kinetics caused by mass transfer and heat transfer limitations is the main bottleneck hindering the implementation of gas hydrates in gas capture and storage. In this work, we experimentally investigated the effect of thermodynamic hydrate promoters (THPs) on solidified natural gas (SNG) thermodynamics and formation kinetics. HP-DSC and autoclave apparatuses were used for the characterization of gas hydrate phase equilibrium and formation kinetics, respectively. From the comparison with the baseline, the thermodynamic promoting effect of THPs was evaluated and quantified. Kinetic parameters, including moles of gas consumed, gas consumption rate and gas storage capacity, were determined, from which gas hydrate formation kinetics was illustrated. This work contributed to the fast and easier formation of SNG and advances the potential application of SNG.