

Clathrate Hydrates in Energy and Carbon Capture Applications

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Clathrate hydrates are ice-like solids comprised of a crystalline lattice of hydrogen-bonded water cages that can trap small gas molecules, such as methane and carbon dioxide. Understanding and controlling the gas hydrate crystal growth processes and interfacial interactions is important in several energy applications, including mitigating the potential environmental impacts during fuel production and transportation. Gas hydrates can present major safety, economic, and environmental hazards when they form and block flowlines producing and transporting oil and natural gas. Conversely, gas hydrate technologies, with different crystal growth and design strategies, may be developed for energy storage of fuels or carbon capture in gas hydrate crystals, or as an alternative potential energy resource from naturally occurring hydrate deposits.