Hydrates: Applications to Energy and Environment

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Gas hydrates are non-stoichiometric crystalline compounds formed when "guest" molecules of suitable size and shape are incorporated in the well-defined cages in the "host" lattice made up of hydrogen-bonded water molecules. Macroscopic analysis of hydrate phase provide valuable information on the promotion and inhibition effects on the formation of gas hydrate, phase behavior and captured gas amount. For microscopic analysis of gas hydrate, NMR, Raman, XRD and MRI are adopted to obtain molecular-level information on gas hydrate. These two kinds of approaches need to be crosschecked for more clear understanding on hydrate pattern. Recently, hydrate researches have been extensively applied to energy and environment systems such as sequestration of carbon dioxide into methane hydrate layer and hydrogen storage using ice-like materials.