

Clathrate Hydrates for Engineering Applications and Multiphase Flow Assurance in Oil & Gas Production Systems

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Clathrate hydrates are crystalline solids of water network capturing small molecules. Hydrates have a great promise for engineering applications including energy storage/transportation, gas capture/separation processes, water purification in that they (i) store a large amount of gas inside, (ii) prefer to capture particular molecular species, and (iii) exclude any impurities that are not part of hydrates. The key to realize such applications relies on robust understandings of when, where, how, and how fast hydrates form and melt. On the other hands, hydrates are rather considered hazardous in oil/gas industry. Formation of hydrates under multiphase flow (oil/gas/water + solid precipitation) of subsea/offshore flowlines narrows the pipe interior, significantly lowering the flow rate and often results in solid blockages that require huge expenses for recovery and dealing with safety problems. In this talk, good and bad aspects of clathrate hydrates in energy industry are discussed. Lab- and bench-scale experimental approaches to advance hydrates engineering applications and to manage hydrate flow risks encountered in flow assurance of oil/gas production systems are introduced.