

Synthesis of multi-functional hydrogel polymer for gas hydrate inhibition and lithium ion recovery

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Kinetic hydrate inhibitors have recently been highlighted because of their low dose injection for the hydrate plug prevention in offshore flowlines. In this work, we suggest the concept of multi-functional hydrogel polymer capable of achieving both hydrate inhibition and metal ion recovery from seawater of offshore flowlines transporting natural gases. Poly(N-isopropyl acrylamide-co-methacryloyloxymethyl-12-crown-4), which can efficiently absorb lithium ion, was synthesized and the hydrate inhibition performance under synthetic natural gas of 120 bar was evaluated for the proof-of-concept. The addition of 0.5wt% hydrogel polymer synthesized in this work to pure water significantly delayed the hydrate onset and reduced the growth rate of hydrate solid. The present work thus demonstrates that multi-functional polymer can be an economical solution for the prevention of hydrate blockage in offshore flowlines.