

Investigate the Effects of Anionic Surfactant on THF Hydrate

Authors : Salah A. Al-Garyani, Yousef Swesi

Abstract : Gas hydrates can be hazardous to upstream operations. On the other hand, the high gas storage capacity of hydrate may be utilized for natural gas storage and transport. Research on the promotion of hydrate formation, as related to natural gas storage and transport, has received relatively little attention. The primary objective of this study is to gain a better understanding of the effects of ionic surfactants, particularly their molecular structures and concentration, on the formation of tetrahydrofuran (THF) hydrate, which is often used as a model hydrate former for screening hydrate promoters or inhibitors. The surfactants studied were sodium n-dodecyl sulfate (SDS), sodium n-hexadecyl sulfate (SHS). Our results show that, at concentrations below the solubility limit, the induction time decreases with increasing surfactant concentration. At concentrations near or above the solubility, however, the surfactant concentration no longer has any effect on the induction time. These observations suggest that the effect of surfactant on THF hydrate formation is associated with surfactant monomers, not the formation of micelle as previously reported. The lowest induction time (141.25 ± 21 s, $n = 4$) was observed in a solution containing 7.5 mM SDS. The induction time decreases by a factor of three at concentrations near or above the solubility, compared to that without surfactant.

Keywords : tetrahydrofuran, hydrate, surfactant, induction time, monomers, micelle

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