EFFECTS OF NOVEL GEMINI SURFACTANTS ON METHANE HYDRATE FORMATION

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ABSTRACT

Storage and transportation of natural gas in solid hydrates is being viewed as a safe and economical alternative to liquid natural gas techniques. Each cubic meter of gas hydrate can contain over 160 cubic meters of gas at standard temperature and pressure; however the greatest challenge is hydrate formation rate, as it can take days in order to form sufficient hydrates for transport. Current work with promoters has shown that sodium dodecyl sulphate (SDS) can significantly increase ethane hydrate formation rate. Furthermore, recent work has shown that a different surfactant structure, known as gemini surfactants, can be much more effective than their conventional counterparts. These unique gemini structures, contain two conventional surfactants attached by a spacer. They exhibit some unique properties, such as 1) their effect on surface activity is greater than their monomeric counterparts and 2) their tendency to aggregate and self-assemble occurs at concentrations almost a hundredfold lower than for the corresponding conventional surfactant. In this work, the effects of gemini surfactant derivatives of SDS on gas solubility, dissolution and hydrate growth rate have been investigated. Experiments performed at temperatures ranging from 275 to 282 K and pressures up to 7 MPa. The effects of spacer length and spacer molecule were also performed and all results were then compared to monomeric SDS and deionized water alone.

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