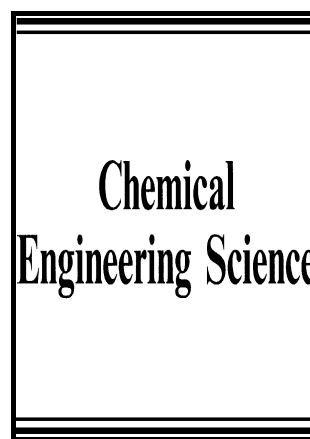


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Nucleation Curves of Methane – Propane Mixed Gas Hydrates in Hydrocarbon Oil

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Abstract

The second generation High Pressure Automated Lag Time Apparatus (HP-ALTA MkII) was used to measure the nucleation curves of Structure II (sII)-forming methane-propane mixed gas hydrates on the surface of a quasi-free water droplet suspended in involatile hydrocarbon oil, squalane. The measured nucleation curves were then compared to the previously obtained nucleation curves of the same guest gas hydrate on a quasi-free water droplet supported by perfluorodecalin. The comparison of the two sets of data sets showed that the nucleation rates of the two systems were broadly similar to each other. A simple master nucleation curve was derived for each system as a function of the system subcooling. The model-independent empirical equation that relates the nucleation rate to the system subcooling was $J_{\text{water-guest}} \text{ (s}^{-1}\text{m}^{-2}\text{)} = 2.38 \times 10^{-39} \Delta T^{26.746}$ for a quasi-free water droplet suspended in squalane and $J_{\text{water-guest}} \text{ (s}^{-1}\text{m}^{-2}\text{)} = 7.70 \times 10^{-11} \Delta T^{7.931}$ for a quasi-free water droplet supported by perfluorodecalin. The nucleation rates predicted by these empirical equations are then compared to the nucleation rates of other relevant systems in the literature. The model-independent analysis method for the derivation of nucleation curves we have

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