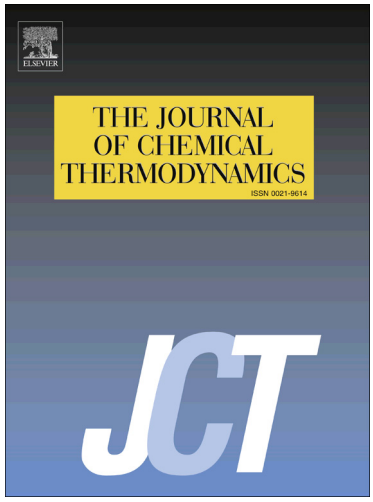

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Modeling Hydrate Formation Conditions in the Presence of Electrolytes and Polar Inhibitor Solutions

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Abstract

In this paper, a new predictive model is proposed for prediction of gas hydrate formation conditions in the presence of single and mixed electrolytes and solutions containing both electrolyte and a polar inhibitor such as monoethylene glycol (MEG), diethylene glycol (DEG) and triethylene glycol (TEG). The proposed model is based on the γ-φ approach, which uses modified Patel-Teja equation of state (VPT EOS) for characterizing the vapor phase, the solid solution theory by van der Waals and Platteeuw for modeling the hydrate phase, the non-electrolyte NRTL-NRF local composition model and Pitzer-Debye-Huckel equation as short-range and long-range contributions to calculate water activity in single electrolyte solutions. Also, the Margules equation was used to determine the activity of water in solutions containing polar inhibitor (glycols). The model predictions are in acceptable agreement with experimental data. For single electrolyte solutions, the model predictions are similar to available models, while for mixtures of electrolytes and mixtures of electrolytes and inhibitors, the proposed model gives significantly better predictions. In addition, the absolute average deviation of hydrate formation pressures (AADP) for 144 experimental data in solutions containing single electrolyte is 5.86% and for 190 experimental data in mixed electrolytes solutions is 5.23%. Furthermore, the proposed model has an AADP of 14.13%, 5.82% and 5.28% in solutions containing (Electrolyte+MEG), (Electrolyte+DEG) and (Electrolyte+TEG), respectively.

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