Predictions of Hydrate-Forming Conditions in the Solutions Containing Electrolyte Inhibitors

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An electrolyte equation of state based on a hydrogen-bonding nonrandom lattice fluid model (Electrolyte NLFHB EOS) was developed by Kim et al. [Kim and Lee, Ind. Eng. Chem. Res. 47, 5102-5111, 2008] and employed to present work to model thermodynamic properties of some alkaline halide solutions. In the model mean spherical approximation (MSA) was used for contribution of long-range interactions of ions. Ion-specific parameters of ions-namely, interaction energy, hydrated ionic diameter, and hydrogen-bonding energy of cations-were fitted to osmotic coefficients and mean activity coefficients at 298.15 K and 1 bar with molalities up to 6. Average deviations between experimental and calculated results were less than 2%. The determined parameters of electrolytes were used to calculate hydrate-containing phase equilibria in electrolyte solutions. Inhibition effects of electrolytes on the hydrate-forming conditions of hydrocarbons were investigated using the Electrolyte NLFHB EOS for fluid phases and van der Waals and Platteeuw theory for hydrate phase. The predicted results were found in general agreements with the literature data.