Phase Equilibria Modelling of Gas Hydrates with a Mixture of Inhibitors

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In this study, a new robust flash algorithm was developed for equilibrium calculation in systems with clathrate hydrates, and it has been applied to complex multicomponent systems (hydrocarbons and non-hydrocarbons), including the presence of thermodynamic inhibitor mixtures (alcohols, salts, glycols). The modelling study was applied for three-phase equilibrium conditions of liquid water-hydrate-vapor, liquid water-hydrate-condensate gas and ice-hydrate-vapor. The model consists of a statistical thermodynamic approach for the hydrate phase based on the van der Waals and Platteeuw theory and the Cubic Plus Association (CPA) equation of state (EoS) for the fluid phases. Predictions of the developed method were compared with experimental data from the literature and with CSMGem software and provided acceptable agreement. In general, the results obtained were satisfactory, presenting a good agreement with the experimental data available in the literature for the several analyzed systems. The performance of the developed model was similar to the CSMGem, the latter being a reference program in the phase equilibria modelling in the presence of hydrates. It can be seen that the model performed significantly better in regions of high pressures, salt-inhibited systems, and in complex multicomponent systems in the presence of mixtures of inhibitors.