Evaluation of various types equations of state for prediction of rate of hydrate formation based on Kashchiev and Firoozabadi model in the presence or absence of kinetic hydrate inhibitors for gasous mixtures in a recirculating systems

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Abstract

This paper compares the effects of using various types of equations of state such as Peng Rabinson(PR), Predictive Soave Ridlich Kowng (PSRK), Benedict–Webb–Rubin-Starling (BWRS), Nasrifar-Boland(NB), and Valderrama -Patel -Teja (VPT) on rate of double gas hydrate formation based on the Kashchiev and Firoozabadi model for gaseous mixtures such as 65% C1/35 %C3, 35% C1/65% C3, 65% C1/35 % i-C4, 35% C1/65% i-C4 with experimental data points obtained in a flow mini-loop apparatus with or without the presence of kinetic inhibitors at various pressures and specified temperature. For the prediction of the gas consumption rate for double gas hydrate formation in a flow mini-loop apparatus, the rate equation based on the Kashchiev and Firoozabadi model for simple gas hydrate formation in bench scale was developed. The TAAD% was found to be 18.6 %, 18.8 %, 19.8%, 20.2% and 20.7% for the PR, NB, PSRK, VPT and BWRS equations of state for calculating gas consumption in double gas hydrate formation in the presence and absence of kinetic hydrate inhibitors, respectively. Comparison results between the calculated and experimental data points of gas consumption indicate that the PR and NB equations of state have lower errors than the PSRK, VPT and BWRS equations of state for this model

Keywords: gas consumption rate, equation of state**,** Kashchiev and Firoozabadi model, double gas hydrate, driving force

Research Highlights

- Measuring the gas consumption for binary gaseous mixtures during gas hydrate formation and write an expression for calculation of gas consumption for double gas hydrate formation in mini-loop apparatus
- Effect of two parameter and three parameter EOS for calculation of driving force and gas consumption
- Experimental investigation is in a flow mini-loop apparatus