A novel two-phase model of fluidized bed methanation reactor

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Abstract

A novel two-phase model was proposed for fluidized bed methanation reactor. In this model, the distribution of gaseous feedstock between bubble phase and emulsion phase due to the effect of the circulation flow was provided. Furthermore, the influence of bubble size on mass transfer was also considered. The proposed model was validated by experimental data of the fluidized bed reactor with methanation. The simulation results of the novel model was compared with the simulation results of the classic Kunii and Levenspiel (K-L) model. To evaluate the role of the two key parameters, two simplified models were presented and the models are solved. Simplified model 1 only considered the influence of bubble size on mass transfer coefficient. Simplified model 2 only considered the influence of circulation flow on the distribution of the gaseous feedstock between bubble and emulsion phase. Finally, the simulation results are compared and results indicate that the role of the circulation flow on the distribution of the gaseous feedstock between bubble and emulsion phase is more important.

Keywords: fluidized bed model, syngas methanation, circulation flow, bubble size