A novel two-phase model for bubbling fluidized-bed CO-methanation reactor

Quancong Zhang[1], Zhikai Cao[2], Songshou Ye[2], Yong Sha[2], Bing Hui Chen[2], and Hua Zhou[2]

[1]Affiliation not available
[2]Xiamen University

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Abstract

Fluidized bed reactor is promising for CO methanation owing to its excellent heat transfer performance. The gas flow distribution between the bubble phase and emulsion phase, and the characteristics of heat removal are important for such a solid-catalyzed exothermal reaction in fluidized bed but these are described simplistically in most conventional models. In this work, a novel model contemplating the gas flow distribution influenced by circulation flow and the effect of particle flow on reaction heat removal is proposed. The simulation results of the proposed model and the classic Kunii–Levenspiel model were compared with experimental data of fluidized bed CO methanation. It was shown that the results of the proposed model have better agreement with experimental data. Finally, the investigation for the effect of particle flow was carried out and the results indicated that the particle flow is important to the reaction heat removal.

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