Effect of drag models on internally-cooled bubbling fluidized bed reactor for CO_2 methanation using CFD model with heterogeneous reactions

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The effect of drag models on an internally-cooled bubbling fluidized bed (IC-BFB) reactor for CO_2 methanation is evaluated by using heterogeneous reactions computational fluid dynamics (HR-CFD) model in which an Eulerian two-fluid model, stiff-chemistry heterogeneous reaction kinetics, and a gas-solid-wall heat transfer model are included. The HR-CFD results showed good agreement with experimental data from the literature. Various drag models available in the literature were compared to determine a drag model representing well hydrodynamics such as pressure drop, bed expansion, temperature distribution, and producer gas compositions. Since most drag models for BFB have been used for cold-beds or non-reaction systems, the present HR-CFD model provides a useful guideline to select a right drag model for the BFB reactor with an internal heat exchanger for CO_2 methanation.