Segregation and intermixing in polydisperse liquid-solid fluidized beds: A multi-fluid model validation study

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September 25, 2021

Abstract

Multifluid model (MFM) simulations have been carried out on liquid-solid fluidized beds (LSFB) consisting of binary and higher-order polydisperse particle mixtures. The role of particle-particle interactions was found to be as crucial as the drag force under laminar and homogenous LSFB flow regimes. The commonly used particle-particle closure models are designed for turbulent and heterogeneous gas-solid flow regimes and thus exhibit limited to no success when implemented for LSFB operating under laminar and homogenous conditions. A need is perceived to carry out Direct Numerical Simulations of liquid-solid flows and extract data from them to develop rational closure terms to account for the physics of LSFB. Finally, a recommendation flow regime map signifying the performance of the MFM has been proposed. This map will act as a potential guideline to identify whether or not the bed expansion characteristics of a given polydisperse LSFB can be correctly simulated using MFM closures tested.

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