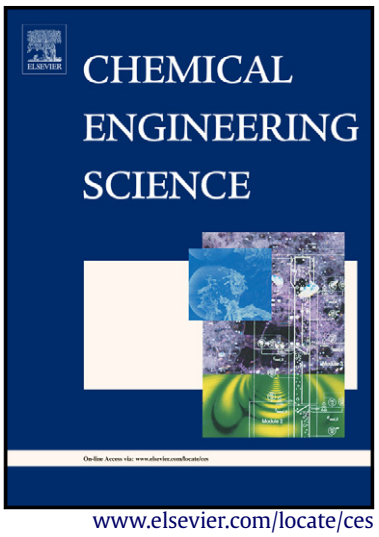

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Modeling of reactive gas-solid flows in riser reactors using a multi-scale chemical reaction model

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ABSTRACT

For gas-solid riser reactors, the multi-scale structure involving a dilute phase in the form of dispersed particles and a dense phase in the form of clusters is a significant feature. Many recent studies have focused on the development of the inter-phase drag coefficient model for the heterogeneous gas-solid flow. However, the impact of the meso-scale structure on mass transfer and chemical kinetics is important for reactive systems. In this work, we extend the multi-scale approach to an n-order irreversible chemical looping reaction and the influence of clusters on chemical reaction is investigated. The local structural parameters can be provided using a modified cluster structure-dependent (CSD) drag coefficient model. The concentrations of gas species in the cluster, the disperse particle and the interface are obtained. The inter-phase mass transfer between the dispersed phase and the cluster phase is evaluated.

Keywords: Multi-scale structure; Riser reactor; Mass transfer; Computational fluid dynamics

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