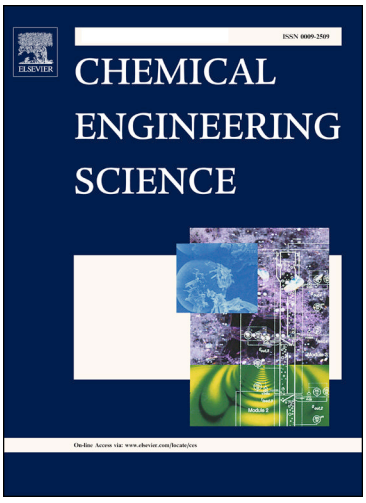

Modelling and numerical simulation of coupled transport phenomena with phase change: layer evaporation of a binary mixture

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Modelling and numerical simulation of coupled transport phenomena with phase change: layer evaporation of a binary mixture

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Abstract

In spite of intense research on coupled transport phenomena in fluid systems, their rigorous modelling and simulation still remains a challenge, especially if a phase change is involved. In this case, the mathematical description becomes particularly interrelated and complex. In the literature, usually only few selected aspects of such problems are considered, e.g. in isothermal or one-component systems. In this work, a more holistic approach is suggested comprising promising concepts available in the literature. The resulting model and relevant code for the *Computational Fluid Dynamics* (CFD)-simulation of momentum, total mass, species, and heat transfer in two-phase binary systems are free of any heuristic or empirical parameters and thus are applicable to a wide range of problems. Several one-dimensional simulation cases are considered to provide a first validation of the model.

Keywords: Computational Fluid Dynamics, coupled transport phenomena, phase change, Volume-of-Fluid method

1. Introduction

Transport phenomena within and between fluid media play a key role in numerous unit operations of process engineering, e.g. in distillation or extrac-

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