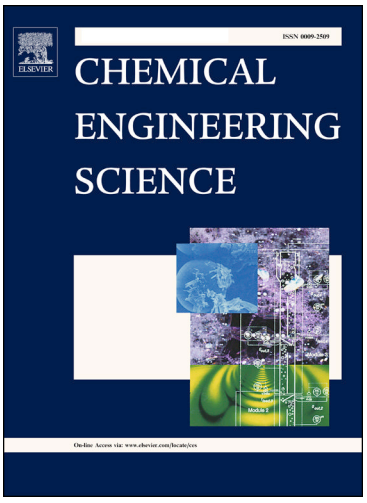

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Modelling and numerical simulation of coupled transport phenomena with phase change: mixture evaporation from a rectangular capillary

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Abstract

Understanding of transport phenomena in fluid-fluid two-phase systems is essential for many engineering applications. When evaporation or condensation is considered, there exists a two-way coupling of momentum, heat and species transfer, i.e. the fluid flow influences the heat and species transfer and vice versa. The CFD-based simulation of evaporating and/or condensing flows requires models and numerical solution techniques for two-way coupled transport equations and their boundary conditions. Most results on transport phenomena in systems with phase change available in the literature are restricted by either isothermal or one-component systems. Recently we have proposed an approach for modelling and simulation of two-way coupled transport phenomena in non-isothermal two-phase binary systems and performed a first validation using some one-dimensional problems (Rieks & Kenig, 2018). In the present work, a further, more sound validation of the new model and simulation code is accomplished to govern two-dimensional systems.

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

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