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# Two-equation macroscopic continuum model for drying capillary porous media: Benchmarking against pore network model simulations

*Tuesday, 31 May 2022 15:20 (1h 10m)*

In this work, a two-equation macroscopic continuum model (CM) is developed that accounts for the local non-equilibrium mass transfer in a drying capillary porous medium. The two-equation CM is based on the volume averaging method and the formulation is formally derived from the upscaling of the pore-scale mass conservation equations of the liquid and vapor phases, where the respective state variables are the saturation and partial vapor pressure. The vapor transport is driven by diffusion in the gas-side boundary layer and in the gaseous pore space, while liquid flows due to the viscous capillary effects induced by evaporation. The two equations are coupled by a source/sink term that characterizes the local non-equilibrium mass transfer between the respective phases. Within the framework of the volume averaging method, mass transport at the medium surface is also modeled by considering the individual boundary conditions for the two continuum model equations. The results of the two-equation CM are compared with pore network model predictions. The macroscopic parameters of the two-equation CM (i.e. effective liquid diffusivity, effective vapor diffusivity and specific interfacial area) are determined heuristically using pore network simulations as a guide. The results indicate that the newly developed two-equation CM captures the non-local equilibrium effect and it reproduces with a good degree of accuracy the phase distributions and drying kinetics predicted by the benchmark pore network model drying simulations.

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## References



## Time Block Preference

Time Block B (14:00-17:00 CET)

## Participation

Online

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