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An axisymmetric solid-liquid phase change model based on Lattice Boltzmann method for phase change material (PCM) melting with porous media DONGYU CHEN, AMIR RIAZ, VIKRANT C. AUTE, Center for Environmental Energy Engineering, Department of Mechanical Engineering, University of Maryland — Phase change material (PCM) is widely used in thermal energy storage systems as it can absorb and release a large amount of heat during the phase change process. Both experimental and numerical studies of PCM have increased substantially in the past two decades. Among them, the phase change in porous media is one of the important topics. In this paper, a solid-liquid phase change model is developed based on the Lattice Boltzmann method (LBM) to simulate transient phase change in porous media. Double distribution functions coupled with multi-relaxation-time (MRT) scheme are utilized in LBM. An enthalpy updating scheme is also applied to determine the liquid fraction of PCM. The basic model without phase change scheme is first verified with the simulation of axisymmetric thermal flow in a vertical annulus with and without porous media. The model integrated with the phase change scheme is tested by simulating the PCM phase change in a vertical cylinder with porous media. The results show a good agreement with the published numerical and experimental results, indicating that the present model can serve as an accurate tool for simulating the axisymmetric convective thermal flow and PCM phase change within porous media.

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