VERIFICATION OF IMMERSED BOUNDARY METHOD AND NUMERICAL SIMULATION OF NEWTONIAN FLUID IN MICROCHANNELS BY OPENFOAM

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Keywords: *Microfluidics;IBM;Microchannels;Microfluid;OpenFOAM*

Research on Microfluidics and Nanofluidics has advanced rapidly over the past two decades, which is a cutting-edge subject and has great application potential in biochemistry, human health, new energy, advanced materials, and so forth. The IBM (immersed boundary method) allows for a precise representation of fixed and moving solid obstacles embedded in the physical domain, using uniform or stretched Cartesian meshes. We recall that the IBM formulation chosen in this work is the discrete forcing approach. The motion of particles suspended in fluid in straight and curved microchannels was simulated by immersed boundary method, and several laws of particle in flow, including the distribution and velocity variation characteristics were obtained. In addition, various 2D and 3D well-documented test cases were carried out to validate IBM solver, based on simulated results of different ratios of Re to viscosity. In summary, the mathematical model of microfluid, in the movement of straight and curved microchannels, is established and further explored in theoretically and experimentally, leading a foundation for the optimal design of microfluidic control.