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Simulation of a Deformable Particle using Lattice Boltzmann Method SHEILA REZAK, ROBERT MACMECCAN, EJIANG DING, JONATHAN CLAUSEN, JINGSHU WU, G. PAUL NEITZEL, CYRUS AIDUN, Georgia Institute of Technology — The flow characteristic of deformable particles and fibers is largely dependent on the deformation and interaction of the solid phase. For example, in fiber suspension, the transport properties of the suspension and the fiber-fiber interaction and flocculation are dependent on fiber bending stiffness. In blood flow, both viscosity and enhanced mass transport of platelets are dependent on red blood cell membrane stiffness and deformation. A new hybrid method has been developed based on coupling an elastic finite element particle model for particle deformation to the lattice Boltzmann method for fluid transport. The elastic finite element model provides easy incorporation into the lattice Boltzmann framework and enough computational efficiency to allow simulation of suspensions at high volume fractions. Issues related to the new method are discussed in the context of two dimensional deformable spheres and fibers in simple shear flow. In particular, we show deviations from Jeffery's orbit in simple shear flow due to particle deformation and discuss the effect on the flow characteristic.

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