Abstract Submitted
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Simulation of suspension flow of finite-size spherical particles in a 3D square channel[1] HUI GAO, LIAN-PING WANG, U. Delaware — Suspension flow of finite-size particles in a turbulent gas is of importance to many engineering applications and natural phenomena. As a first step, the present work focuses on the motion and hydrodynamic interaction of finite-size particles in the absence of background carrier-fluid turbulence. The major challenge for an accurate simulation is twofold: an efficient implementation of no-slip boundary conditions on the moving particle surface and an accurate representation of short-range lubrication effects that typically are not resolved numerically. A Navier-Stokes based hybrid approach (i.e., Physalis) developed by Prosperetti and co-workers is employed to solve the suspension flows of a pair of finite-size, freely-moving particles at finite particle Reynolds numbers. A lubrication force representation, designed by Ladd, involving particle relative location and velocity, is incorporated to capture the short-range interactions between particles. The accuracy of the representation and its compatibility with the flow simulation will be examined. A mesoscopic lattice Boltzmann equation (LBE) approach is also used to simulate the same problem for cross validation. Specific implementation issues will be addressed. Comparison with available numerical data will also be discussed.

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