Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Dynamics of two balls in bounded shear flow of Oldroyd-B fluids[1]

SHANG-HUAN CHIU, TSORNG-WHAY PAN, ROLAND GLOWINSKI, Department of Mathemtics, University of Houston, Houston, TX — The motion of dilute sphere suspensions in bounded shear flow of Oldroyd-B fluids has been studied at zero Reynolds number. Up to the initial sphere displacement, binary encounters of spheres in bounded shear flow of Newtonian fluid are known to have either swapping or non-swapping trajectories at zero Reynolds number (Zurita-gotor et al., J. Fluid Mech. 592 (2007) 447-469). We have simulated the interaction of two spherical particles in Newtonian fluid and Oldroyd-B fluid, respectively, and compared the resulting motions of particles. The motions of two spheres in Newtonian fluid are consistent with those in literature. In Oldroyd-B fluid, swapping trajectories can be obtained for the lower values of the relaxation time. For the non-swapping cases, two spheres do not return to their original transversed position once the encounter terminates, but being closer to the mid-plane between two walls, due to the effect of the elastic force. Two spheres may also attract each other first and then form rotating dipole in bounded shear flow, depending on the value of the relaxation time and initial sphere displacement.

[1]NSF

Tsorng-Whay Pan
Department of Mathemtics, University of Houston, Houston, TX

Date submitted: 18 Jul 2016 Electronic form version 1.4