Abstract Submitted
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Dynamics of elastic particles in a shear flow[1] HOWARD HU, TONG GAO, PEDRO PONTE CASTANEDA, University of Pennsylvania — We study the dynamics of elastic particles in a simple shear flow under Stokes flow conditions. Both 2D and 3D situations are considered. The particle is assumed to be an incompressible neo-Hookean elastic solid. A polarization technique based on Eshelby's problem in elasticity is used to describe the finite-strain, time-dependent response of the particle. Under simple flow conditions (e.g., with constant velocity gradient), a set of coupled, nonlinear, first-order ODEs is obtained for the evolution of the uniform stress fields in the particle, as well as for the shape and orientation of the particle. Three types of particle motion which are typically seen in the vesicle motion under shear—steady-state, trembling and tumbling—are captured by changing the shear rate, the elastic modulus and the initial shape. The conditions that determine the trembling- to-tumbling transition, as well as the critical behavior of the particle near transition are explored. Additionally, the effective viscosity of a suspension of such soft particles under shear is also computed.

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