Abstract Submitted
for the DFD11 Meeting of
The American Physical Society

**Dynamics of elastic particles in an elongational flow**[1] TONG GAO, HOWARD HU, PEDRO PONTE CASTANEDA, University of Pennsylvania — We consider dynamics of elastic particles in a steady elongational viscous flow under Stokes flow conditions. 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. In the elongational flow, the particle deforms and rotates to align with the flow directions before reaching steady state. However, the steady-state solutions only exist in certain regimes where the deformation is not very large. In 2D, the closed-form analytical solutions can be solved directly; while in 3D, the solutions have to be solved numerically. The results of initially spherical shaped particles compare well with those of the classical work by Roscoe (1967).

[1]We acknowledge the Nano/Bio Interface Center at the University of Pennsylvania.

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Date submitted: 02 Aug 2011 Electronic form version 1.4