Abstract Submitted
for the DFD08 Meeting of
The American Physical Society

Hi Fidelity Multiscale Flow Simulation of Sedimentation of a Sphere in Dilute Polymeric Solutions BAMIN KHOMAMI, ARASH ABEDI-JABERI, University of Tennessee at Knoxville — Modeling flow of dilute polymeric solutions in complex kinematics flows using closed form constitutive equations or single segment elastic dumbbell models has attracted considerable attention in the past decade. However, to date most of these simulations have not been able to ***quantitatively*** describe the experimentally observed flow dynamics**.** This failure can be attributed to the fact that these models can at best qualitatively describe the polymer dynamics and rheological properties of dilute polymer solutions. However, multi-segment bead-rod and bead spring descriptions of dilute polymeric solutions have been shown to describe both single molecule dynamics as well as the solution rheological properties. Our recent success in quantitatively describing a contraction/expansion flow behavior has motivated extension of this approach to other complex kinematics flows, namely, sedimentation of a sphere in a tube. In particular, we have carried out extensive multiscale flow simulations in tubes of various diameters. Comparison of computational and experimental results clearly demonstrate that multiscale simulations with micromechanical models that accurately describe the internal degrees of freedom of the macromolecules as well as their polydispersity are capable of providing accurate prediction of the drag coefficient of the sphere over a broad range of De and tube diameters.

Bamin Khomami

Date submitted: 01 Aug 2008 Electronic form version 1.4