Abstract Submitted
for the DFD09 Meeting of
The American Physical Society

Dynamics of suspensions of elastic capsules flowing in confined geometries PRATIK PRANAY, PIETER J.A. JANSEEN, MICHAEL GRAHAM, UW-Madison — Modeling the behavior of fluid-filled capsules (a simple representation of red blood cells and vesicles), is not only important to understand biological processes, such as blood flow in the microcirculation, but also to help design and improve microfluidic devices for characterizing or separating such particles. The present work describes simulations of large numbers of deformable capsules with various properties in confined geometries. Our algorithm incorporates a General-Geometry-Ewald-Like method (GGEM) for efficiently calculating hydrodynamic interactions (O(N)) in an immersed-boundary method. With our algorithm, we have addressed several issues. The ability to quickly simulate large number of particles enables examinations of not only of the competition between shear-induced diffusion and wall-induced hydrodynamic migration of single particles, but also exploration of concentration effects and segregation by size, shape and/or deformability. Combined with the simulation of grooved channels, we propose a methodology to separate these cells depending on their deformability and size. Finally, the effect of addition of long-chained polymer molecules in blood flow, known to lower blood pressure, is investigated.

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Date submitted: 06 Aug 2009 Electronic form version 1.4