Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Shear thinning in soft particle suspensions PANAYIOTIS VOUDOURIS, Eindhoven University of Technology (a) Department of Mechanical Engineering, Materials Technology (b) Institute for Complex Molecular Systems, BERCO VAN DER ZANDEN, Eindhoven University of Technology - Department of Mechanical Engineering, DANIEL FLOREA, ZAHRA FAHIMI, HANS WYSS, Eindhoven University of Technology (a) Department of Mechanical Engineering, Materials Technology (b) Institute for Complex Molecular Systems — Suspensions of soft deformable particles are encountered in a wide range of food and biological materials. Examples are biological cells, micelles, vesicles or microgel particles. While the behavior of suspenions of hard spheres - the classical model system of colloid science - is reasonably well understood, a full understanding of these soft particle suspensions remains elusive. The relation between single particle properties and macroscopic mechanical behavior still remains poorly understood in these materials. Here we examine the surprising shear thinning behavior that is observed in soft particle suspensions as a function of particle softness. We use poly-N-isopropylacrylamide (p-NIPAM) microgel particles as a model system to study this effect in detail. These soft spheres show significant shear thinning even at very large Peclet numbers, where this would not be observed for hard particles. The degree of shear thinning is directly related to the single particle elastic properties, which we characterize by the recently developed Capillary Micromechanics technique. We present a simple model that qualitatively accounts for the observed behavior.

Panayiotis Voudouris
Eindhoven University of Technology (a) Dept of Mechanical Engineering,
Materials Technology (b) Institute for Complex Molecular Systems

Date submitted: 18 Nov 2011 Electronic form version 1.4