Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Random Organization of Suspensions: Geometry versus Hydrodynamics EMMANOUELA FILIPPIDI, ALEXANDRE FRANCESCHINI, PAUL CHAIKIN, DAVID PINE, Center for Soft Matter Research, NYU — Suspensions of athermal spheres at moderate volume fractions (0.2-0.4) under slow periodic strain undergo a phase transition from an absorbing to an active state despite the low Reynolds number regime of the flow imposed. In the absorbing state, the particles return to their original positions after every cycle, while in the active steady state, they appear diffusive. To explain the scaling near the transition and explore its universality class, we propose to replace the spherical particle with an effective particle whose shape depends on strain. We experimentally measure the particle pair correlation and the time evolution of the rheology and the stress-strain curves. The pair correlation is compared to the one expected for our effective particle and the time evolution curves are compared to theoretical existing models. While the geometrical approach of the effective particle captures the main physics of the system, it overestimates the effects. The consideration of hydrodynamics seems essential in understanding the finer details and the stresses in the suspension. Together, reductionist geometrical approach and detailed hydrodynamics provide a more complete picture in understanding the observed critical phase transition.

Emmanouela Filippidi
Center for Soft Matter Research, NYU

Date submitted: 11 Nov 2013 Electronic form version 1.4