Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

The Role of Shear Bands in the Yielding of a Dense Colloidal Suspension ITAI COHEN, Harvard, DAVID WEITZ, Harvard — While much has been done to characterize phases of colloidal suspensions which are either equilibrated or driven out of equilibrium by an applied shear, very little is known about hybrid structures such as shear bands formed at the transition between these regimes. We have built a shear cell which can be loaded onto a confocal microscope thus allowing us to image the micro-structure of a dense colloidal suspension when it is subjected to an imposed oscillatory strain. In particular, we are able to characterize flows which are inhomogeneous both vertically, across the gap, and laterally, throughout the shear zone. In this talk I will address the role played by shear bands when a suspension undergoes the yielding transition from a solid-like material which can support a load to a liquid-like material which flows under an applied stress. I will show that the role played by shear bands varies dramatically with the gap between the shearing plates. In bulk, shear bands facilitate a continuous transition whereas under confinement, the transition becomes discontinuous and hysteretic. Moreover, we find that in such dense suspensions the flow profiles couple laterally so that a locally disordered or jammed region can produce shear bands throughout the shear zone even in regions which are perfectly ordered.

Itai Cohen
Harvard

Date submitted: 29 Nov 2004 Electronic form version 1.4