253h Linear and Non-Linear Microrheology of Colloidal Suspensions

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The microrheology of colloidal suspensions are measured using laser tweezers. Suspensions of index-matched fluorescent silica and fluorinated ethylene propylene (FEP) are seeded with index-mismatched melamine and polystyrene probe particles, respectively. The probes are trapped with laser tweezers and subjected to a uniform flow, enabling measurements of the suspension microviscosity. Good agreement is found between the microviscosities of FEP measured with laser tweezers and bulk viscosities using a couette cell. As the probe size approaches the suspension particle size, non-linear behavior similar to shear thinning is observed at suspension volume fractions ~ 0.23. This is consistent with the formation of a ``wake'' in the non-equilibrium pair distribution function of the suspension surrounding the probe particle [1], which is confirmed by confocal images of probe experiments in fluorescent silica suspensions.

[1.] T. M. Squires, J. F. Brady, Physics of Fluids [submitted].