



# FRONTIERS IN MICRORHEOLOGY



## A novel technique for interfacial Microrheology

Si Young Choi, David J. Broesch and Todd M. Squires

Chemical Engineering, University of California - Santa Barbara

**Abstract:** We have developed a novel and sensitive interfacial rheometer capable of measuring linear and nonlinear rheological properties of fluid/fluid interfaces, while simultaneously allowing the interface itself to be visualized. We place a micron-sized ferromagnetic disk probe on a fluid-fluid interface, and use electromagnets to exert defined torques. Measuring the angular displacements in response to the known exerted torques allows us to determine the rheological properties of the interface. The sensitivity of the technique stems from the small size of the probe, which naturally emphasizes interfacial stresses relative to those from the bulk. Various modes of operation are possible: linear viscoelastic properties can be obtained using small amplitude oscillations, non-linear (shear-rate dependent) viscosities can be measured with steady rotation, and large amplitude oscillatory measurements can probe the transition between two. Visualization of the probe and the interfacial strain fields simultaneously allow us to directly correlate the measured rheological properties to the microstructural state. We demonstrate the technique with careful measurements of the rheological properties of thin films of silicon oils at air-water interfaces, and highlight ongoing measurements on colloidal systems.



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