Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Investigating Molecular Level Stress-Strain Relationships in Entangled F-Actin Networks by Combined Force-Measuring Optical Tweezers and Fluorescence Microscopy KENT LEE, DEAN HENZE, RAE M. ROBERTSON-ANDERSON, University of San Diego — Actin is an important cytoskeletal protein involved in cell structure and motility, cancer invasion and metastasis, and muscle contraction. The intricate viscoelastic properties of filamentous actin (F-actin) networks allow for the many dynamic roles of actin, thus warranting investigation. Exploration of this unique stress-strain/strain-rate relationship in complex F-actin networks can also improve biomimetic materials engineering. Here, we use optical tweezers with fluorescence microscopy to study the viscoelastic properties of F-actin networks on the microscopic level. Optically trapped microspheres embedded in various F-actin networks are moved through the network using a nanoprecision piezoelectric stage. The force exerted on the microspheres by the F-actin network and subsequent force relaxation are measured, while a fraction of the filaments in the network are fluorescent-labeled to observe filament deformation in real-time. The dependence of the viscoelastic properties of the network on strain rates and amplitudes as well as F-actin concentration is quantified. This approach provides the much-needed link between induced force and deformation over localized regimes (tens of microns) and down to the single molecule level.

Kent Lee
University of San Diego

Date submitted: 15 Nov 2012 Electronic form version 1.4