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Characterization of actin filament deformation in response to actively driven microspheres propagated through entangled actin networks

TOBIAS FALZONE, SAVANNA BLAIR, RAE ROBERTSON-ANDERSON, Univ of San Diego — The semi-flexible biopolymer actin is a ubiquitous component of nearly all biological organisms, playing an important role in many biological processes such as cell structure and motility, cancer invasion and metastasis, muscle contraction, and cell signaling. Concentrated actin networks possess unique viscoelastic properties that have been the subject of much theoretical and experimental work. However, much is still unknown regarding the correlation of the applied stress on the network to the induced filament strain at the molecular level. Here, we use dual optical traps alongside fluorescence microscopy to carry out active microrheology measurements that link mechanical stress to structural response at the micron scale. Specifically, we actively drive microspheres through entangled actin networks while simultaneously measuring the force the surrounding filaments exert on the sphere and visualizing the deformation and subsequent relaxation of fluorescent labeled filaments within the network. These measurements, which provide much needed insight into the link between stress and strain in actin networks, are critical for clarifying our theoretical understanding of the complex viscoelastic behavior exhibited in actin networks.

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