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Active microrheology of entangled blends of DNA and Actin link polymer flexibility to induced molecular deformations and stress propagation ROBERT FITZPATRICK, RAE ROBERTSON-ANDERSON, University of San Diego, ANDERSON RESEARCH TEAM — Actin is a ubiquitous structural protein in the cytoskeleton that gives cells shape and rigidity, and plays important roles in mechanical processes such as cell motility and division. Actins diverse roles stem from its ability to polymerize into semiflexible filaments that are less than one persistence length (17 m) in length, and form entangled networks that display unique viscoelastic properties. We previously found that entangled actin networks propagate microscale forces over several persistence lengths (¿60 m) and takes minutes to relax. DNA, oppositely, has thousands of persistence lengths (50 nm) per chain, exhibits minimal force propagation, and takes only seconds to re-equilibrate. To directly determine the role of flexibility in mechanical response and force propagation of entangled networks, we use optical tweezers and fluorescence microscopy to investigate blends of actin and DNA. We use optically driven microspheres to perturb the network far from equilibrium and measure the force the network creates in response to the induced force. We simultaneously track partially labeled actin filaments during the perturbation and subsequent relaxation period. We characterize filament deformation and show explicitly how induced microscale forces propagate through the network.

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