Abstract Submitted
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Active microrheology of entangled biopolymer composites link polymer flexibility and length to molecular force response[1] ROBERT FITZPATRICK, COLE HAUER, University of San Diego, CARL KYRILLOS, Georgetown University, RYAN MCGORTY, RAE ROBERTSON-ANDERSON, University of San Diego — Entangled polymers have complex viscoelastic properties that are tuned by polymer lengths and flexibilities. Entangled composites of distinct polymers offer added versatility and display nonlinear mechanics, serving as a platform for multifunctional materials. To determine the role of flexibility and length in polymer composites we use optical tweezers and confocal microscopy to measure mechanical and structural properties of co-entangled actin and DNA. Actin filaments have lengths of 5-20 μm, comparable to their persistence length, while DNA of similar lengths have hundreds of persistence lengths per chain. To characterize the nonlinear mechanics of actin-DNA composites, we optically drive a microsphere through the composite and measure the induced force during and following strain. We characterize viscoelasticity and relaxation timescales; and determine the dependence of these quantities on the actin:DNA ratio (0:1-1:0) and DNA length (4-100 μm). We use confocal microscopy to image distinctlylabeled co-entangled actin and DNA and characterize network homogeneity and fluctuations. Initial results show actin and DNA are well-integrated and form structurally homogenous networks that exhibit stiffness and relaxation times that increase nonlinearly with increased actin.

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