Abstract Submitted
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Microscale force response and morphology of tunable co-polymerized cytoskeleton networks[1] SHEA RICKETTS, University of San Diego, VIKRANT YADAV, JENNIFER L. ROSS, University of Massachusetts Amherst, RAE M. ROBERTSON-ANDERSON, University of San Diego — The cytoskeleton is largely comprised of actin and microtubules that entangle and crosslink to form complex networks and structures, giving rise to nonlinear multifunctional mechanics in cells. The relative concentrations of semiflexible actin filaments and rigid microtubules tune cytoskeleton function, allowing cells to move and divide while maintaining rigidity and resilience. To elucidate this complex tunability, we create in vitro composites of co-polymerized actin and microtubules with actin:microtubule molar ratios of 0:1-1:0. We use optical tweezers and confocal microscopy to characterize the nonlinear microscale force response and morphology of the composites. We optically drag a microsphere 30 μm through varying actin-microtubule networks at 10 μm/s and 20 μm/s, and measure the force the networks exerts to resist the strain and the force relaxation following strain. We use dual-color confocal microscopy to image distinctly-labeled filaments in the networks, and characterize the integration of actin and microtubules, network connectivity, and filament rigidity. We find that increasing the fraction of microtubules in networks non-monotonically increases elasticity and stiffness, and hinders force relaxation by suppressing network mobility and fluctuations.

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