Abstract Submitted
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Microscale Mechanics of Actin Networks During Dynamic Assembly and Dissociation[1] BEKELE GURMESSA, RAE ROBERTSON-ANDERSON, Univ of San Diego, JENNIFER ROSS, University of Massachusetts, DAN NGUYEN, OMAR SALEH, University of California, Santa Barbara — Actin is one of the key components of the cytoskeleton, enabling cells to move and divide while maintaining shape by dynamic polymerization, dissociation and crosslinking. Actin polymerization and network formation is driven by ATP hydrolysis and varies depending on the concentrations of actin monomers and crosslinking proteins. The viscoelastic properties of steady-state actin networks have been well-characterized, yet the mechanical properties of these non-equilibrium systems during dynamic assembly and disassembly remain to be understood. We use semipermeable microfluidic devices to induce in situ dissolution and re-polymerization of entangled and crosslinked actin networks, by varying ATP concentrations in real-time, while measuring the mechanical properties during disassembly and re-assembly. We use optical tweezers to sinusoidally oscillate embedded microspheres and measure the resulting force at set time-intervals and in different regions of the network during cyclic assembly/disassembly. We determine the time-dependent viscoelastic properties of non-equilibrium network intermediates and the reproducibility and homogeneity of network formation and dissolution. Results inform the role that cytoskeleton reorganization plays in the dynamic multifunctional mechanics of cells.

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